

Veterinary Science



Student Workbook



Veterinary Science



Student Workbook



Veterinary Science

Illustrated by Elisabeth A. Martinec & Reka Janosi

The Veterinary Science instructional unit was developed through a collaborative effort of The National Council for Agricultural Education and Cornell University as a special project of the National FFA Foundation.

This curriculum has been developed as a full year course for high school students studying veterinary science with an emphasis on math and science. It is recommended that students have a background in biology and small animal care prior to taking this course.



Published and Distributed by: Cornell Educational Resources Program
College of Agriculture and Life Sciences
Department of Education
420 Kennedy Hall
Cornell University
Ithaca, New York 14853

© Cornell University 2003*

*Cornell University has granted a worldwide license to use and distribute the Veterinary Science instructional unit to The National Council for Agricultural Education.

Partial funding to support this project was provided by Ag Tech Prep Consortium sponsored by a VTEA grant from the New York State Education Department.

Sponsored by



Teachers have permission to duplicate the information found of the CD-ROM for use in their classrooms to benefit their students. These materials can not be duplicated for commercial purposes without the direct and expressed written permission from Cornell University. In these cases a royalty fee must be paid to Cornell. Contact Janet Hawkes (607)255-8122, for commercial duplication permissions.

Notice: The information presented in this publication reflects current veterinary practices to the best of our knowledge. Readers are advised to be aware of local protocols, the needs and circumstances of individual cases, and their responsibility to stay abreast of emerging knowledge and procedures. The authors, editors, and publishers disclaim any responsibility for improper treatment resulting from the procedures outlined in this publication, for misinterpretation of the information presented, and for any undetected inaccuracies.

Acknowledgements

Sincere appreciation and gratitude are extended to all those who contributed to the development of this publication:

Dr. Daryle Foster, Director of Cornell Educational Resources Program (CERP), Cornell University, College of Agriculture and Life Sciences, Department of Education, Ithaca, New York.

Terry Hughes, New York State Ag-Tech Prep, State University of New York at Cobleskill, Cobleskill, New York.

Author

Elisabeth A. Martinec, Curriculum Development Specialist, Cornell Educational Resources Program (CERP), Cornell University, College of Agriculture and Life Sciences, Department of Education, Ithaca, New York.

Contributing Authors

Sue Brown, Veterinary Technician, Cornell University Companion Animal Hospital, Ithaca, New York.

Mary Lou Genaway, Pioneer High School, Yorkshire, New York.

Sandra Hawkins, Finger Lakes Area Vocational Center, Stanley, New York.

Holly Partridge, Genesee Valley BOCES, Batavia, New York.

Robin Robbins, Town and Country Veterinary Hospital, Corning, New York.

Amanda Thomson, Nonnewaug Regional High School, Woodbury, Connecticut.

Curriculum Committee

Gary Burdine, West Jessamine High School, Nicholasville, KY

Perry Bulison, Woodburn High School, Woodburn, OR

Charles Casada, Jasper High School, Plano TX

Rebecca Connors, Ohio State University

Elizabeth Anne Craig, Alvirne High School, Hudson, NH

Dr. Peter Eyre, Virginia Tech

Michael Gowans, Lone Peak High School, Cedar Valley, UT

Dr. Brian Heim, Cedar Valley College, Lancaster TX

Dick Kyser, R.L. Turner High School, Carrollton, TX

Billy Moss, University of Georgia

Dr. Mary Catherine Odom, Morrison School, Mesa, AZ

Joan Robertson, Burlington Co. Inst. Tech. Vet.

Dr. Marie Rush, All Species Veterinary Services, Lineville, AL

Dr. Clarissa Sheldon, Madison Area Technical College, Madison, WI

Dr. Walter B. Stein, Joliet Junior College, Joliet, IL

Consultants

Roger Barkman, Veterinary Technician, State University of New York at Alfred, Alfred, New York.

Dr. Dwight D. Bowman, Cornell University, College of Veterinary Medicine, Ithaca, New York.

Sue Brown, Veterinary Technician, Cornell University Companion Animal Hospital, Ithaca, New York.

Donna Moore, Agricultural Education Outreach, Cornell University, Ithaca, New York.

Dr. Joseph Savarese, DVM, Medaille College, Buffalo, New York.

Illustrations

Elisabeth A. Martinec, CERP, Cornell University, Ithaca, New York.

Reka Janosi, Fine Arts major, Cornell University, Ithaca, New York.

Editing

JoAnn Martinec

Breed Identification Slides

Oklahoma State University

Laboratory Activities

Wards Natural Science

Preface

Veterinary Science is an instructional package designed for use as a full-year high school course. The goal of these materials is to prepare students for post-secondary education and/or a career in the field of veterinary medicine. The units contained in these materials are sequential with concepts and activities building on the previous units. However, each unit can be used as a separate piece and integrated into existing courses in animal science. Due to the level of content in math, science and technical areas, it is recommended that students have basic math and science skills and knowledge of small animal care prior to participating in this course.

These materials were developed to meet a national need for quality veterinary science materials at the high school level. The curriculum has a strong base in science, math, and career education and documents National Learning Standards and New York State Learning Standards. The result is a comprehensive curriculum developed in cooperation with Cornell Educational Resources Program (CERP), The National Council for Agriculture Education, New York State Ag-Tech Prep, agriculture teachers in New York and Connecticut, and veterinarians and veterinary technicians at Cornell University, SUNY Alfred, Medaille College, SUNY Delhi, and private practice.

The veterinary science curriculum strives to provide integration between academics and career skills. By participating in decision-making, problem solving, and career related activities, students leave the program with the employability and technical skills needed to succeed in the workplace and/or further education.

The developmental process for these materials follows the CERP procedural model for curriculum development. This process includes review of existing materials and creation of new materials that are pedagogically appropriate and technically accurate. All instructional materials are pilot-tested in schools with students. All materials are created by a curriculum development specialist and reviewed by educators and technical experts.

Your comments are welcome. Please share them with:

Elisabeth Martinec
Curriculum Development Specialist
Kennedy Hall
Cornell Educational Resources Program
Cornell University
Ithaca, New York 14853
607.255.9255

Table of Contents

Unit A – Safety & Sanitation

Terms To Know	2
Handouts	3
Student Activities	8

Unit B – Veterinary Terminology

Pronunciation Key	18
Handouts	20
Word Drills	28
Student Activities	34

Unit C – Anatomy & Physiology

Terms To Know	42
Handouts	45
Student Activities	56

Unit D – Clinical Exams

Terms To Know	70
Handouts	71
Student Activities	73

Unit E – Hospital Procedures

Terms To Know	82
Handouts	83
Student Activities	94

Unit F – Parasitology

Terms To Know	104
Handouts	105
Student Activities	111

Unit G – Office Management

Terms To Know	126
Handouts	127
Student Activities	130

Unit H – Posology

Handout	144
Problem Sets	145

Unit I – Laboratory Techniques

Terms To Know	196
Handouts	197
Student Activities	210

Unit J –Animal Nutrition

Terms To Know	232
Handouts	233
Student Activities	241

Unit K – Principles of Disease

Terms To Know	258
Handouts	259
Student Activities	265

Unit L – Animals in Society

Terms To Know	284
Handouts	285
Student Activities	290

Unit M – Career Exploration

Terms To Know	294
Handouts	295
Student Activities	302

Unit N – Animal Management

Terms To Know	316
Handouts	317
Student Activities	322

Safety & Sanitation

By Elisabeth A. Martinec

This unit deals with safety and sanitation in the veterinary hospital including: safety hazards, OSHA, signs and equipment, handling and restraint, and sanitation methods.

Unit A Contents

Terms To Know	2
Handouts	3
Student Activities	8



Terms To Know

Antiseptics – solutions that destroy microorganisms or inhibit their growth on living tissue

Aseptic – being free of infection or contamination by microorganisms

Biohazard – medical waste that could cause infection; needles, scalpel blades, blood, body parts

Carcinogenic – cancer causing

-cide, -cidal – suffixes meaning to kill

Disinfect – to cleanse of harmful organisms

Dosimeter – a badge that records exposure to radiation that is worn when taking x-rays

EPA – Environmental Protection Agency

FDA – Food and Drug Administration

Incubation period – the period of time between infection and the appearance of clinical signs

Isolation – the process of keeping an animal by itself to prevent the spread of disease; quarantine

MSDS – Material Safety Data Sheet

OSHA – Occupational Safety and Health Administration

Parasite – an organism that grows, feeds, and lives on or in another organism while contributing nothing to the survival of the host organism

Pathogen – any microorganism that causes disease

Quarantine – the process of keeping an animal by itself to prevent the spread of disease; isolation

Sanitation – applying practices that make something more acceptable by cleaning it

Sharps – biohazard materials such as needles, scalpel blades, and syringes

Sterilization – the process of killing and removing all microorganisms

Virus – a pathogen consisting of a single nucleic acid surrounded by a protein coat and having the ability to replicate only within a living cell

Zoonosis – any disease that can be passed from animal to human

Name _____

Types of Safety Hazards

Directions: Using transparencies 2-5, fill in the following information on safety hazards.

Physical Hazards



Chemical Hazards



Biological Hazards



Zoonotic Hazards



Common Dog Restraints

Restraints for Injections & Examinations

Lateral Recumbency:

Placing a dog on its side varies in difficulty with size and disposition. With the dog standing on a table, grasp the forelegs with one hand. Reach over the back with the other hand to grasp the hind legs. Lean the dog into your chest to support its weight, and slide it gently down your body so that it is resting on its side on the table. **DO NOT DROP THE DOG ONTO THE TABLE.** Small dogs are generally easier to restrain due to size; a large dog may need to be placed in sternal recumbency then rolled onto its side.

1. Once the dog is down, grasp the forelegs in one hand and the hind legs in the other. Place your index finger between the dog's legs.
2. Restrain the neck with the arm that is holding the forelegs by pressing against the base of the dog's skull. This immobilizes the head. Lean your body on the hindquarters to prevent movement.

Sternal Recumbency:

This is the most commonly used restraint for intravenous (IV) injections. The injection site is the cephalic vein that runs down the front of the dog's forelegs.

1. Hold the dog's head with one arm.
2. With the other arm, reach over the dog's back and grasp the foreleg. Apply weight to the dog's back to prevent movement. Apply pressure on the foreleg to raise the cephalic vein.
3. Press on the vein with your thumb, twisting the thumb outward slightly to roll the vein to the top of the foreleg.



Name _____

Common Cat Restraints

Restraint for Injections & Examination

Sternal Recumbency:

Sternal recumbency for the cat is similar to the dog and is mainly used to administer intravenous (IV) injections into the cephalic vein.

1. Grasp the cat's head with one hand, placing thumb and fingers firmly around the jaw. Gently pull the head away from the foreleg. This will prevent the cat from biting and makes it easier to access the foreleg.
2. Use your other hand to grasp the cat's foreleg at the elbow and extend the leg forward. Apply pressure to the cat's back with your upper body to minimize movement.
3. Apply pressure to the cephalic vein with your thumb, making sure to release pressure when the injection is given.



The Stretch:

This is a modified version of lateral recumbency. It is used for procedures such as intraperitoneal (IP) and intramuscular (IM) injections.

1. Place the cat on its side and use one hand to grasp the scruff. The forearm of this hand will be placed on the table and used to stabilize the cat's back.
2. Hold the hind legs with the other hand, placing your index finger between the legs.
3. Gently stretch the cat out so that its back is resting beside your forearm.



Drug Schedules

Directions: Describe what a drug schedule is and fill in the types of drugs listed in each schedule.

A Drug Schedule is...

<p>Schedule I:</p>
<p>Schedule II:</p>
<p>Schedule III:</p>
<p>Schedule IV:</p>
<p>Schedule V:</p>

Name _____

Sanitation

Directions: Using transparencies 7-9, fill in the following information on sanitation.

Types of Sanitation:

Cleaning –

Sterilizing –

Disinfecting –

Antiseptics –

Commonly Used Chemicals:

Alcohols –

Iodine and Iodophors –

Aldehydes –

Quaternary ammonias –

Chlorine –

Methods of Sanitation:

Physical –

Filtration –

Cold sterilization –

Ultrasound –

Dry heat –

Autoclave –

Radiation –

Student Activity 1:

Analyzing The MSDS

Name _____

Purpose:

If an accident occurs with a hazardous chemical it is crucial that all employees know how to read the MSDS and be able to locate life saving information.

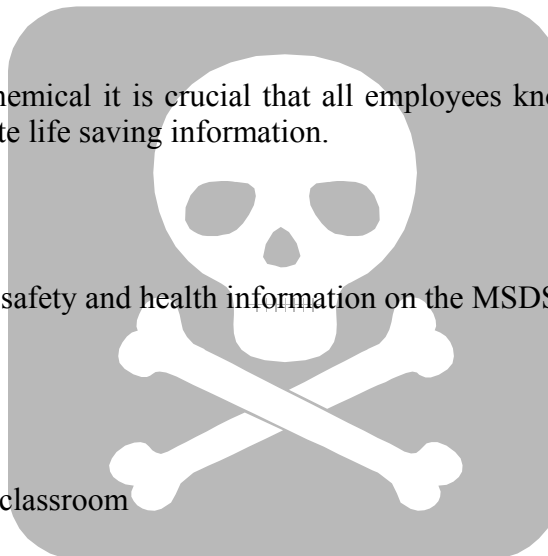
Objectives:

The students will be able locate important safety and health information on the MSDS.

Materials:

Sample MSDS

Several MSDS for chemicals kept in your classroom



Procedure:

Use the sample MSDS to locate the correct information and answer the following questions. Then locate an MSDS for a product used in your classroom and answer the same questions. Questions are located on the next page.

Sample MSDS	Classroom MSDS
1. What is the name of the product?	
2. What does PEL stand for?	
3. Describe the appearance and odor of this product.	
4. What steps should be taken if the product is spilled?	
5. What are the hazardous chemicals that make up this product?	
6. Describe the first aid procedure to be followed if the product comes in contact with your eyes.	
7. If the product catches on fire, how should it be extinguished?	
8. What is the correct way to store this product?	
9. What types of protective gear should be used when handling this product?	
10. If an emergency occurred with this product how could you get information to help you?	

Sample Material Safety Data Sheet

1. Product Information

Product Name: Acme Super Stain
Product Code(s)- 56-9751, 56-9853, 37-0380, 0-0388, BR2300 size: 120 mL, 500 mL
Chemical Name: Product is a mixture
CAS Number: See Section 2
Formula: See Section 2
Synonyms: None known
Distributor: Acme Supply Company
700 Spencer Road
Corning, NY 14830
Chemical Information: 800-277-1430 (8am-5pm (ET) M-F)
(Transportation Spill Response 24 hours): 800-414-4500

2. Composition/ Information on Ingredients

Principle Hazardous Components: Sodium Phosphate, Dibasic (CAS#7768-79-4) 0.25%,
Potassium Phosphate, Monobasic (CAS# 3378-77-0) 0.63%
TLV and PEL units: None established

3. Hazard Identification

Emergency Overview: Avoid contact with skin and eyes. Do not ingest.
Potential Health Effects:
Eyes: May cause irritation.
Skin: May cause irritation. Ingestion: May cause gastrointestinal discomfort. Inhalation: May cause irritation to respiratory tract.

4. First Aid Measures

Emergency and First Aid Procedures:
Eyes - Flush with water for at least 15 minutes, raising and lowering eyelids occasionally. Get medical attention if irritation persists.
Skin - Thoroughly wash exposed area for at least 15 minutes. Remove contaminated clothing. Launder contaminated clothing before reuse. Get medical attention if irritation persists.
Ingestion - If swallowed, if conscious, give plenty of water.
Immediately call a physician or poison control center. Never give anything by mouth to an unconscious person.
Inhalation - Remove to fresh air. Give oxygen if breathing is difficult;
Give artificial respiration if breathing has stopped. Keep person warm, quiet, and get medical attention.

5. Firefighting Procedures

Flash Point (Method Used): Not applicable
NFPA Rating: None established
Extinguisher Media: Use dry chemical, CO2 or appropriate foam.
Flammable Limits in Air % by Volume: Not applicable
Autoignition Temperature: Not applicable
Special Firefighting Procedures:
Firefighters should wear full protective equipment and NIOSH approved self-contained breathing apparatus.
Unusual Fire and Explosion Hazards: This product will not burn; it is not expected to explode.

6. Spill or Leak Procedures

Steps to be taken in case material is Released or Spilled: Ventilate area of spill. Eliminate all sources of ignition. Remove all non-essential personnel from area. Clean-up personnel should wear proper protective equipment and clothing. Absorb material with suitable absorbent and containerize for disposal.

7. Special Precautions

Precautions to be taken in Handling or Storing: Store tightly closed in cool, dry, well-ventilated area suitable for general chemical storage.

8. Special Protection Information

Respiratory Protection (Specify Type):

A NIOSH/MSHA chemical cartridge respirator should be worn if PEL or TLV is exceeded.

Ventilation: Local Exhaust: Yes

Mechanical (General): Yes

Special: No

Other: No

Protective Gloves: Rubber, neoprene, PVC, or equivalent.

Eye Protection: Splash proof chemical safety goggles should be worn at all times.

Other Protective Clothing or Equipment: Lab coat, eyewash, and safety shower.

9. Physical Data

Molecular Weight: No information available

Melting Point: Approximately 0 C (water)

Boiling Point: Approximately 100 C (water)

Vapor Pressure: Approximately the same as water

Vapor Density (Air=1): 0.1 (water)

Specific Gravity (H₂O=1): Approximately 1

Percent volatile by Volume: Approximately 99%

Evaporation Rate (H₂O=1): Approximately 1 (water)

Solubility in water: Appearance and Odor: Complete, product is an aqueous solution Clear, colorless solution with no odor

10. Reactivity Data

Stability: Stable

Conditions to Avoid: None known Incompatibility (Materials to Avoid): Water reactive agents

Hazardous Decomposition Products: None expected

Hazardous Polymerization: Will not occur

11. Toxicity Data

Toxicity Data: Sodium Phosphate, Dibasic: orl-rat LD50: 17gm/kg

ipr-rat LDlo: 1000mg/kg

Potassium Phosphate, Monobasic: No toxic effects data found

Effects of Overexposure:

Acute: See section 3

Chronic: No data found

Conditions Aggravated by Overexposure:

Target Organs: No information available

Primary Route(s) of Entry: Ingestion, skin

12. Ecological Data

EPA Waste Numbers: None

13. Disposal Information

Waste Disposal Methods: Dispose in accordance with all applicable Federal State and Local regulations. Always contact a permitted waste disposer (TSD) to assure compliance.

14. Transport Information

Non-regulated

15. Regulatory Information

EPA TSCA Status: On TSCA Inventory

Hazard Category for SARA Section 311/312 Reporting: Acute

Product or Components	SARA EHS Sec. 302 TPQ	SARA Sec. 313 Chemicals Name List	CERCLA Sec. 103 RQ lbs.	RCR A Sec. 261.33
Sodium Phosphate	No	No	No	No
Potassium Phosphate	No	No	No	No

16. Additional Information

The information provided in this Material Safety Data Sheet represents a compilation of data drawn directly from various sources available to us. Acme Supply makes no representation or guarantee as to the suitability of this information to a particular application of the substance covered in the Material Safety Data Sheet. Any employer must carefully assess the applicability of any information contained herein in regards to the particular use to which the employer puts the material.

Glossary

ACGIH American Conference of Governmental Industrial Hygienists

CSA Number...Chemical Services Abstract Number

CERCLA ... Comprehensive Environmental Response, Compensation, and Liability Act

DOT U.S. Department of Transportation

IARC ... International Agency of Research on Cancer

N/A Not Applicable

NTP National Toxicology Program

OSHA ... Occupational Safety and Health Administration

PEL Permissible Exposure Limit

ppm parts per million

RCRA ... Resource Conservation and Recovery Act

SARA ... Superfund Amendments and Reauthorization Act

TLV Threshold Limit Value

TSCA ... Toxic Substances Control Act

Student Activity 2:

Zoonotic Research

Name _____

Purpose:

Understanding zoonotic diseases enables veterinarians to prevent their spread.

Objectives:

The students will research a zoonotic disease and give a class report.

Materials:

Internet

Procedure:

Choose a zoonotic disease and use the internet to research it and answer the following questions. Be prepared to present your report to the class.

1. Disease Category: virus ____ bacteria ____ fungi ____ parasite ____
2. Common name:
3. Scientific name:



4. What species of animal(s) carry the disease?

5. How do the animals get this disease?

6. How is it passed to humans?

7. What are the signs and symptoms for both animals and humans?

8. How will it harm humans if it is not treated?

9. What is the treatment for animals and humans?

10. List specific ways that this disease can be prevented in animals and humans.

11. Where did you find your information? List at least three websites and any other publications used.

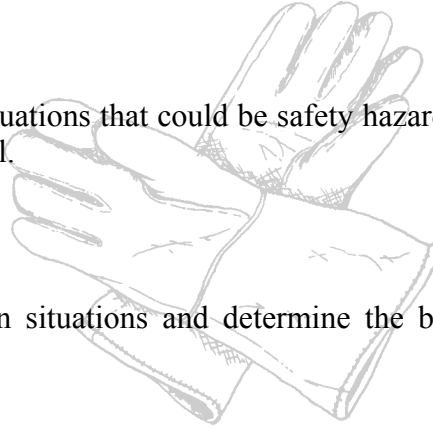
Student Activity 3:

The Safety/Sanitation Situation

Name _____

Purpose:

Every day veterinary staff is faced with situations that could be safety hazards or cause pathogens to spread throughout the hospital.



Objectives:

The students will discuss safety/sanitation situations and determine the best way to handle each situation.

Procedure:

As a group, read and discuss each situation, then determine the best course of action to be taken.

Situations:

1. You are asked to mop the surgery room floor after all the surgeries have been done. When you go to do this, you are unable to find the surgery room mop. You know there is a mop for the kennel area. Should you use this mop? Why or why not?
2. As Carrie is cleaning the surgery room, she notices a pack of sterilized instruments has been opened, but not used. What should Carrie do with the pack?
3. A dog suspected to have Leptospirosis is brought into the hospital. What precautions should be taken to ensure that this dog does not infect other dogs or humans?

4. Jim is cleaning one of the exam rooms and finds several used vaccine syringes. What types of hazard do these represent and how should Jim dispose of them?

5. You are going to assist the vet while she takes x-rays on a parrot. How should you prepare yourself?

6. A new kennel worker starts today and it is your job to talk to him about safety. How would you explain an MSDS?

7. A technician carrying a large bag of dog food slips on a wet floor and hurts his back. How could this injury have been prevented?

8. A cat bites your hand while you're taking it out of its cage. What disease could you get and how could you prevent it?

9. The vet wants you to clean and sterilize a set of surgical instruments. What are your options?

10. Every Friday Jane uses a special disinfectant to clean the exam rooms. She used the last bottle last Friday and the order for a new bottle has not arrived. The only cleaner she can find says "For Use in Outdoor Kennels Only". Should Jane use the cleaner? Why or why not?

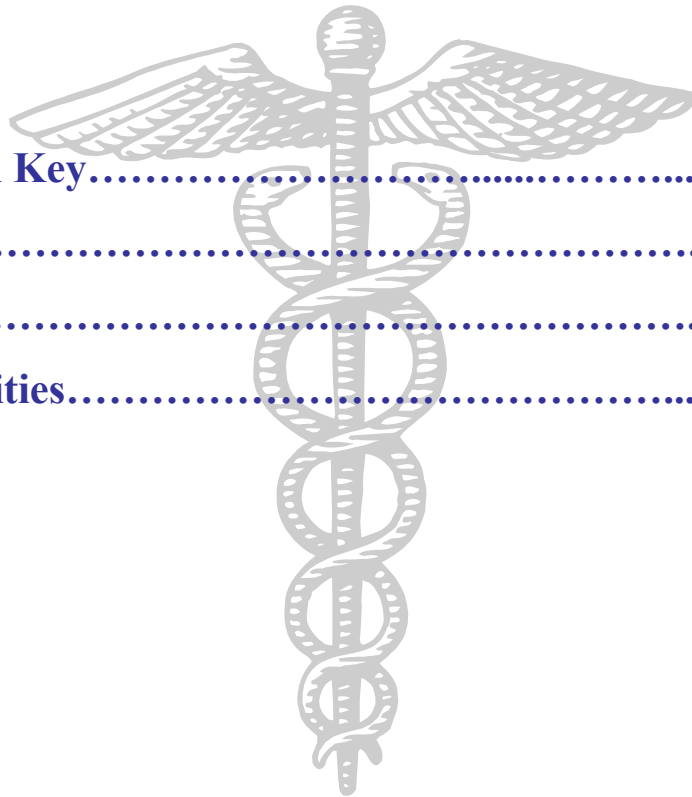
Veterinary Terminology

By Elisabeth A. Martinec

This unit is a basic introduction to veterinary terminology and includes activities to familiarize the student with terms as well as methods used to determine the meaning of unknown terms.

Unit B Contents

Pronunciation Key.....	18
Handouts.....	20
Word Drills.....	28
Student Activities.....	34



Pronunciation Key:

Abdominal	Ab-DAH-mi-nuhl	Pertaining to the abdomen
Anemia	uh-NEE-mee-uh	Lack of blood
Anoxia	a-NAHK-see-uh	Lack of oxygen
Arthritis	ahr-THRY-tis	Inflammation of the joints
Bradycardia	BRAY-dee-KAHR-dee-uh	Abnormally slow heart rate
Carcinoma	KAHR-si-NOH-muh	Cancerous tumor
Cardiomegaly	KAHR-dee-oh-MEH-guh-lee	Abnormally large heart
Cephalic	seh-FAL-ik	Pertaining to the head
Cephalitis	seh-FA-LY-tis	Inflammation of the head
Coprophagia	kah-PRAH-FAY-gia	Eating feces
Cyanuria	SY-a-NOO-ree-uh	Blue urine
Cystotomy	sis-TAH-toh-mee	Cutting into the urinary bladder
Cytopenia	SY-toh-PEE-nee-uh	A deficiency of the cells
Dermatitis	DER-muh-TY-tis	Inflammation of the skin
Dysphagia	dis-FAY-gia	Difficulty eating
Dyspnea	DISP-nee-uh	Difficulty breathing
Dysuria	dis-YOO-ree-uh	Difficulty urinating
Enteral	EHN-teh-rul	Pertaining to the intestines
Enteric	EHN-ter-ick	Pertaining to the intestines
Erythrocyte	eh-RI-throh-site	Red blood cell
Erytholysis	eh-RI-throl-o-sis	Destruction of the red blood cell
Erythropenia	eh-RI-throh-PEE-nee-uh	Deficiency of red blood cells
Eupnea	YOOP-nee-uh	Normal breathing
Gingivitis	JIN-ji-VI-tis	Inflammation of the gingiva
Hepatomegaly	heh-PA-toh-MEH-guh-lee	Abnormally large liver
Hydrocephalous	HY-dro-SEH-fuh-lus	Water on the brain
Hydrous	HY-drus	Pertaining to water
Hypoxia	hy-PAHK-see-uh	Insufficient oxygen
Leukemia	loo-KEE-mee-uh	Malignant blood disease
Leukopenia	LOO-koh-PEE-nee-uh	Deficiency of white blood cells
Lobectomy	loh-BEHK-toh-mee	Surgically removing a lobe

Pronunciation Key (cont.)

Malocclusion	MAL-oh- KLOO -zhuhn	Poor positioning of the teeth
Mammography	mam-MAH-gruh-fee	A recording of the mammary glands
Neonatal	NEE-oh- NAY -tul	Newborn
Ophthalmology	AHF-thal- MAH -loh-jee	The study of the eye
Ophthalmoscope	AHF-thal-moh-skohp	An instrument used to examine the eye
Osteoma	AH-stee-oh-muh	Cancer of the bone
Otic	OH-tic	Pertaining to the ear
Otitis	OH- TY -tis	Inflammation of the ear
Otoscope	OH-toh-skohp	Instrument used to examine the ear
Pericardial	PAIR-i- KAHR -dee-ul	Pertaining to the area surrounding the heart
Pericarditis	PAIR-i-kahr- DY -tis	Inflammation of the tissue surrounding the heart
Periodontal	PAIR-ee-oh- DAHN -tul	Pertaining to the area around the tooth
Peritoneal	PAIR-i-toh- NEE -ul	Pertaining to the peritoneum-the lining of the abdominal cavity
Polyarthritis	PAH-lee-ahr- THRY -tis	Inflammation of multiple joints
Polyuria	PAH-lee- YOO -ree-uh	Producing a lot of urine
Radiography	RAY-dee- AH -gruh-fee	Recording an image using x-rays
Tachycardia	TA-kee- KAHR -dee-uh	Abnormally fast heart rate
Tachypnea	tuh-KIP-nee-ah	Abnormally fast breathing
Thoracotomy	THORAH -KAH-toh-mee	An incision into the thorax
Tracheoma	TRAY-kee-oh-muh	A tumor of the trachea
Tracheotomy	TRAY-kee- AH -toh-mee	Cutting into the trachea
Urology	yoo-RAH-loh-jee	Study of the urinary system

Name: _____

Prefixes 1**Directions:** Fill in the meaning for each prefix, and then define the examples.

Prefix	Meaning	Example
A-, an-		Anemia: Asymptomatic:
Anti-		Antibiotic:
Brady-		Bradycardia:
De-		Dehydrate: Decay:
Dys-		Dyspnea:
Hyper-		Hyperthermia:
Hypo-		Hypothermia:
Mal-		Malocclusion:
Poly-		Polyuria:
Tachy-		Tachycardia:

Name: _____

Suffixes 1**Directions:** Fill in the meaning for each suffix, and then define the examples.

Suffix	Meaning	Example
-cyte		Erythrocyte:
-ectomy		Lobectomy:
-emia		Leukemia:
-pnea		Tachypnea:
-itis		Arthritis:
-logy		Biology:
-oma		Carcinoma:
-penia		Leukopenia:
-scope		Microscope:
-tomy		Cystotomy:

Name: _____

Roots 1**Directions:** Fill in the meaning of the root word.

Root/Combining Form	Pronunciation	Meaning
Cardi/o	KAHR-dee-oh	
Cephal/o	SEH-fal-loh	
Dent/i, dent/o	DEHN tee, DEHN-toh	
Mamm/a, mamm/o	MAM-mah, MAM-moh	
Nas/o	NAZ-zoh	
Ophthalm/o	Afh-THAL-moh	
Ot/o	OH-toh	
Steth/o	STETH-oh	
Thorac/o	THOR-ah-koh	
Trache/o	TRAY-kee-oh	

Name: _____

Prefixes 2**Directions:** Fill in the meaning for each prefix, and then define the examples.

Prefix	Meaning	Example
Ep-, epi-		Epidermal:
Eu- (yoo)		Eupnea:
Iso-		Isothermic:
Multi-		Multicellular:
Neo-		Neonatal:
Pan-		Panarthrits:
Peri-		Periodontal:
Post-		Postoperative:
Uni-		Unicellular:

Name: _____

Suffixes 2**Directions:** Fill in the meaning for each suffix, and then define the examples.

Suffix	Meaning	Example
-al, -ic, -ac, -ous		Thermic: Dermal: Hydrous:
-graphy		Radiography:
-ist		Cardiologist:
-lysis		Erythrolysis:
-megaly		Hepatomegaly:
-natal		Postnatal:
-oxia		Hypoxia:
-phagia		Malphagia:
-spasm		Cardiospasm:
-toxin		Entrotoxin:

Name: _____

Roots 2**Directions:** Fill in the meaning of the root word.

Root/Combining Form	Pronunciation	Meaning
Abdomin/o	Ab-DAH-mi-noh	
Copr/o	KAH-proh	
Cyan/o	SY-a-noh	
Derm/o, Dermat/o	DER-moh, DER-mah-toh	
Enter/o	EHN-teh-roh	
Erythr/o	Eh-RI-throh	
Gingiv/o	JIN-ji-voh	
Hepat/o	Heh-PA-toh	
Hydr/o	HY-droh	
Peritone/o	PAIR-i-toh- NEE -oh	
Ur/o	Yoo-roh	

Common Abbreviations

<u>Abbreviation</u>	<u>Meaning</u>
ad lib.	As much as desired
sid	One time daily
bid	Two times daily
tid	Three times daily
qid	Four times daily
qh	Every hour
qd	Every day
w/o	Without
stat	Immediately
n	Normal
DSH	Domestic short hair (cat)
DLH	Domestic long hair (cat)
Dx	Diagnosis
Hx	History
Rx	Prescription
Sx	Surgery
FeLV	Feline leukemia virus
FIA	Feline infectious anemia
FIP	Feline infectious peritonitis
ECG	Electrocardiogram
ICU	Intensive care unit
cc	Cubic centimeter, mL
mL	Milliliter, cc
wt	Weight
HR	Heart rate
PCV	Packed cell volume
sg	Specific gravity
TPR	Temperature, pulse, respiration
UA, U/A	Urinalysis
IM	Intramuscular
IP	Intraperitoneal
IV	Intravenous
Sub-Q	Subcutaneous
rbc	Red blood cell
wbc	White blood cell
DVM	Doctor of Veterinary Medicine
CNS	Central nervous system
GI	Gastrointestinal
DOA	Dead on arrival
DOB	Date of birth
♀	Female
♂	Male

Latin (Scientific) Adjectives:

How many Latin names and adjectives do you know for the species listed below?
For example, the Latin name for dog is *Canis* and the adjective is canine.

Common name	Latin name	Latin adjective
Dog	<i>Canis</i>	Canine
Cat		
Horse		
Cattle		
Sheep		
Goat		
Pig		
Bird		
Mouse		
Rat		

Word Drill: Prefixes 1

Name _____

Directions: Match the prefixes on the left with the correct meaning on the right.

- | | | |
|-----------|---------|---------------------------------|
| 1. _____ | Dys- | A. abnormally fast |
| 2. _____ | Anti- | B. bad, poor |
| 3. _____ | De- | C. difficulty |
| 4. _____ | Tachy- | D. against, opposing |
| 5. _____ | A-, an- | E. down, from |
| 6. _____ | Hyper- | F. abnormally slow |
| 7. _____ | Poly- | G. excessive, abnormally high |
| 8. _____ | Mal- | H. easily |
| 9. _____ | Hypo- | I. without, lack of, not |
| 10. _____ | Brady- | J. many, much, multiple |
| | | K. insufficient, abnormally low |

Word Drill: Suffixes 1

Name _____

Directions: Match the suffixes on the left with the correct meaning on the right.

- | | |
|------------------|-----------------------------|
| 1. _____ -cyte | A. blood condition |
| 2. _____ -scope | B. cell |
| 3. _____ -itis | C. inflammation |
| 4. _____ -logy | D. abnormally large |
| 5. _____ -ectomy | E. instrument for examining |
| 6. _____ -pnea | F. tumor |
| 7. _____ -emia | G. cutting, incision |
| 8. _____ -tomy | H. deficiency of |
| 9. _____ -oma | I. study of |
| 10. _____ -penia | J. to surgically remove |
| | K. breathing |

Word Drill: Roots 1

Name _____

Directions: Match the roots on the left with the correct meaning on the right.

- | | | |
|-----------|----------------|------------------|
| 1. _____ | Dent/o, dent/i | A. nose |
| 2. _____ | Ophthalm/o | B. trachea |
| 3. _____ | Cardi/o | C. heart |
| 4. _____ | Nas/o | D. ear |
| 5. _____ | Cephal/o | E. teeth |
| 6. _____ | Steth/o | F. eye |
| 7. _____ | Ot/o | G. chest |
| 8. _____ | Thorac/o | H. head |
| 9. _____ | Mamm/o | I. thorax |
| 10. _____ | Trache/o | J. mammary gland |
| | | K. brain |

Word Drill: Prefixes 2

Name _____

Directions: Match the prefixes on the left with the correct meaning on the right.

- | | |
|--------------------|------------------|
| 1. _____ Iso- | A. on, upon |
| 2. _____ Multi- | B. after |
| 3. _____ Uni- | C. new |
| 4. _____ Eu- | D. many, much |
| 5. _____ Ep-, epi- | E. one |
| 6. _____ Neo- | F. single celled |
| 7. _____ Post- | G. around |
| 8. _____ Pan- | H. all |
| 9. _____ Peri- | I. normal |
| | J. equal, same |

Word Drill: Suffixes 2

Name _____

Directions: Match the suffixes on the left with the correct meaning on the right.

- | | |
|------------------------------|----------------------------|
| 1. _____ -toxin | A. eating, swallowing |
| 2. _____ -megaly | B. recording of |
| 3. _____ -ist | C. inflammation |
| 4. _____ -natal | D. destruction of |
| 5. _____ -spasm | E. one who studies |
| 6. _____ -al, -ic, -ac, -ous | F. birth |
| 7. _____ -graphy | G. oxygen |
| 8. _____ -phagia | H. abnormally large |
| 9. _____ -lysis | I. poison |
| 10. _____ -oxia | J. involuntary contraction |
| | K. pertaining to |

Word Drill: Roots 2

Name _____

Directions: Match the roots on the left with the correct meaning on the right.

- | | | |
|-----------|------------------|-------------------|
| 1. _____ | Derm/o, dermat/i | A. liver |
| 2. _____ | Peritone/o | B. blue |
| 3. _____ | Hydr/o | C. feces |
| 4. _____ | Abdomin/o | D. gums |
| 5. _____ | Erythr/o | E. intestines |
| 6. _____ | Ur/o | F. peritoneum |
| 7. _____ | Hepat/o | G. skin |
| 8. _____ | Copr/o | H. water |
| 9. _____ | Cyan/o | I. urinary system |
| 10. _____ | Entr/o | J. red blood cell |
| 11. _____ | Gingiv/o | K. abdomen |

Student Activity 1:

Dissect & Define

Name: _____

Directions: Using handouts 1, 2, and 3, complete the following word drills.

Review

Directions: Match the prefix, suffix, or root on the left with the correct meaning on the right.

- | | |
|-------------------------|-----------------------------|
| 1. _____ -cyte | A. inflammation |
| 2. _____ ot/o | B. abnormally slow |
| 3. _____ brady- | C. teeth |
| 4. _____ -itis | D. study of |
| 5. _____ cardi/o | E. ear |
| 6. _____ mal- | F. instrument for examining |
| 7. _____ -scope | G. difficulty |
| 8. _____ -logy | H. cell |
| 9. _____ dent/i, dent/o | I. bad, poor |
| 10. _____ dys- | J. heart |

Dissect & Define

Directions:

1. Dissect the following words into their pieces by drawing a line between the prefix, root, combining form, and suffix.
2. Define each piece.
3. Write a definition for the whole word.

Example:

Cardiology = cardi/o/logy
 Heart study of

Cardiology = the study of the heart

1. Stethoscope

9. Dysuria

2. Thoracotomy

10. Tonsillectomy

3. Ophthalmology

11. Tachypnea

4. Otitis

12. Polyarthrititis

5. Anemia

13. Bradycardia

6. Mammology

14. Cytopenia

7. Tracheoma

15. Cephalitis

8. Declaw

Student Activity 2: Word Sleuth

Name: _____

Directions: Using handouts 1-6, complete the following word drills.

Review

Directions: Match the prefix, suffix, or root on the left with the correct meaning on the right.

- | | |
|--------------------|-----------------------|
| 1. _____ -ic | A. inflammation |
| 2. _____ nas/o | B. head |
| 3. _____ dys- | C. after |
| 4. _____ -itis | D. eating, swallowing |
| 5. _____ enter/o | E. feces |
| 6. _____ post- | F. nose |
| 7. _____ -phagia | G. against |
| 8. _____ anti- | H. intestines |
| 9. _____ copr/o | I. difficulty |
| 10. _____ cephal/o | J. pertaining to |

Word Sleuth

L J K E L E C T R O C A R D I O G R A M
P O S T I D F O F B E T H E M K W G B A
A S W T P Q R S P G R E M R I O X I C L
N T U K C O P P R R W C Y M T S Y N A O
L E S T R A M T U I O K Y I I R Z G R C
E O S D F B R A D I O L O G I S T I N C
U M K L E O N D H J Z V O Z B W X V J L
K A M N J W C H I P I U F G S A E I R U
O K L A H O M A M A P E P P Y N V T S S
P B E L I Z R N U K C L H S A M F I F I
E L E U K O C Y T E Y V W I A P L S E O
N E V E R S A Y N E V E R A G A I N G N
I V W P O S T O P E R A T I V E G H K B
A L W A Y S G W M F N J P X C X U R E Z
P L V N J U Y T C I R M O P E R A T E R
M B R A D Y C A R D I A S F W W M B X W
A N O K U L Y E C H O Y V E T G I V I S
R O L G Y D T X B R O N C H O S P A S M
S U N I C E L L U L A R H G F D S A L K
H R Y U V I O P E F B R G N Y J M U K I

Directions: Find the hidden words in this puzzle.

Cardiac

Radiologist

Bradycardia

Osteoma

Leukocyte

Panleukopenia

Coprology

Postoperative

Unicellular

Malocclusion

Electrocardiogram

Gingivitis

Bronchospasm

Veterinarian

Student Activity 3:

Crossword

Name: _____

Directions: Using handouts 1-6, complete the following word drills.

Review

Directions: Match the prefix, suffix, or root on the left with the correct meaning on the right.

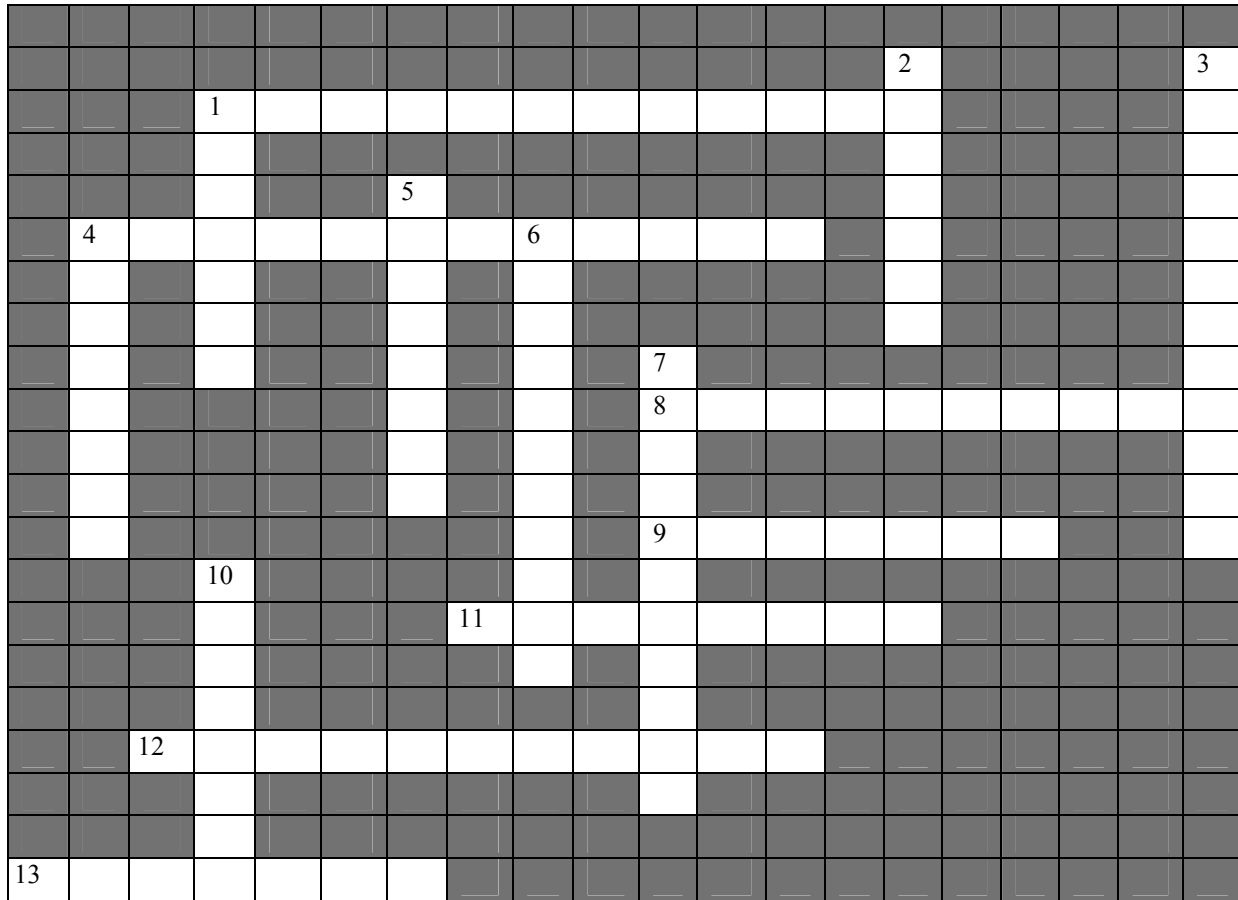
- | | |
|-------------------|-----------------|
| 1. _____ -natal | A. inflammation |
| 2. _____ hepat/o | B. around |
| 3. _____ iso- | C. cell |
| 4. _____ -itis | D. liver |
| 5. _____ ur/o | E. red |
| 6. _____ eu- | F. birth |
| 7. _____ -cyte | G. equal |
| 8. _____ dys- | H. urine |
| 9. _____ erythr/o | I. difficulty |
| 10. _____ peri- | J. normal |

Define

Directions: Define the following words.

1. Pericarditis
2. Hydrocephalous
3. Eupnea
4. Periodontal

Crossword



Directions: Read the clues below and fill in the boxes that correspond with the number of the clue.

Across:

1. Abnormally large liver
4. Abnormally large heart
8. An incision into the trachea
9. Insufficient oxygen
11. An instrument used to examine the ear
12. A recording of the mammary gland
13. The study of the urinary system

Down:

1. Pertaining to water
2. Difficulty breathing
3. Destruction of the red blood cell
4. Pertaining to the head
5. Producing a lot of urine
6. Red blood cell
7. Instrument used to listen to the chest
10. Newborn

Student Activity 4: Common Abbreviations

Name: _____

Purpose: Veterinarians and their staff use dozens of abbreviations that they use. It is important to know the correct meaning for each abbreviation, otherwise serious mistakes could be made and animals could die.

Directions: Read each sentence and write the correct abbreviation above the underlined words.

1. Doctor Center is needed in the intensive care unit immediately. His patient just came out of surgery and needs an electrocardiogram.
2. Snowball is a female domestic long hair cat. She needs vaccinated for Feline Leukemia Virus, Feline Infectious Anemia, and Feline Infectious Peritonitis.
3. Please write a prescription for 6 milliliters of penicillin to be given three times a day.
4. As a vet tech you will have to monitor temperature, pulse, and respiration, every day, every hour.
5. The test results for specific gravity, urinalysis, packed cell volume, and white blood cell count are all normal.
6. Intramuscular, intravenous, subcutaneous, and intraperitoneal are all routes to administer injections.
7. The date of birth for Max, a domestic short hair male cat, is 10/10/00.
8. The Doctor of Veterinary Medicine took a history on his patient and listened to his gastrointestinal sounds before he wrote his diagnosis.
9. Most cats are fed as much as they want, whereas dogs are usually fed twice a day.
10. The dog that arrived dead on arrival was suspected to have a central nervous system disease.

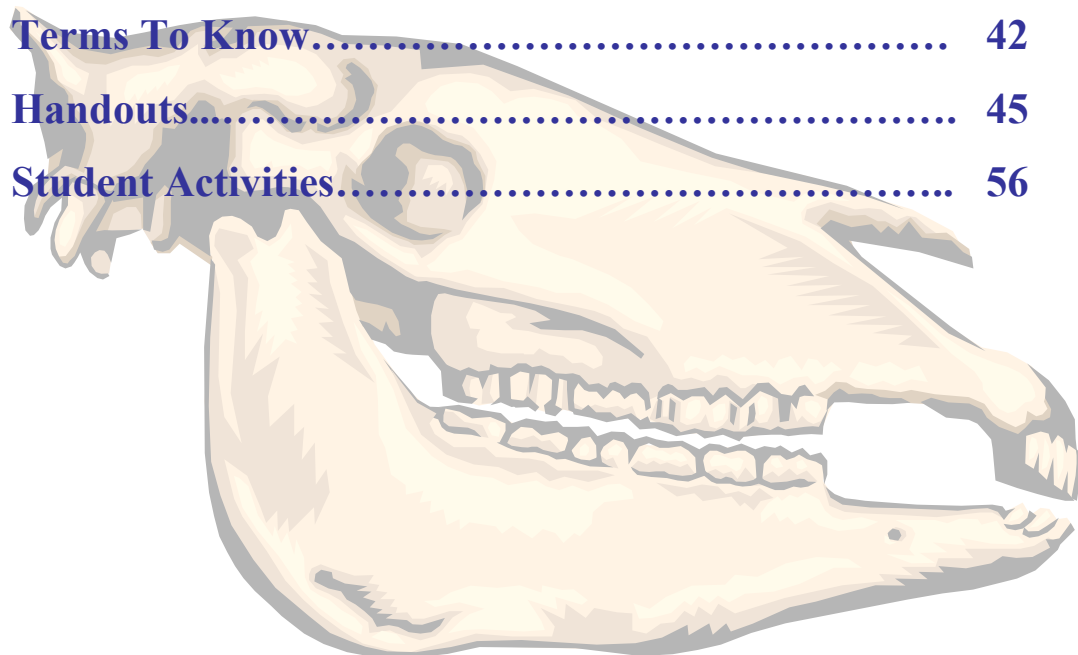
Anatomy & Physiology

By Amanda Thomson

This unit covers anatomical and directional terminology, the skeletal and muscular systems, and the respiratory and nervous systems.

Unit C Contents

Terms To Know.....	42
Handouts.....	45
Student Activities.....	56



Terms To Know

Anatomical Terminology

- Anterior** – front of the animal
- Caudal** – towards the tail of an animal
- Cranial** – towards the head of an animal
- Deep** – further from the surface
- Distal** – part of the limb furthest from the body
- Dorsal** – along the back or uppermost surface
- Frontal plane** – body plane that divides the animal into dorsal and ventral parts
- Lateral** – side of an animal
- Median** – body plane that divides the animal into “equal” right and left halves
- Posterior** – rear of the animal
- Proximal** – part of the limb closest to the body
- Sagittal** – any body plane that is parallel to the median plane
- Superficial** – closer to the surface
- Transverse** – body plane that divides the body into cranial and caudal parts
- Ventral** – along the belly surface

Skeletal System

- Appendicular skeleton** – consists of fore and hind limbs
- Axial skeleton** – consists of the skull and vertebrae
- Comminuted fracture** – bone shatters into many pieces
- Compound fracture** – bone breaks through the skin
- Diaphysis** – body of a long bone
- Endosteum** – thin inner layer of bone covering; lines medullary cavity
- Epiphysis** – enlarged ends of long bones
- Fissure fracture** – break along the long axis of a bone
- Flat bone** – plate of bone, i.e. scapula
- Greenstick fracture** – break on one side of a bone, usually due to a bending force
- Irregular bone** – complex and irregularly shaped bone, i.e. vertebrae
- Long bone** – bone longer than it is wide, i.e. humerus, radius, and femur
- Medullary cavity** – space within the bone filled with marrow
- Metaphysis** – joining point of epiphysis and diaphysis
- Ossification** – process by which tissue and cartilage becomes bone
- Periosteum** – thin outer layer of bone covering
- Sesamoid** – small, seed-shaped bone embedded in a tendon, i.e. proximal and distal sesamoids
- Short bone** – cube shaped bone, i.e. bones of the carpus and tarsus
- Simple fracture** – bone does not break through the skin
- Skeleton** – framework of structures that support and protect the body
- Synovial joint** – freely moveable joint
- Transverse fracture** – break completely across the bone

Terms To Know (cont.)

Muscular System

- Abdominal obliques** – large flat muscles that support digestive and reproductive organs
- Abduction** – movement away from the median plane
- Adduction** – movement towards the median plane
- Agonist** – prime mover of a joint
- Ambulation** – moving from one place to another
- Antagonist** – opposes movement of the agonist
- Biceps brachii** – primary flexor of the elbow joint
- Deep digital flexor** – primary flexor of the digit
- Deltoid** – primary abductor of shoulder
- Extension** – moving the distal part of a limb away from the body
- Flexion** – moving the distal part of a limb towards the body
- Gluteals** – large muscle of the upper hindquarters
- Latissimus dorsi** – large dorsal muscle, attaches humerus to lumbar region
- Masseter** – muscle of the cheek
- Pectorals** – primary adductors of the forelimbs
- Serratus ventralis** – attaches front leg to trunk
- Synergist** – muscle that indirectly aids the agonist
- Tendon** – narrow band of tissue that connects muscle to bone
- Trapezius** – superficial triangular muscle of the shoulder
- Triceps brachii** – primary extensor of the elbow joint

Respiratory System

- Alveoli** – grape-like clusters at ends of bronchioles; where exchange of oxygen and carbon dioxide gases occur
- Apnea** – not breathing
- Asphyxiation** – suffocation; blockage of airflow that results in a lack of oxygen
- Bradypnea** – abnormally slow respiratory rate
- Bronchi** – paired terminal branches of the trachea contained within the lungs; singular: bronchus
- Bronchial tree** – term that describes how bronchi get continually smaller, like a tree branch
- Bronchioles** – smallest branches of the bronchial tree
- Cilia** – tiny hairs inside nostrils that help to filter air
- Diaphragm** – Muscle located below the lungs; contraction causes the lungs to draw in a breath
- Dyspnea** – difficult breathing
- Epiglottis** – flap that covers the larynx during swallowing
- Exhalation** – release of a breath
- Inhalation** – drawing in of a breath
- Larynx** – ‘voice box’ that contains vocal cords

Terms To Know (cont.)

Lungs – paired major organs of respiration that contain bronchi and are divided into clearly defined lobes

Mucous membrane – lining of respiratory tract that secretes mucus

Mucus – slimy secretion that warms, moistens, and filters air

Pharynx – common passageway for both the respiratory and digestive systems

Respiration – exchange of oxygen and carbon dioxide gases with cells

Tachypnea – abnormally fast respiratory rate

Trachea – windpipe; has distinct rings of cartilage

Nervous System

Axon – sends impulses away from cell

Brain – major organ of nervous system; contained within the skull

Brainstem – connects the cerebrum with the spinal cord; contains the Medulla oblongata

Central nervous system – contains brain and spinal cord

Cerebellum – coordinates movement and muscle activity, balance

Cerebrum – largest portion of brain; responsible for receiving and storing information and signaling for voluntary movement

Connecting neuron – carries impulses from one neuron to another

Dendrites – branch-like; receive impulses

Homeostasis – state of balance of the physiologic systems within the body

Impulse – electrical signal that is transmitted through nervous tissue

Medulla oblongata – part of the brain responsible for all life functions including: heart rate, breathing, and reflex actions (coughing, sneezing, swallowing, and vomiting)

Meninges – protective layer covering the brain; has three layers

Motor neuron – carries impulses from the brain towards the muscles and glands

Nerve – term for one or more bundles of nerve cells

Neuron – nerve cells

Neurotransmitter – chemical substance that allows impulses to travel

Parasympathetic nervous system – maintains and restores normal body function

Peripheral nervous system – consists of all nerves that lead to and from the spinal cord and brain, known as cranial and spinal nerves

Sensory neuron – carries impulses towards the brain and spinal cord

Soma – cell body that contains the nucleus

Spinal cord – pathway for all impulses going to and from the brain,

Sympathetic nervous system – responsible for stress and emergency responses; “fight or flight”

Synapse – space between neurons that contains a neurotransmitter

Name _____

Directional Terminology

Directions: Label the drawing with the directional terms.

Cranial

Caudal

Proximal

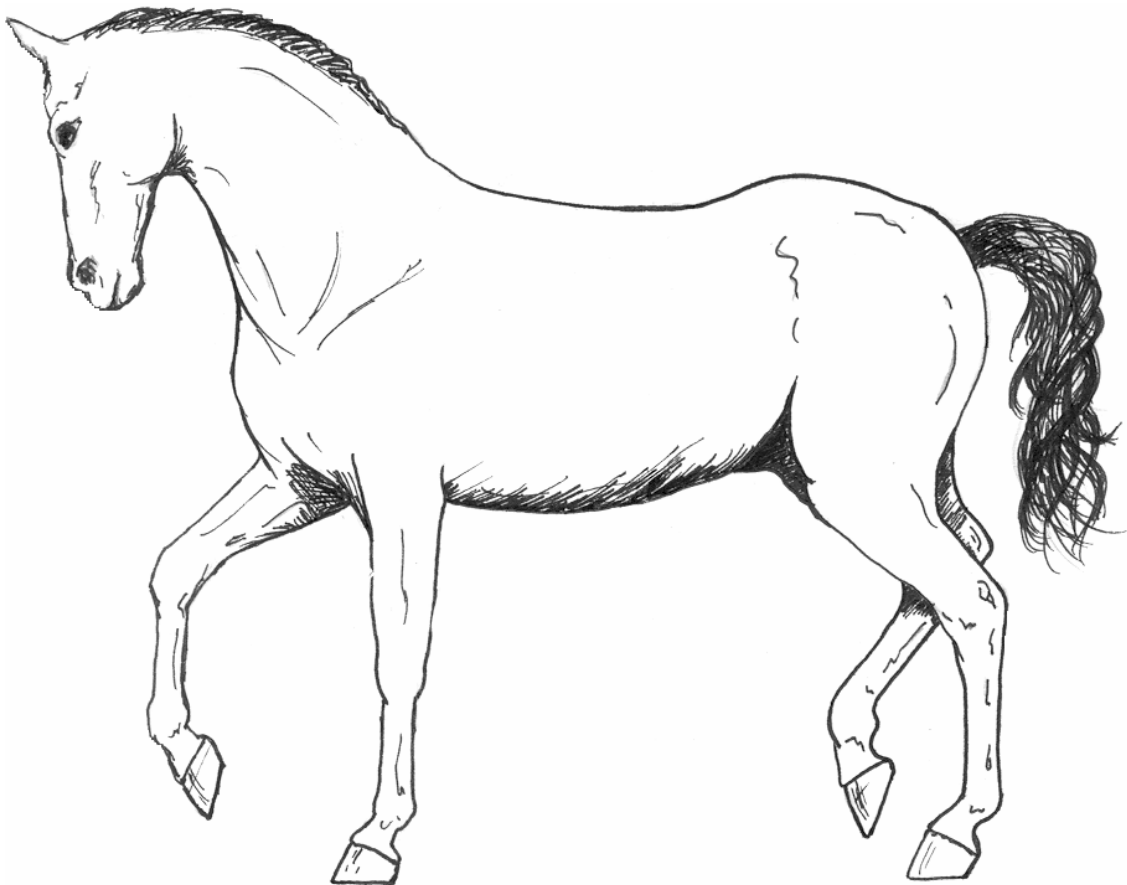
Distal

Dorsal

Ventral

Anterior

Posterior



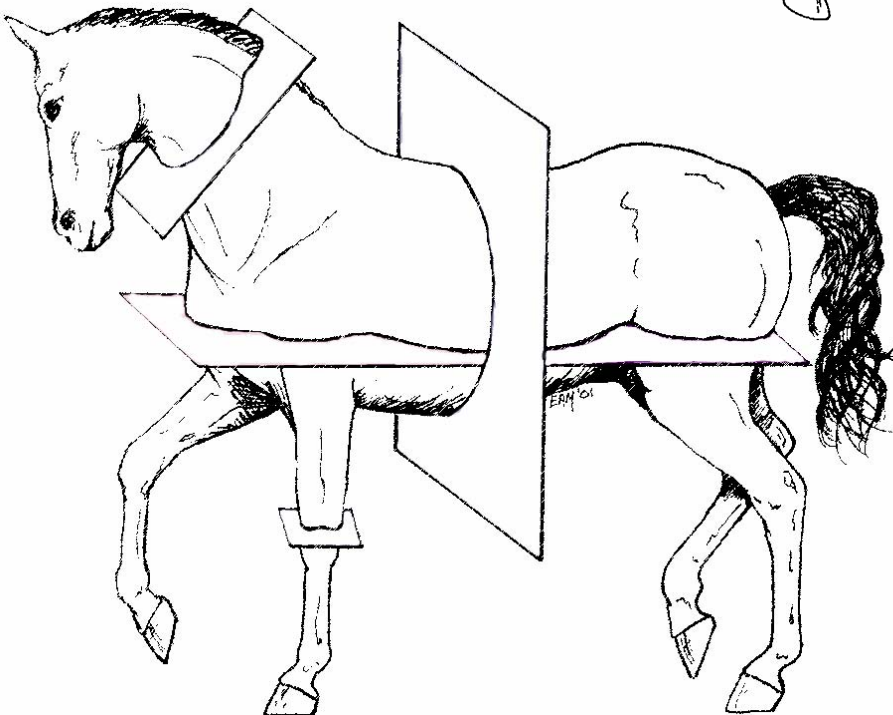
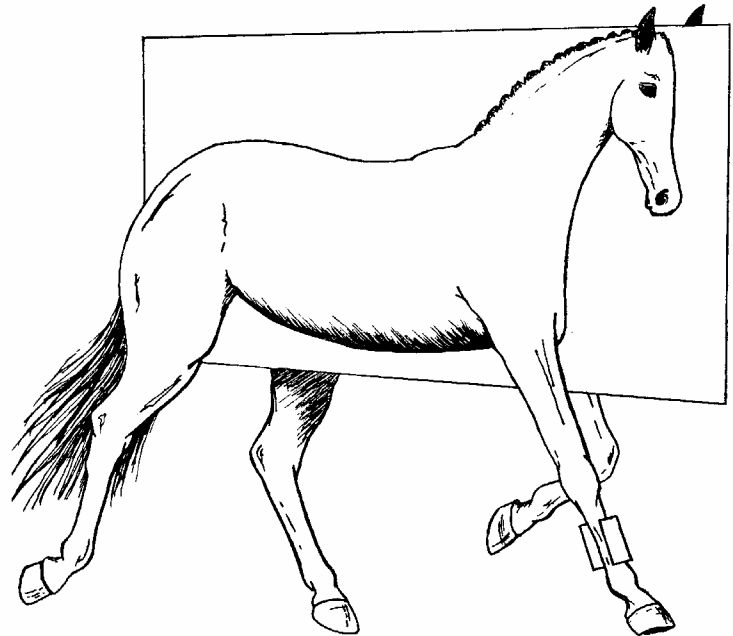
Name _____

3-D and Surface Planes

Directions: Label the drawing with the 3-dimensional and surface planes. Use colored pencil to shade each plane.

Frontal
Median
Superficial

Transverse
Sagittal
Deep

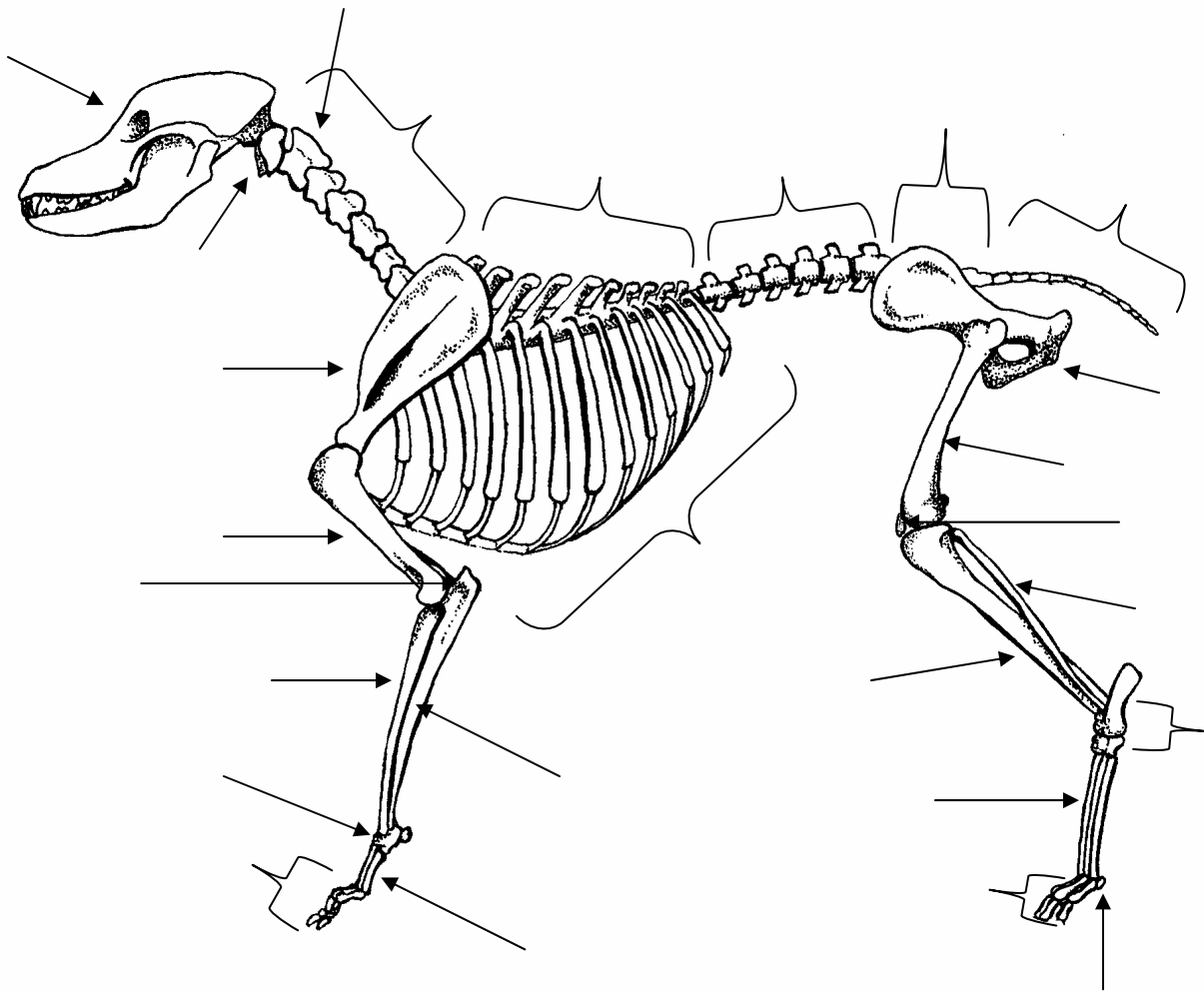


Name _____

Skeletal Anatomy

Directions: Correctly label the bones on the drawing of the dog. Use a colored pencil to shade the bones of the axial skeleton.

- | | | | |
|----------|---------------------|--------------------|------------------|
| Skull | Cervical vertebrae | Thoracic vertebrae | Lumbar vertebrae |
| Ribs | Sacral vertebrae | Scapula | Humerus |
| Radius | Coccygeal vertebrae | Carpus | Phalanges |
| Os coxae | Femur | Tibia | Patella |
| Fibula | Tarsus | Metatarsals | Metacarpals |
| Atlas | Axis | Sesamoids | Olecranon |
| Ulna | | | |

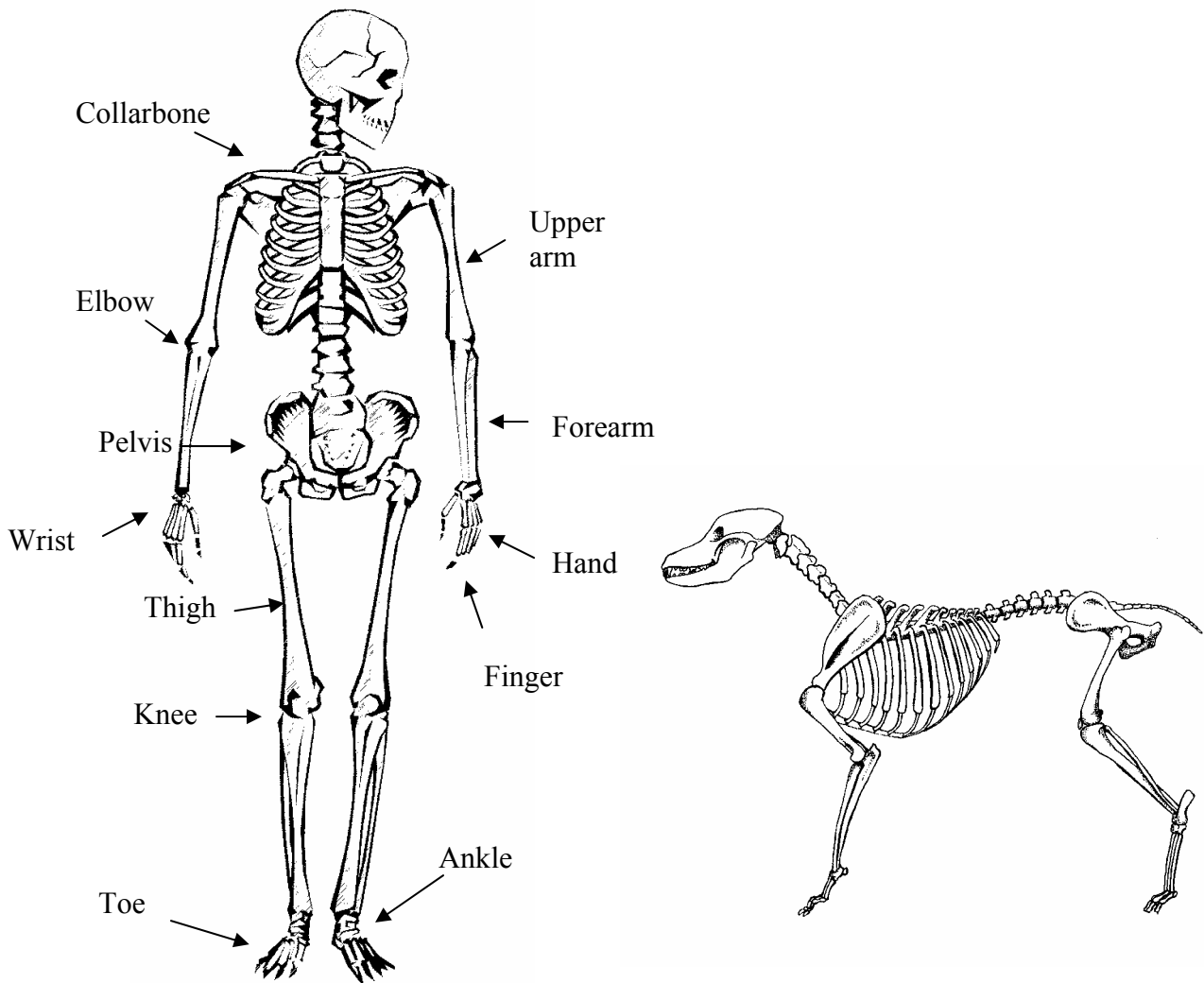


Name _____

Match the Dog to the Human!

Directions: In the spaces below, write the names of the bones of the dog that correspond to the bones of the human.

- | | |
|-----------------|----------------------|
| 1. Wrist _____ | 7. Elbow _____ |
| 2. Knee _____ | 8. Ankle _____ |
| 3. Hand _____ | 9. Upper arm _____ |
| 4. Toe _____ | 10. Forearm _____ |
| 5. Finger _____ | 11. Collarbone _____ |
| 6. Thigh _____ | 12. Pelvis _____ |

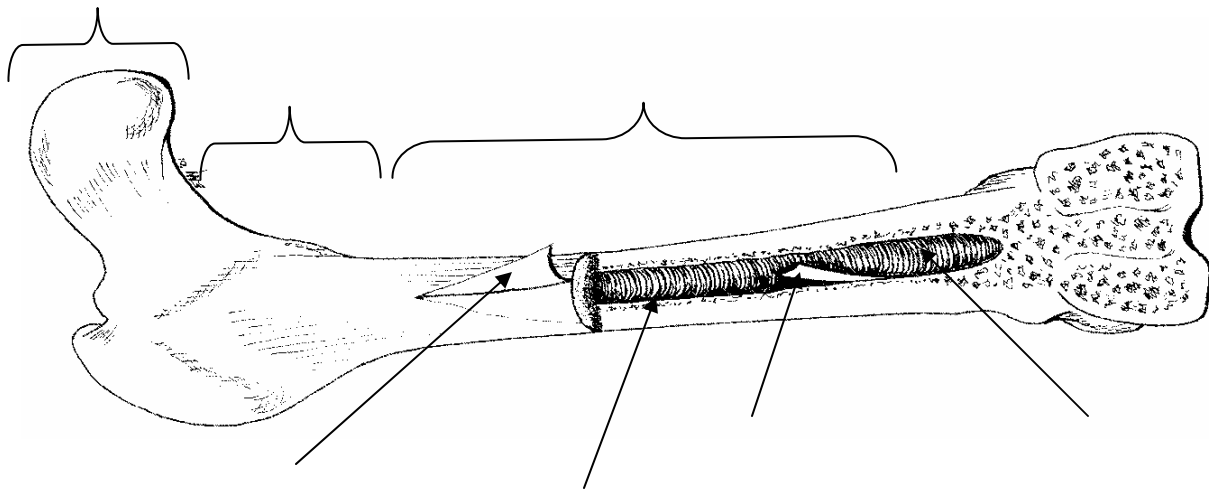


Name _____

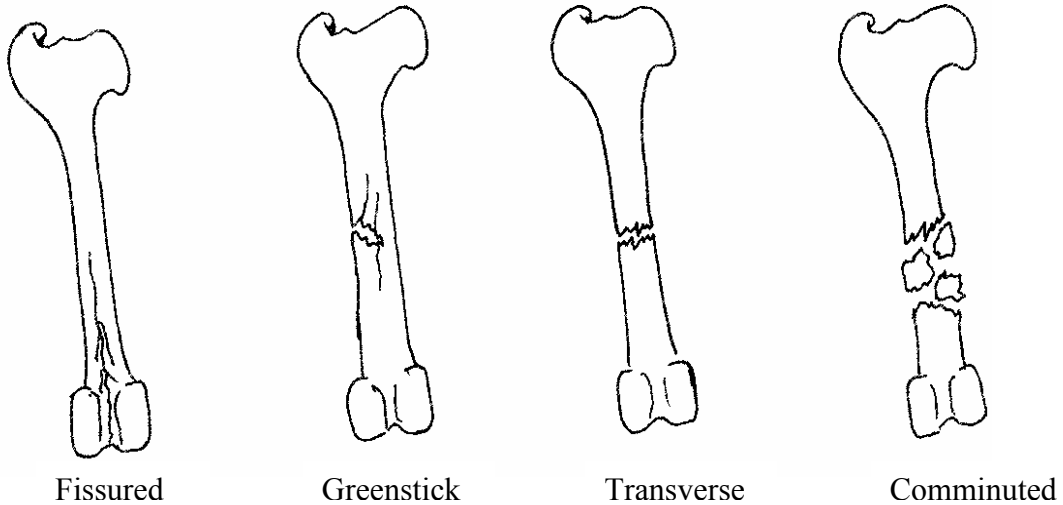
Bone Anatomy & Types of Fractures

Directions: Label the parts of the bone.

- Epiphysis
- Metaphysis
- Medullary cavity
- Bone marrow
- Diaphysis
- Endosteum
- Periosteum



Types of Bone Fractures



Name _____

Types of Muscle & Muscle Movement

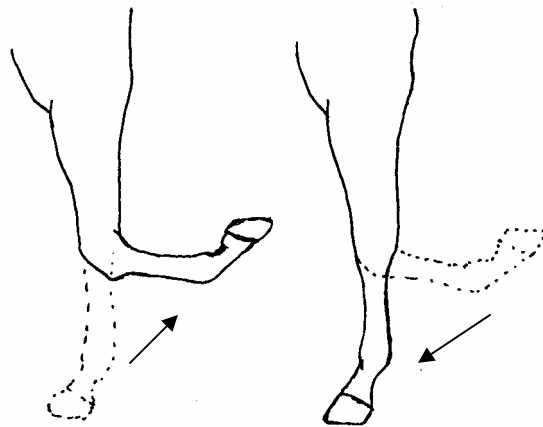
Directions: Explain the function of the three types of muscle in the spaces below.

Skeletal Muscle _____

Cardiac Muscle _____

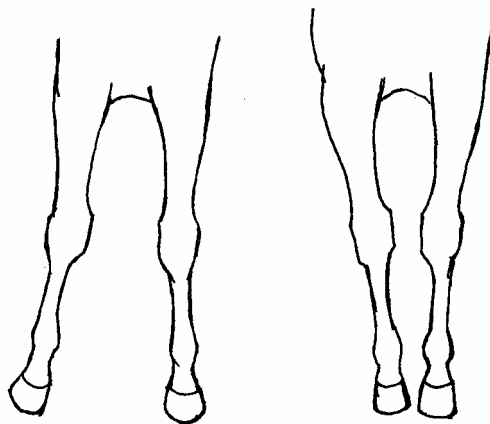
Smooth Muscle _____

Muscle Movement



Flexion

Extension



Abduction

Adduction

Name _____

Major Muscles

Directions: Label the major muscles.

Masseter

Deltoid

Trapezius

Intercostal

External abdominal oblique

Gluteals

Gastrocnemius

Brachiocephalicus

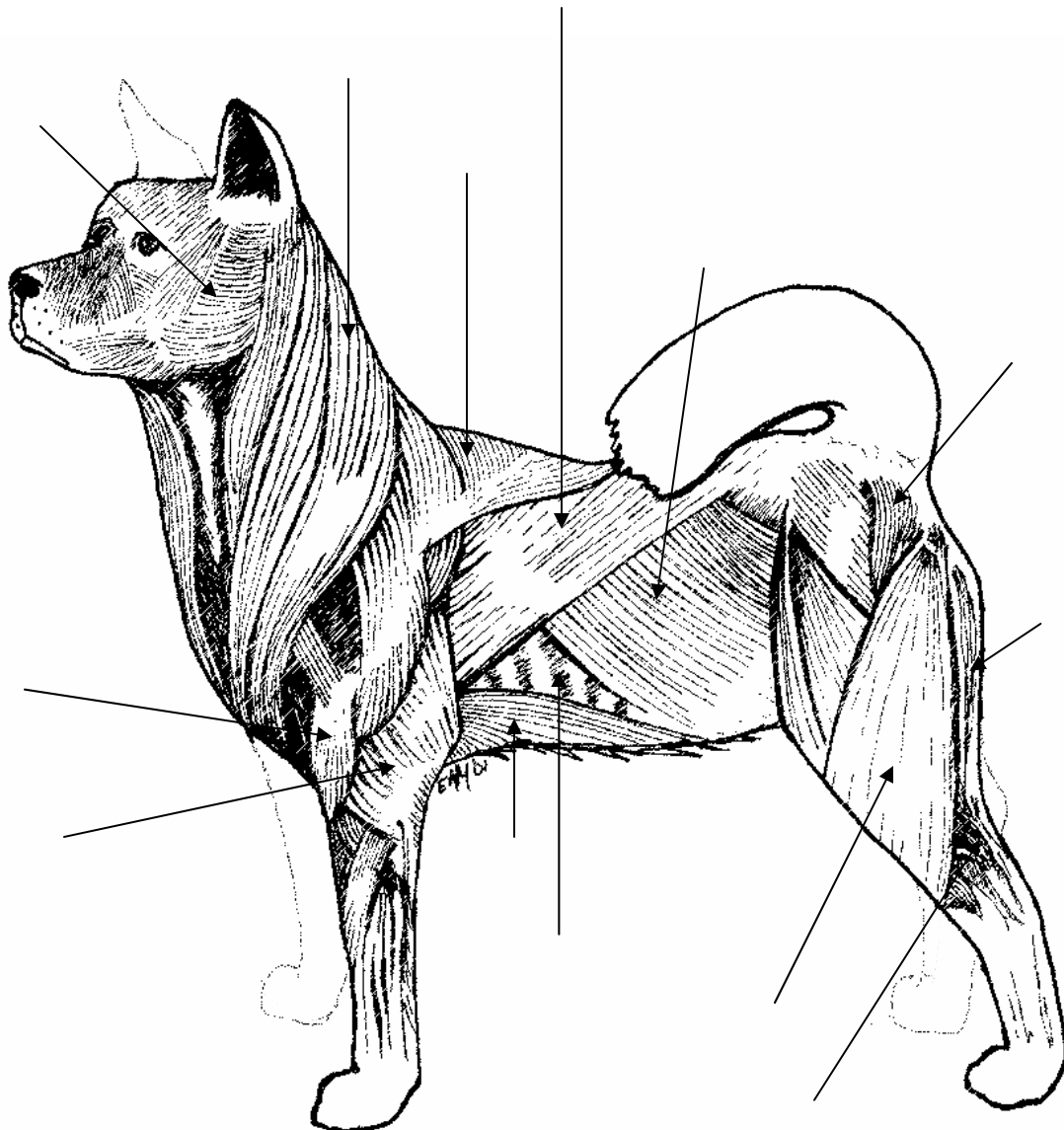
Triceps brachii

Latissimus dorsi

Pectoral

Biceps femoris

Semitendinosus



Name _____

Upper Respiratory System

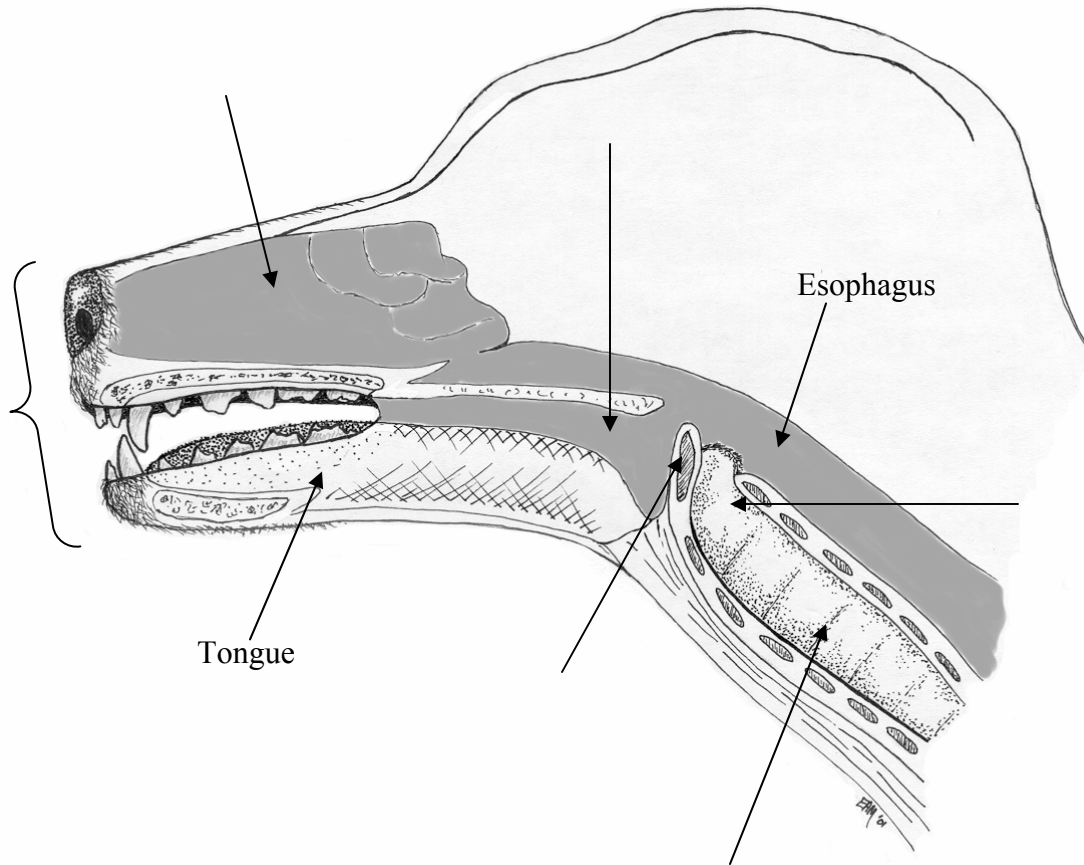
Directions: Label the parts of the upper respiratory system.

Mouth
Trachea

Nasal cavity
Epiglottis

Pharynx

Larynx



Name _____

Lower Respiratory System & Alveoli

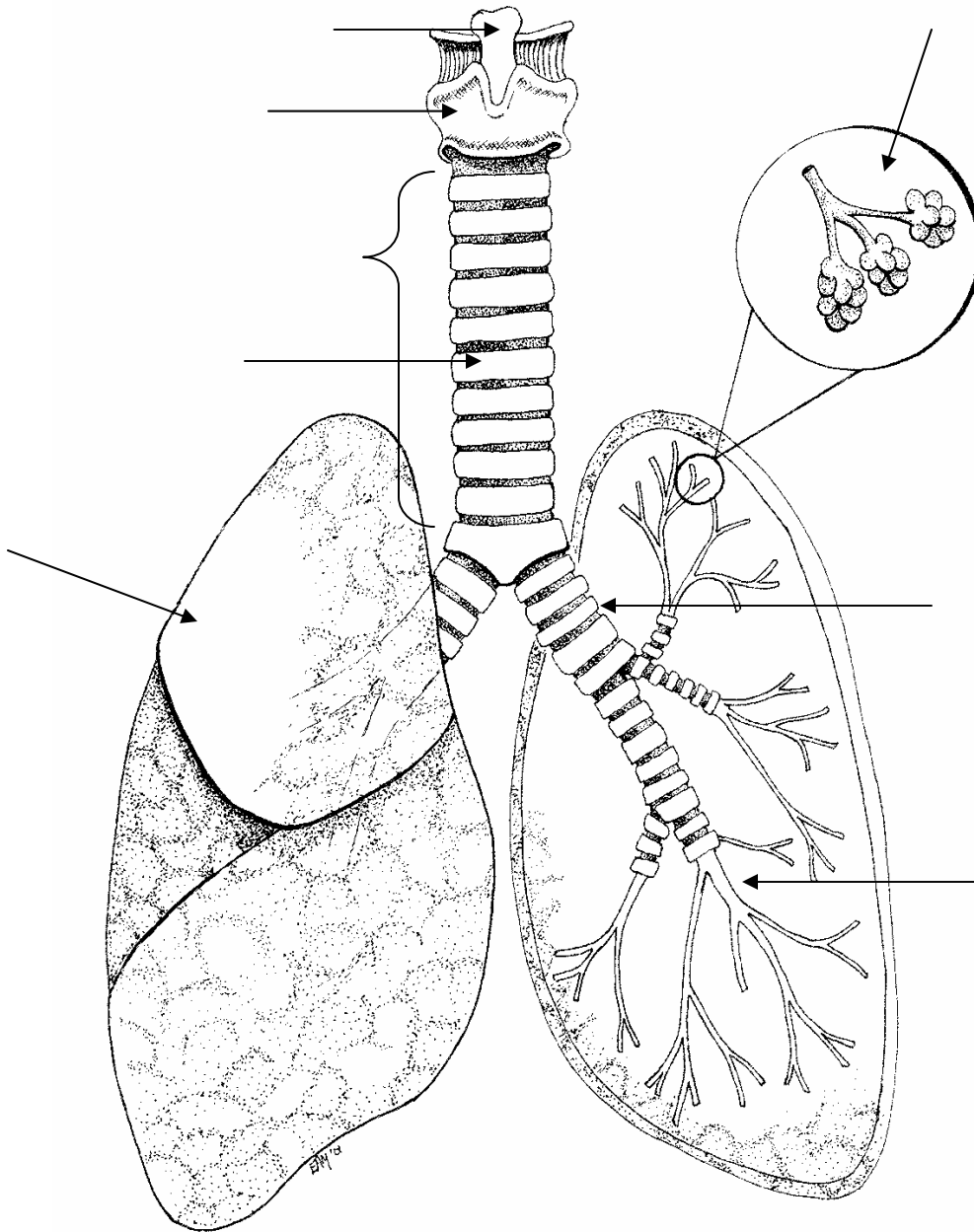
Directions: Label the drawing with the following parts.

Epiglottis
Alveoli

Larynx
Lungs

Trachea
Bronchioles

Bronchi
Cartilage ring



Name _____

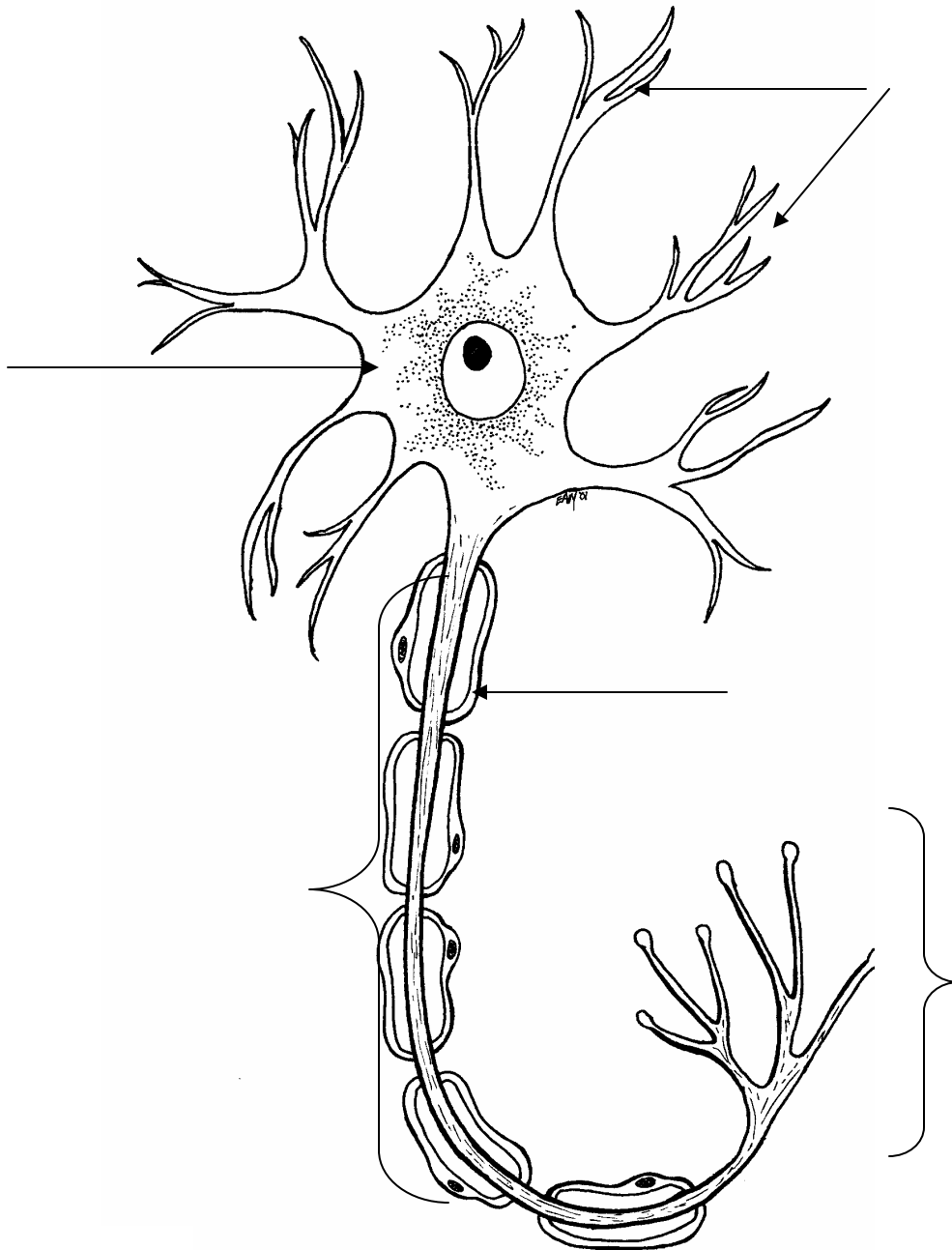
Parts of a Neuron

Directions: Label the parts of a neuron.

Cell body (soma)
Synapse

Dendrite
Axon

Myelin sheath



Name _____

Brain Anatomy

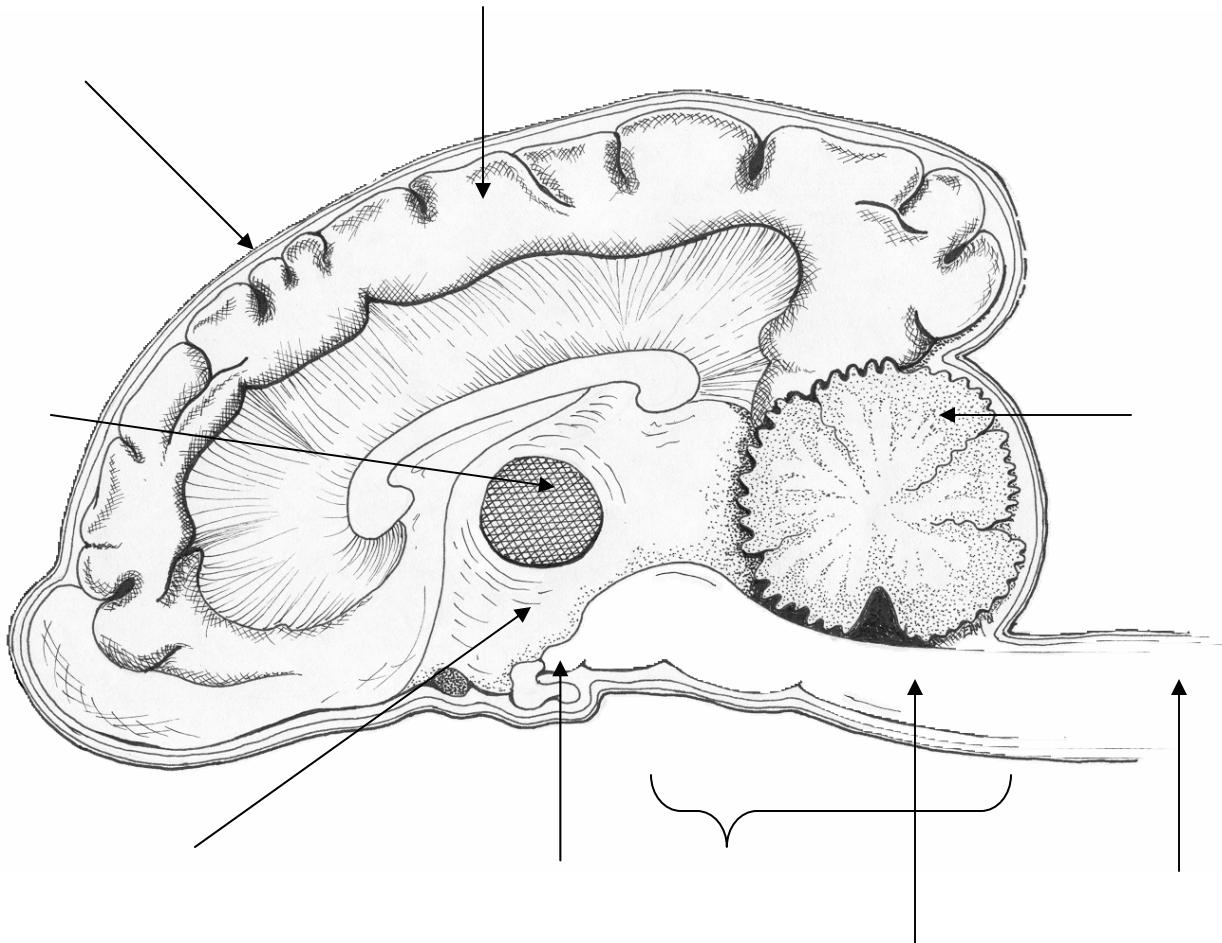
Directions: Label the parts of the brain.

Meninges
Thalamus
Spinal cord

Cerebellum
Hypothalamus

Cerebrum
Pituitary gland

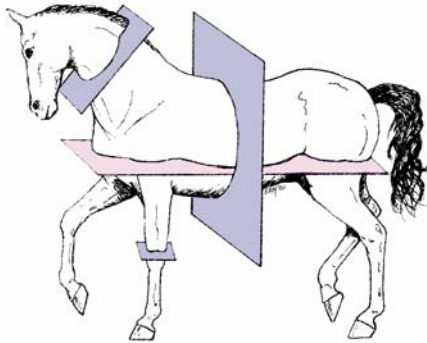
Medulla
Brain stem



Student Activity 1:

Directional Terminology

Name _____



Purpose:

Professionals who work with animals in a medical setting must know directional terms so that discussing and treating injuries, illnesses, and medical procedures can be precise. When directional terms are not used or are used improperly, costly mistakes can be made.

Objectives:

The students will be able to identify and use the most common directional terms and label any animal with those terms.

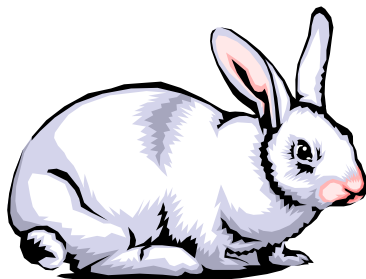
Materials:

Directional terminology handout
3D and surface planes handout
Colored pens or pencils

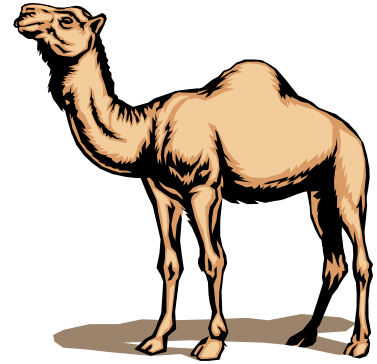
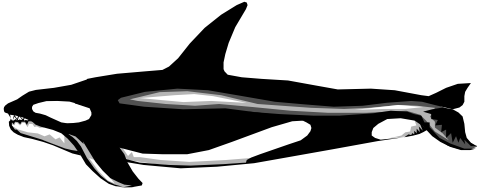
Procedure:

For each animal below, use a colored pen or pencil and label the animal with the correct directional term(s).

1. Divide these animals with a **frontal plane**.



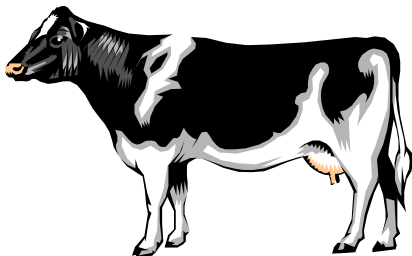
2. Label the **dorsal** and **ventral** regions of these animals.



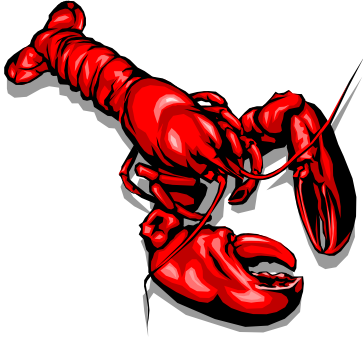
3. Divide these animals into a **median** and a **sagittal** plane.



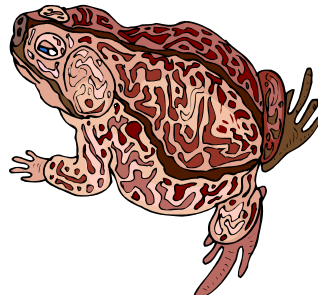
4. Label these animals as being a **lateral**, **posterior**, or **anterior** view.



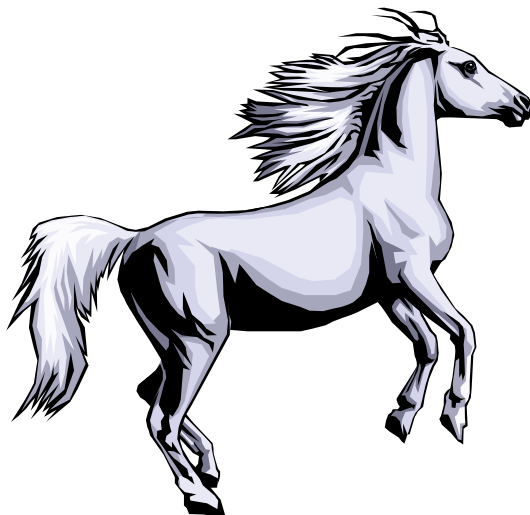
5. Label the **cranial** and **caudal** regions on these animals.



6. Divide these animals with a **transverse plane**.



7. Label **proximal** and **distal** on the horse's legs and the parrot's tail.



Student Activity 2:

Gummi Bear Dissection

Name _____

Purpose:

To practice using directional terminology.



Objectives:

The students will be able to apply directional terminology by dissecting a three-dimensional object.

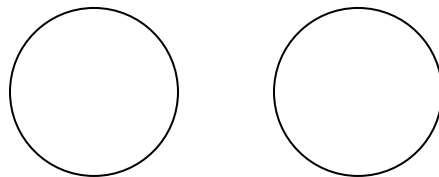
Materials:

10 Gummi bears per student
Plastic knives
Napkins
Tape

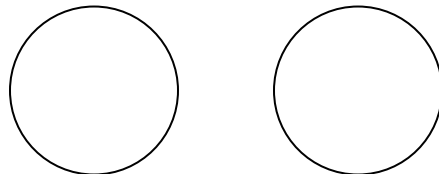
Procedure:

Divide each Gummi using the knife, tape it into the circle and label it:

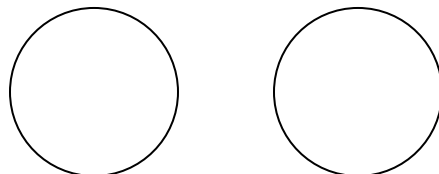
1. Dorsal & ventral surfaces



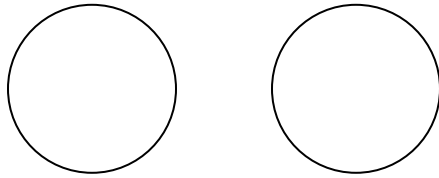
2. Anterior and posterior views



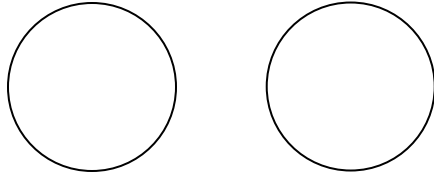
3. Cranial & caudal portions



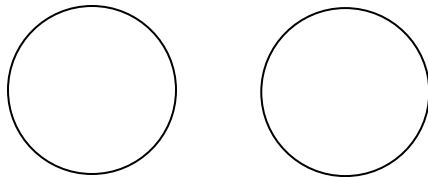
4. Place Gummi on its legs, like a four-legged animal stands.
Cut one of the legs into **proximal** and **distal** portions. Eat the leftovers!



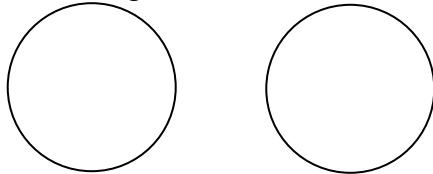
5. Place Gummi on its legs, like a four-legged animal stands.
Cut along the **transverse plane** to divide into cranial and caudal parts.



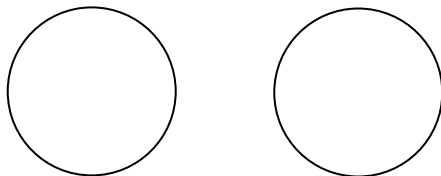
6. Place Gummi on its side, like a four-legged animal lying down.
Cut along the **frontal plane** to divide into dorsal and ventral parts.



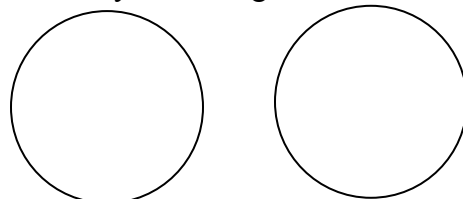
7. Place Gummi on its legs, like a four-legged animal stands, and place it in an anterior view facing you. Cut it along the **median plane** to break into equal, symmetrical right and left halves.



8. Place Gummi on its legs, like a four-legged animal stands, and place it in an anterior view facing you. Cut along any **sagittal plane** except the median plane to divide it into unequal right and left halves.



9. Repeat and label your favorite “dissection” with any remaining Gummi bears!



Student Activity 3:

Chalk Figures & Post-Its

Name _____



Purpose:

For veterinarians and vet techs it is important not only to be able to identify the bones of a skeleton, but also to be able to palpate and locate those bones in living animals.

Objectives:

The students will be able to palpate, locate and label the bones of any living species of mammal.

Materials:

Colored chalk

Short-haired cooperative animals (dog, horse, pig, cow)

Post-It notes

Procedure:

1. Using chalk, palpate and outline the major bones of the fore and hind limbs of the living animal. You can clearly feel the ridges of the scapula.
2. Be careful to take into account the joints, some of which (for example, shoulder and hip) are inside the body itself. If the animal will allow you to, bend the legs carefully to find the elbow, carpus, stifle, and tarsus joints.
3. Once the bones themselves are roughly outlined, label them with Post-Its and review.
4. When finished, carefully remove the stickers by pulling in the direction of the hair coat.

Student Activity 4: Pin The Tail on the Dog?

Name _____

Purpose:

Skeletal anatomy is the basis for many other aspects of veterinary medicine.

Objectives:

The students will be able to identify and label the bones of the dog.

Materials:

Overhead projector
Dog transparencies
Bone cards
Container to hold cards
Blindfold
Masking tape

Procedure:

This activity is similar to “pin the tail on the donkey.” The objective is to get the most bones in the correct spot on the dog’s body.

1. Project the dog outline onto a white wall or a sheet.
2. Place the bone cards into a box.
3. Divide the class into 2 or 3 teams.
4. One student at a time is blindfolded and then chooses a bone card out of the box.
5. The student’s teammates look at the bone card and then guide the blindfolded student to tape the card into the correct position by **using words only** (up, down, left, right).
6. One student from each team should keep track of which bone cards belong to the team.
7. Each team should take a turn until all bone cards have been placed on the dog.
8. When all bone cards have been placed, put the dog skeleton transparency over the dog outline transparency to determine which team placed the most bones correctly.

Bone Cards

Cervical vertebrae

Thoracic vertebrae

Lumbar vertebrae

Sacral vertebrae

Metatarsals

Fibula

Ribs

Skull

Os coxae

Radius

Humerus

Sesamoids

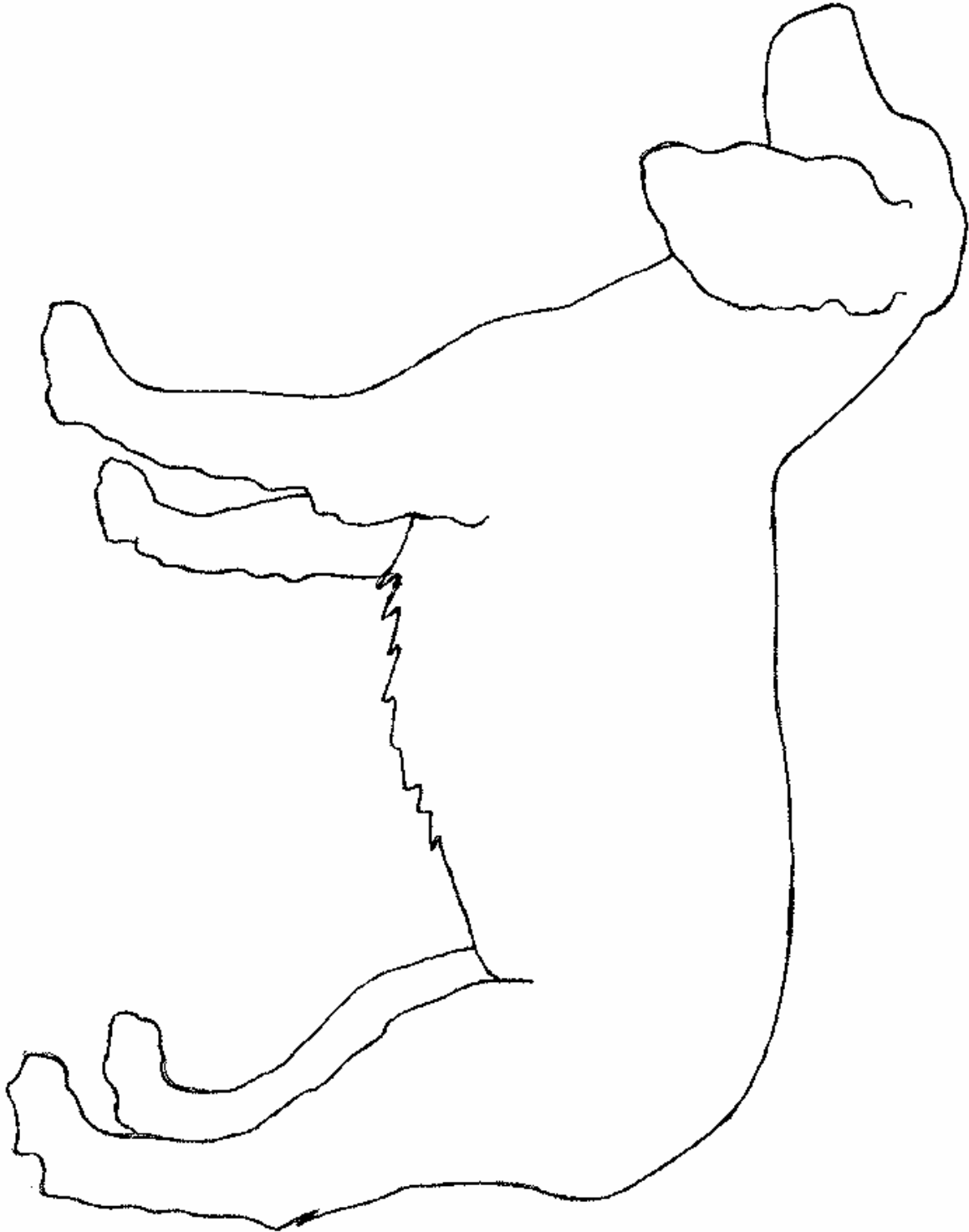
Axis

Atlas

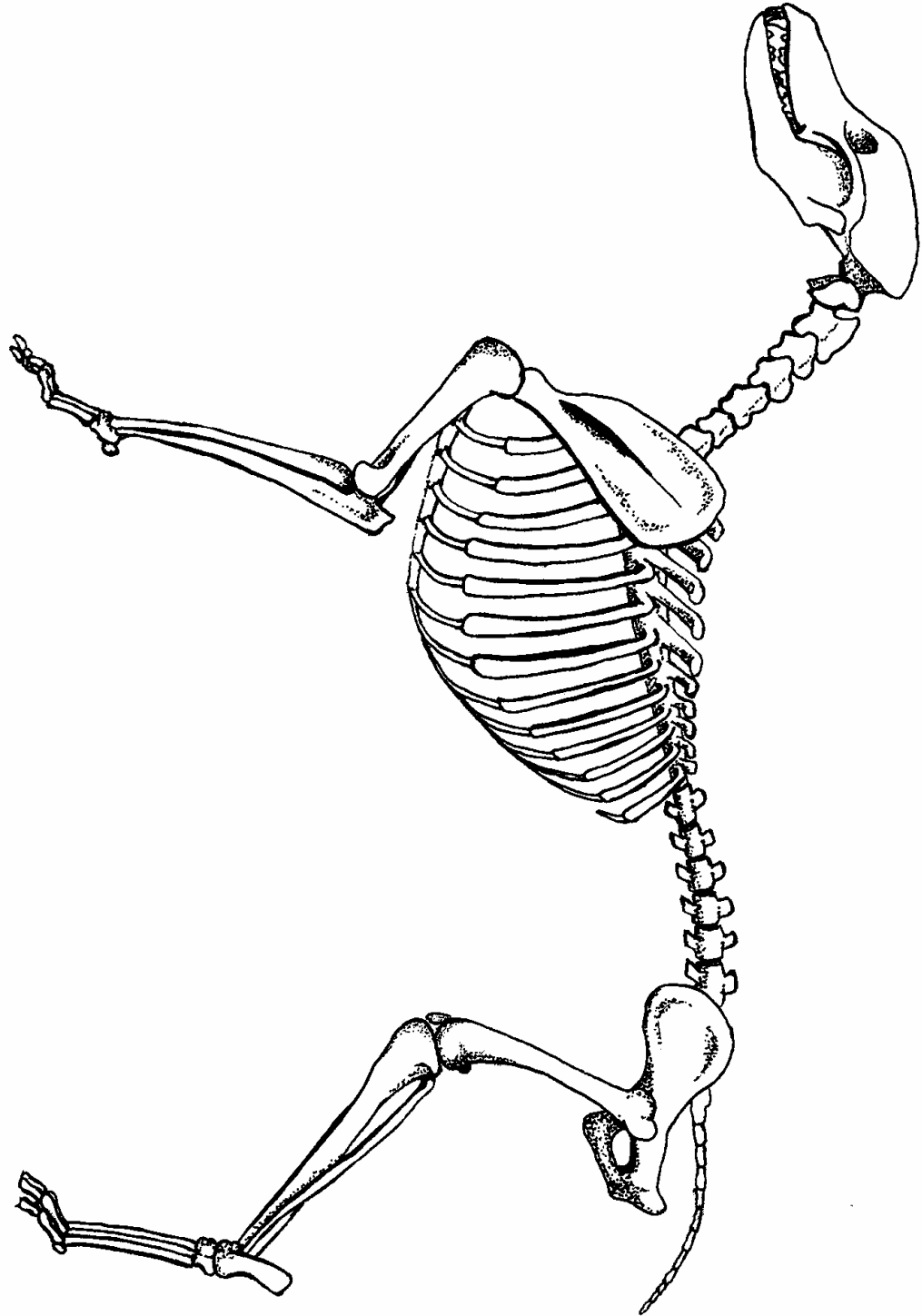
Bone Cards

Tarsus	Scapula
Femur	Carpus
Ulna	Tibia
Metacarpals	Olecranon
Patella	Phalanges

Dog Outline for Activity 4



Dog Skeleton for Activity 4



Student Activity 5:

Muscle Types Observation

Name _____

Purpose:

To understand the basic structural differences between types of muscle and practice some basic microscope skills.

Objective:

Students will be able to sketch and describe the differences between skeletal, smooth, and cardiac muscle.

Materials:

Microscope
Striated muscle slide
Cardiac muscle slide
Smooth muscle slide

Procedure:

View a slide of each muscle type under low and high power.

Skeletal Muscle

1. Draw a picture of skeletal muscle as it appears under the microscope.
2. What is the function of skeletal muscle?
3. Give three examples of skeletal muscles in the body.

Smooth Muscle

1. Draw a picture of smooth muscle as it appears under the microscope.
2. What is the function of smooth muscle?
3. Give three examples of smooth muscle in the body.

Cardiac Muscle

1. Draw a picture of cardiac muscle as it appears under the microscope.
2. What is the function of cardiac muscle?
3. Cardiac muscle is involuntary. Explain what that means.

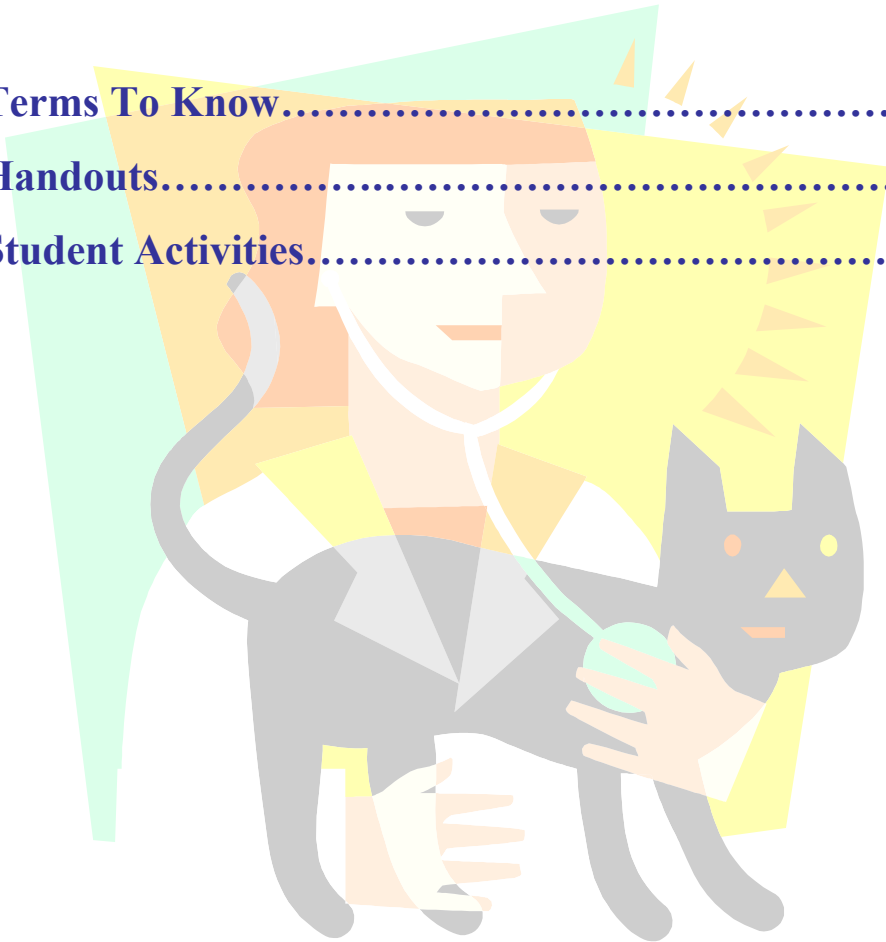
Clinical Exams

By Elisabeth A. Martinec

This unit covers the basics of clinical exams including: the signs of a healthy animal; patient histories; equipment; temperature, pulse and respiration; and the physical exam.

Unit D Contents

Terms To Know.....	70
Handouts.....	71
Student Activities.....	73



Terms To Know

Arrhythmia – a fluctuation in the heart rate

Auscultation – the use of a stethoscope to listen to sounds produced by the functions of the respiratory, circulatory, and digestive systems

Bradycardia – a decreased pulse rate seen most commonly with electrolyte imbalances or heart disease

Cyanosis – a bluish discoloration of the skin, resulting from inadequate oxygen concentrations in the blood

Dyspnea – difficulty breathing, characterized by shallow rapid breaths with abdominal effort

Eupnea – normal breathing

Gastrointestinal – a term used to describe the stomach and intestines as one unit

Murmur – any abnormal heart sounds produced by improper blood flow through the heart

Palpation – using touch to determine the character of deeper, underlying body structures

Ophthalmoscope – instrument used to examine the interior eye

Otoscope – instrument used to examine the interior ear

Tachycardia – an increased pulse rate seen often with fear, pain, exercise, and certain heart diseases

Tachypnea – rapid breathing

Name _____

TPR

Species	Normal Temperature	Pulse	Respiration
Cat	101.5	110-130	20-30
Cattle	101.0	60-70	10-30
Chicken	107.0	200-400	15-30
Dog	102.0	70-120	10-30
Goat	102.5	40-60	12-20
Horse	100.0	30-60	8-16
Rabbit	103.0	123-304	30-45
Sheep	102.0	60-90	12-20

Directions: Write the procedures for taking a TPR.**Temperature**

Procedure:

Variations occur due to:

- Infection/disease
- Excitement/stress
- Environment

- 1.
- 2.
- 3.

Pulse

Procedure:

Variations occur due to:

- Anxiety
- Exercise
- Pain
- Disease
- Shock

- 1.
- 2.
- 3.

Respiration

Procedure:

Evaluated based on:

- Rate of respiration
- Depth – degree of effort needed to take a breath (deep, shallow)
- Character – rapid, slow, normal

- 1.
- 2.
- 3.

Name _____

12 Areas to Examine

Directions: List specific signs to look for when evaluating an animal.

1. General appearance –
2. Integumentary (skin) –
3. Muscoskeletal (muscles and skeletal structure) –
4. Circulatory –
5. Respiratory –
6. Digestive –
7. Genitourinary (genitals and urinary system) –
8. Nervous system –
9. Lymph nodes –
10. Ears –
11. Eyes –
12. Mouth –

Student Activity 1:

Taking A Patient History

Name _____

Purpose:

Getting a patient history is the most important step in diagnosing an illness. The pet owner can give the veterinarian information that will make the diagnosis easier. Veterinarians must be good at communicating with clients and obtaining the right kind of information for a patient history.

Objectives:

The students will develop a series of questions that can be used to determine the health history of any species of animal.

Materials:

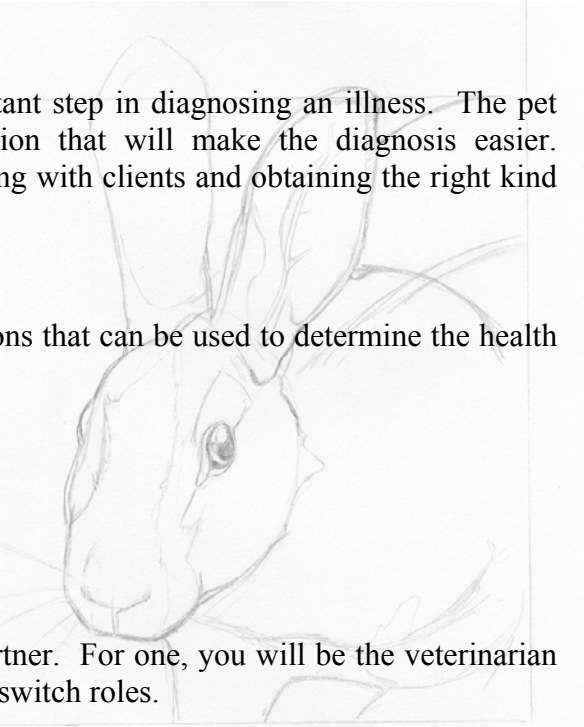
History and Physical Form
Role play cards

Procedure:

You will be doing two role-plays with a partner. For one, you will be the veterinarian and your partner will be the pet owner, then switch roles.

1. With a partner, develop a set of at least 10 questions that can be used to get a patient history. Remember to ask specific questions instead of questions that can be answered yes or no. The first question you will ask is what the owner thinks is wrong with the pet. This is called the **chief complaint**.

Use the space provided to list the questions you will ask.



-
-
-
-
-
-
-
-
2. You and your partner will each be given a role-play card. Taking turns as the pet owner and as the veterinarian, fill out the top of the history and physical sheet and then use the questions you developed to write down a history of the animal.

Note: You may need to ask questions that are not on your list in order to get a thorough history. You will **only fill out the patient information and history sections!**

3. When you are the veterinarian, be sure to introduce yourself to the pet owner in a professional manner.
4. Once you have finished role-playing, share your card with your partner. Did you ask enough questions to find out all of the information on the role-play card?

Analysis/Conclusions:

1. What questions could you have asked to get a more thorough history?

2. It is important to make the pet owner feel comfortable. How did you introduce yourself to the owner and what did you say to put him/her at ease?

3. Why are leadership, public speaking, and communication skills important to a veterinarian?

Cornell University Hospital for Animals

History and Physical Form

Date: _____

Owner: _____	Animal's name: _____
Address: _____	Species: _____ Breed: _____
_____	D.O.B. _____ Sex: _____
Phone: _____	Vaccination status: _____

History:

Chief Complaint:

Physical:

Temp: _____ Pulse: _____ Resp: _____ Weight: _____ lbs _____ kg

N – Normal A – Abnormal NGA – No Gross Abnormalities

	N	A	NGA		N	A	NGA		N	A	NGA
General Appearance:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Musculoskeletal:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Genitourinary:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Integumentary:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Cardiovascular:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Nervous System:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Eyes:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Respiratory:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Lymph Nodes:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ears:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Digestive:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Mouth:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Veterinarian

Role Play Cards

Role 1: Canine – “Sandy”

3 yr. old spayed female golden retriever
Had complete vaccinations 3 weeks ago

Chief Complaint - lame on left foreleg

History – Sandy has been lame for a week. The limp has been getting worse. She did not eat anything today and has been acting depressed for two days. She is drinking normally and going to the bathroom normally. At the beginning of the week, she would limp around on her leg, but now she does not want to put any pressure on it at all. About a week ago she got out of the house and did not come back for several hours. She was very muddy when she came back, but was not limping. She has never had a problem with her leg in the past. A friend of yours has a littermate of Sandy’s, and this dog has been having problems with its hind legs. You are worried that Sandy’s problem might be related.

Role 2: Feline – “Pants”

2 yr. old neutered male domestic long hair
Has been vaccinated for rabies this year

Chief Complaint – acting depressed and losing weight

History – Pants is a stray cat that you have had for only a few months. When you found him you had him vaccinated for rabies, but did not get any other vaccinations. About three weeks ago you noticed a change in his behavior. He was hiding a lot and acting depressed. About a week ago you noticed that he was not eating and drinking as much as he normally did. Now he is not eating or drinking at all. He is an outside cat, so you don’t know if he’s going to the bathroom normally. Because he is not eating, he is losing weight rapidly. You have tried giving him canned cat food and milk, but he shows no interest in eating. He did vomit once and it was a yellowish liquid with no food in it.

Role 3: Rabbit – “Frizzle”

1 yr. old neutered male English angora
Has no vaccinations

Chief Complaint – bald patches around neck

History – Frizzle is a house rabbit. You had him neutered when you got him so that he would not mark his territory in your house. Recently, he has been scratching a lot and has developed bald patches on his neck. The bald patches are scaly. You have a cat also, but the cat does not have fleas. You feed Frizzle hay, rabbit pellets, and vegetables. He has been eating, drinking, and going to the bathroom normally. You like to take Frizzle outside to eat grass in the yard. You have noticed that he shakes his head a lot and is scratching his ears.

Role 4: Canine – “Kali”

8 yr. old spayed female English springer spaniel
Current on all vaccinations

Chief Complaint – urinating in the house

History – Kali has recently started urinating in the house. She is home alone all day, but in the past this has not been a problem. She is drinking 2 bowls of water a day, but eating normally. In the past she has had urinary infections. The color of her urine is a very pale yellow. She vomited once about three weeks ago. The vomit looked like it had pieces of grass in it. Kali is still very full of energy. She goes for walks twice a day and goes out in the yard for two hours each day. You have noticed that she sometimes urinates while she is sleeping, or if she has been lying down and then gets up.

Student Activity 2:

Temperature, Pulse, & Respiration Assessment

Name _____

Purpose:

Veterinarians use TPR as a general guideline for assessing an animal's health. They must know the normal values for all of the species of animals that they see.

Objectives:

The students will be able to determine temperature, pulse, and respiration rates for the dog and cat, and be able to recognize abnormal results and their causes.

Materials:

Several dogs and/or cats

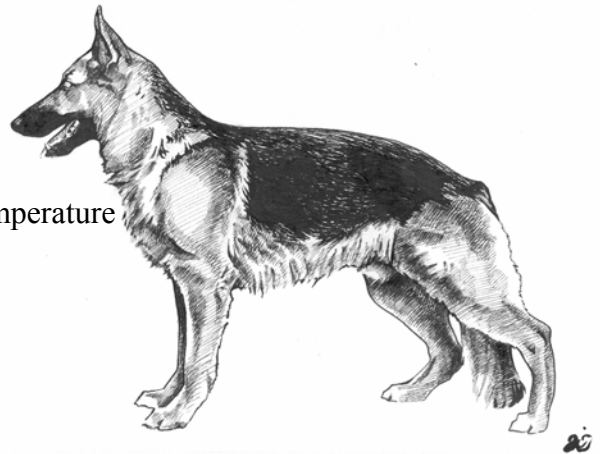
Thermometers

Petroleum jelly

Watch with a second hand

Gloves – students may want to use when taking temperature

Handling and restraint equipment



Procedure:

1. List the average TPR's for the following animals.

	Temperature	Pulse	Respiration
Cat			
Dog			

2. Name four factors that may cause an increase or decrease in TPR.

- Using the handout on TPR procedures, assess the temperature, pulse, and respiration rates for each animal. List the results in the following table.

Patient Name	Species	Temperature	Pulse	Respiration

- Choose one of your canine “patients” and trot them around for two minutes. After two minutes, retake the TPR and record the results.

Patient Name	Species	Temperature	Pulse	Respiration

Analysis/Conclusions:

- Were all of the TPR’s within normal range?
- What changes were seen after the dog was exercised for two minutes?
- What other factors did you observe that might have caused an increase or a decrease in TPR for each of your “patients”?
- What challenges did you face while working with the animals to obtain a TPR?

Student Activity 3:

The Physical Exam

Name _____

Purpose:

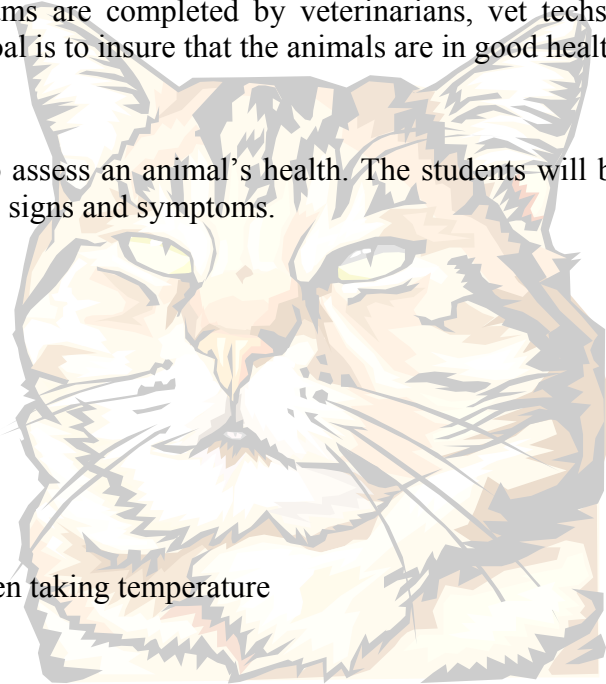
Every day thousands of physical exams are completed by veterinarians, vet techs, and others involved with animals. Their goal is to insure that the animals are in good health.

Objectives:

The students will develop a routine to assess an animal's health. The students will be able to recognize normal and abnormal signs and symptoms.

Materials:

Dog, cat, rabbit
Physical and History Form
Stethoscope
Thermometer
Watch with second hand
Petroleum jelly
Restraint and handling equipment
Gloves – students may want to use when taking temperature



Procedure:

Students are divided into small groups. Each group should have an animal to examine. Use the History and Physical Form to take a history of the animal and then do a complete physical exam on that animal.

1. Introduce yourself to the animal's owner and take a history. Remember to ask questions that need more than a yes or no answer. Fill in the information on the History and Physical Form.
2. Take the animal's TPR and fill in the information on the History and Physical Form. Take turns examining and restraining the animal.
3. On the History and Physical Form there is a listing of all the areas that should be examined. Fill in the appropriate box as you examine your patient. Any area that is abnormal needs to be explained in the Physical section. For example, if the animal's right eye is cloudy and runny, write – eyes: right eye is cloudy with discharge.

Cornell University Hospital for Animals

History and Physical Form

Date: _____

Owner: _____	Animal's name: _____
Address: _____	Species: _____ Breed: _____
_____	D.O.B. _____ Sex: _____
Phone: _____	Vaccination status: _____

History:

Chief Complaint:

Physical:

Temp: _____ Pulse: _____ Resp: _____ Weight: _____ lbs _____ kg

N – Normal A – Abnormal NGA – No Gross Abnormalities

	N	A	NGA		N	A	NGA		N	A	NGA
General Appearance:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Musculoskeletal:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Genitourinary:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Integumentary:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Cardiovascular:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Nervous System:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Eyes:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Respiratory:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Lymph Nodes:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ears:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Digestive:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Mouth:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

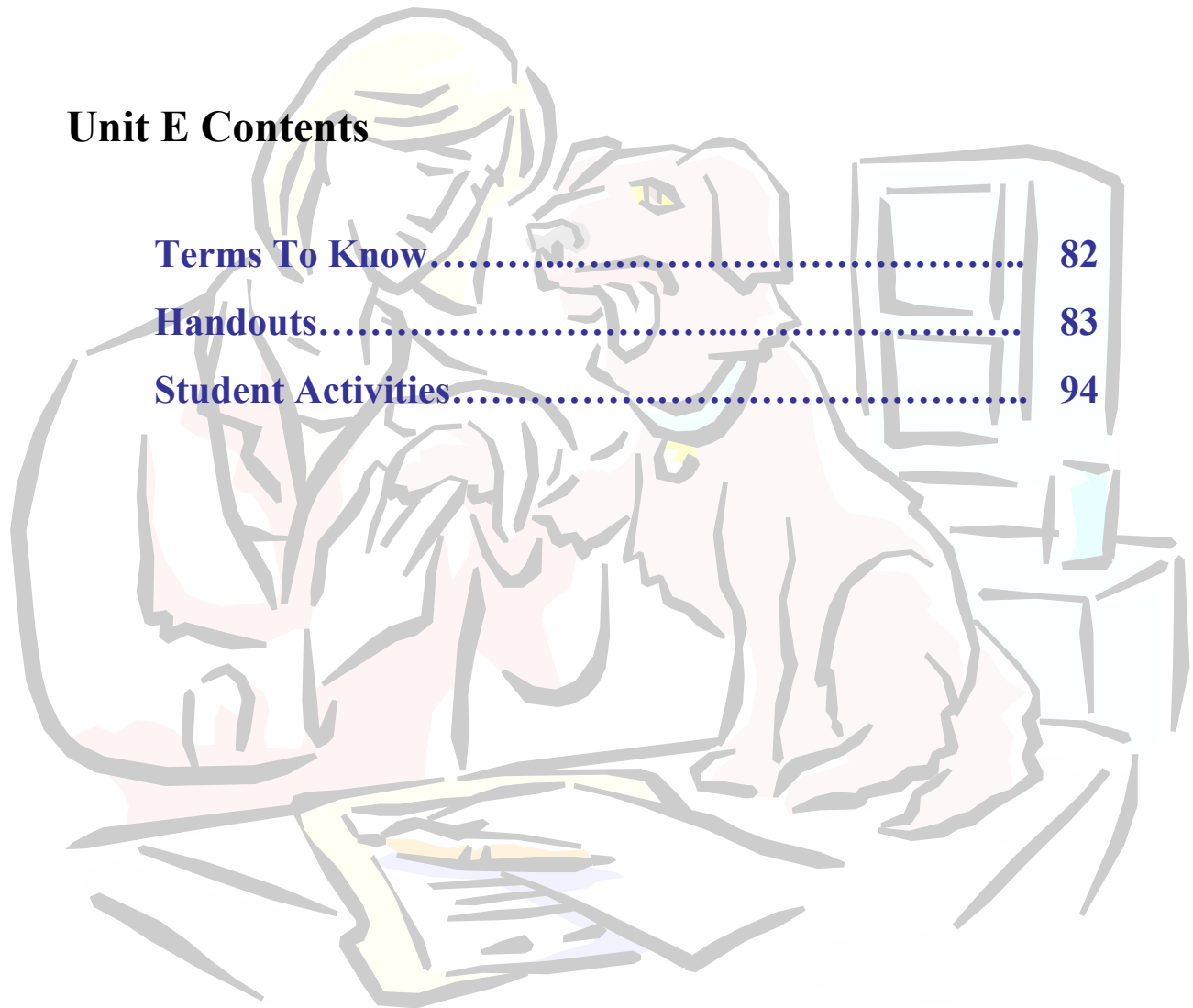
Veterinarian

Hospital Procedures

By Elisabeth A. Martinec

Unit E Contents

Terms To Know.....	82
Handouts.....	83
Student Activities.....	94



Terms To Know

Active immunity – the animal's own immune system produces antibodies in response to an antigen by either natural or artificial means

Anaphylactic shock – an exaggerated allergic response

Antibody – proteins produced by the lymph system in response to a foreign organism or substance

Antigen – any substance that induces an immune response by the body

Calculus – a mineralized brown or yellow deposit on the teeth caused by the build up of plaque over time

Gingivitis – the swelling and inflammation of the sensitive gums around the teeth

Immunity – having resistance to a disease due to the formation of antibodies

Neuter – the common term used to describe the removal of the male reproductive organs

Orchiectomy (neuter) – the removal of the testes

Ovariohysterectomy (spay) – the removal of the ovaries and the uterus

Passive immunity – antibodies are received from another individual such as the mother before birth

Plaque – a slippery white film on teeth that is composed of bacteria, food particles, and saliva

Spay – the common term used to describe the removal of the female reproductive organs

Vaccine – a suspension of killed or modified microorganisms that stimulate an immune response when introduced into the body

Name _____

Anatomy of a Tooth

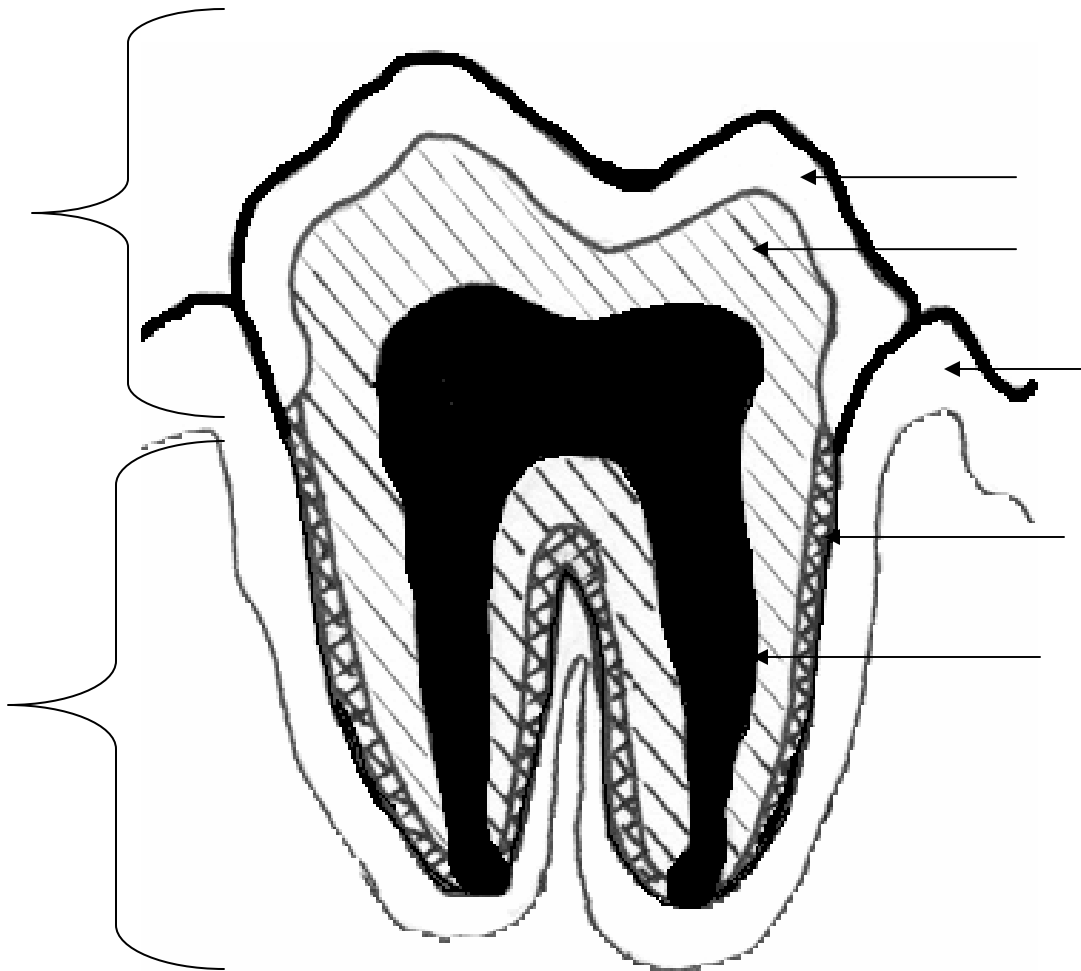
Directions: Label the drawing with the following terms.

Crown
Root

Dentin
Pulp canal

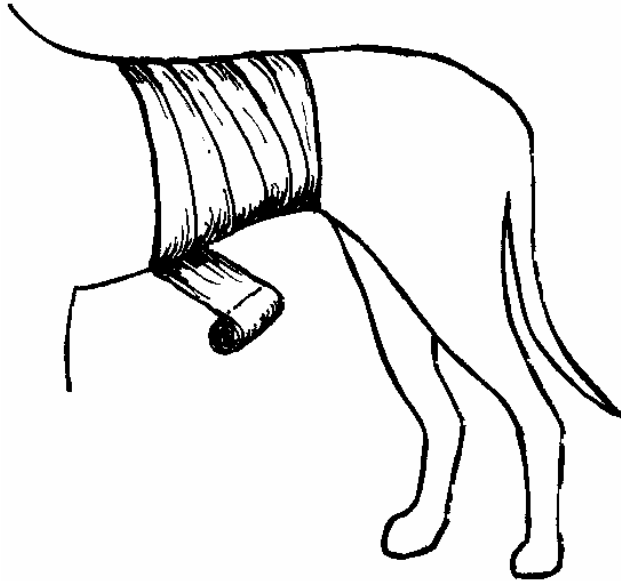
Enamel
Gingiva

Periodontal ligament

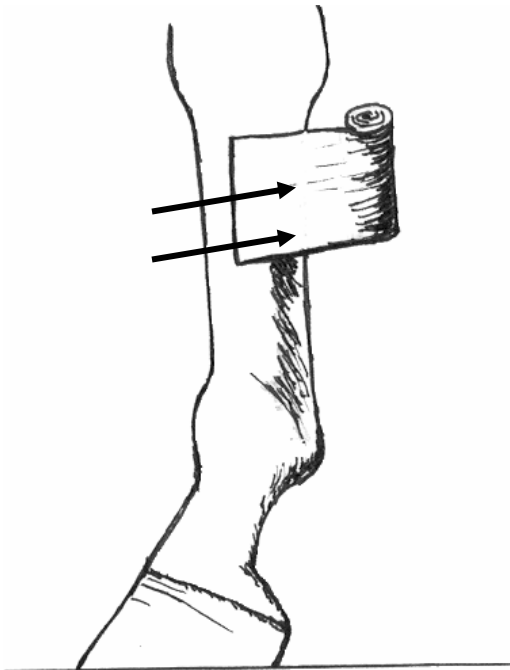


Name _____

Bandaging Techniques



The bellyband should overlap slightly as it is wrapped. It should be smooth and snug to prevent it from falling off, but not so tight that it is uncomfortable.



Leg bandages on horses are started on the outside (lateral) part of the leg and wrapped towards the back.

Leg bandages on other species may be wrapped in either direction.

Name _____

Causes of Disease

Directions: Fill in the information about infectious and non-infectious diseases.

Infectious disease – caused by bacteria, viruses, fungi, rickettsiae, helminthes, protozoa, and arthropods. These disease-causing agents can enter an animal through the skin, mouth, mucous membranes, lungs, or reproductive tract.

Caused by:

Transmission occurs by –

Direct means:

Indirect means:

Non-infectious – caused by dysfunctions of one or more body systems, nutritional deficiencies, poisoning, physical injury, and stress. Genetics and environment also cause non-infectious disease.

Name _____

Immunity

Directions: Fill in the information about immunity and define the terms in bold.

Immunity: having resistance to a disease due to the formation of antibodies

Immunity is a function of the _____ and protects the body from infection, disease and foreign bodies.

Antibodies:

Antigens:

Passive immunity is when an animal is given antibodies that have already been produced by another individual. Passive immunity provides short-term immunity only because the body breaks down the antibodies. Mothers give their newborns passive immunity through the placenta and by ingesting colostrum.

Active immunity is when an animal produces antibodies in response to an antigen by natural or artificial means.

Active immunity is produced _____ when an animal is exposed to a disease and builds antibodies in response.

Active immunity is produced _____ when an animal is vaccinated and builds antibodies in response to the vaccine.

Name _____

Dog Diseases**Directions:** In the box provided, fill in how often to vaccinate for each disease by calling a local vet.

Disease Name	Disease-causing Agent	Symptoms	Transmission	Vaccination Schedule
Bordetella (Kennel Cough)	<i>Bordetella bronchiseptica</i> bacteria	Dry hacking cough, not eating, pneumonia	Direct inhalation of the bacteria from infected dogs	
Coronavirus	 RNA virus	Severe vomiting and diarrhea, anorexia, depression	Ingestion of fecal material from infected dogs	
Distemper	 virus	Fever, vomiting, diarrhea, nasal secretions, seizures	Contact with nose and eye secretions from infected dogs	
Infectious canine hepatitis	 DNA virus	Fever, anorexia, swelling of head and neck, thirst, abdominal pain	Ingestion of urine, feces, or saliva from infected dogs	
Leptospirosis	<i>Leptospira</i> bacteria	Fever, anorexia, vomiting and diarrhea, depression, red mucous membranes	Contact with contaminated water/soil, or direct contact with an infected dog	
Lyme disease	<i>Borrelia burgdorferi</i> bacteria	Lameness and fever, swollen painful joints	Bite from a tick (vector)	
Parainfluenza	 myxovirus	Mild respiratory tract infection	Contact with nasal secretions of infected dogs	
Parvovirus	 DNA virus	Severe diarrhea, vomiting, anorexia, high fever	Contact with contaminated feces	
Rabies	<i>rhabdovirus</i> virus	Aggression, foaming at the mouth, paralysis	Contamination of a wound by saliva	Vaccinate every one to three years

Name _____

Cat Diseases**Directions:** In the box provided, fill in how often to vaccinate for each disease by calling a local vet.

Disease Name	Disease-causing Agent	Symptoms	Transmission	Vaccination Schedule
Feline calicivirus	RNA virus	Depression, coughing, sneezing, severe eye and nose discharge	Direct contact with discharge from nose, eyes, and throat of an infected cat	
Feline infectious peritonitis (FIP)	coronavirus	Anorexia, depression, large fluid filled abdomen, organ failure	Direct contact with an infected cat	
Feline leukemia virus	RNA virus	May show no signs, fever, depression, enlarged lymph nodes, anorexia	Direct contact and through shared litter boxes, feed and water dishes (fomites)	
Feline viral rhinotracheitis	virus	Sneezing, discharge from nose and eyes	Inhalation of aerosol droplets and contact with fomites	
Panleukopenia	parvovirus	Depression, anorexia, high fever, vomiting, dehydration, hanging over the water bowl	Direct contact and contact with fomites	
Rabies	<i>rhabdovirus</i> virus	Aggression, foaming at the mouth, paralysis	Contamination of a wound by saliva	Vaccinate every one to three years

Name _____

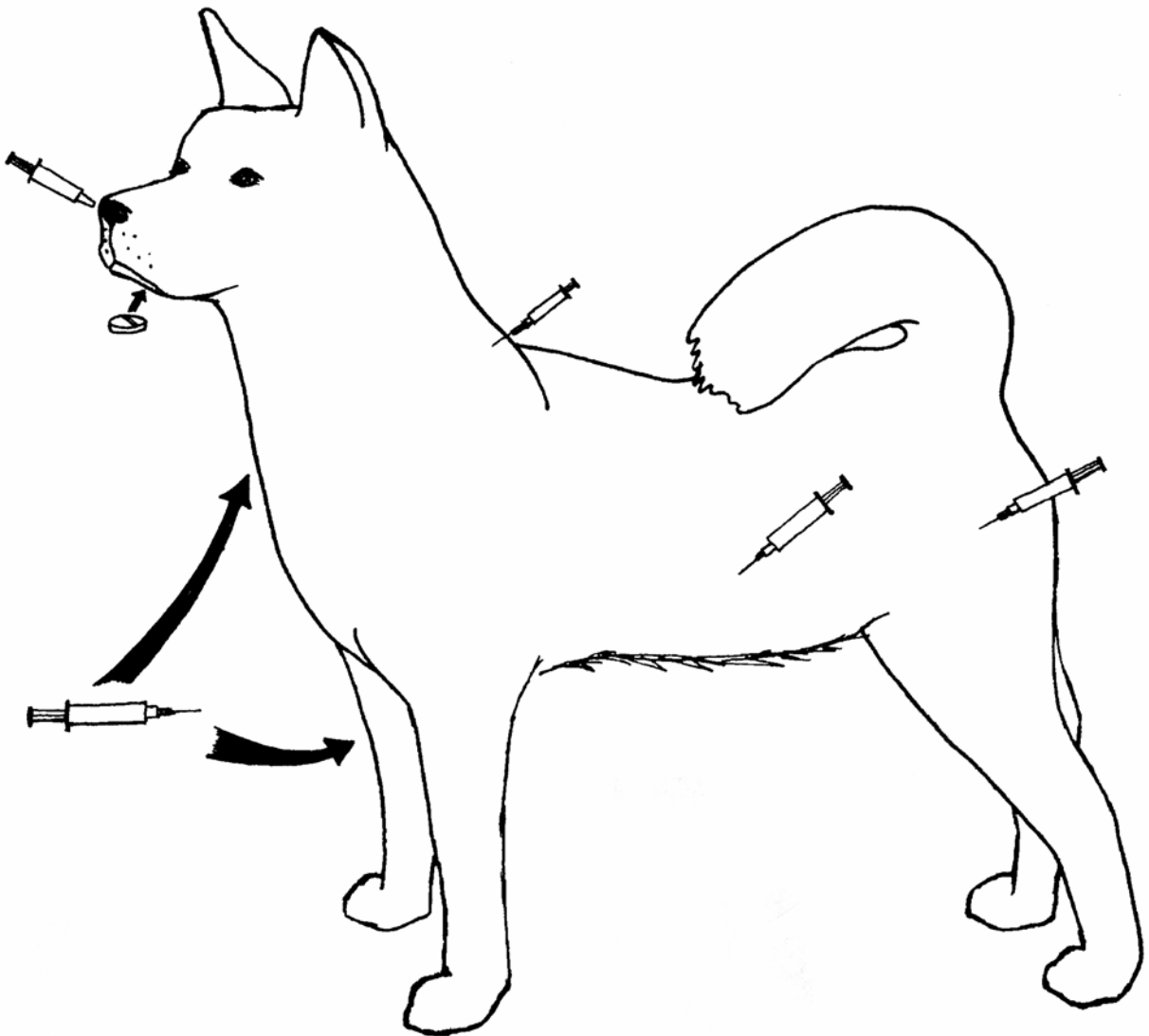
Routes of Administration

Directions: Label the drawing with the following routes of administration.

Oral
Nasal

Sub-Q (subcutaneous)
IP (intraperitoneal)

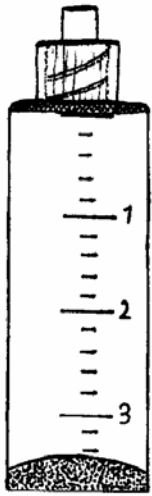
IM (intramuscular)
IV (intravenous)



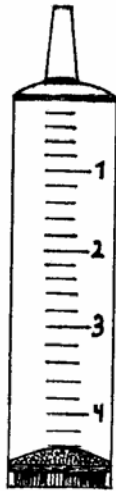
Name _____

Needles & Syringes

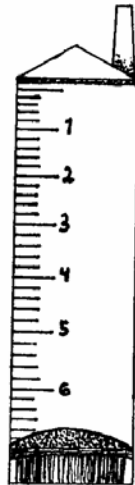
Types of Syringes



Luer-Lok



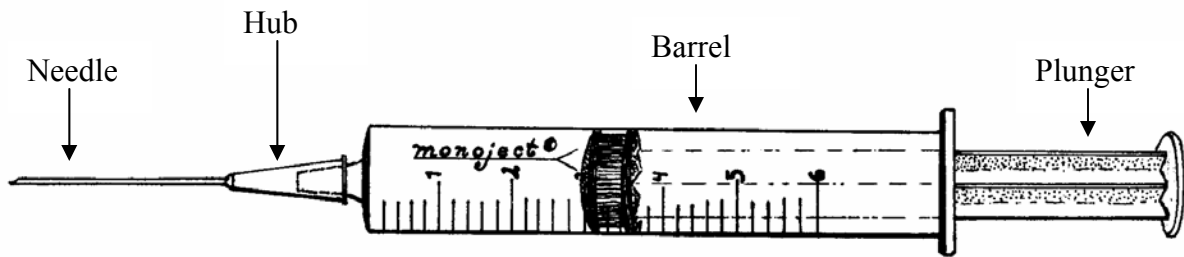
Slip tip



Eccentric



Catheter tip



Parts of the Needle and Syringe

Name _____

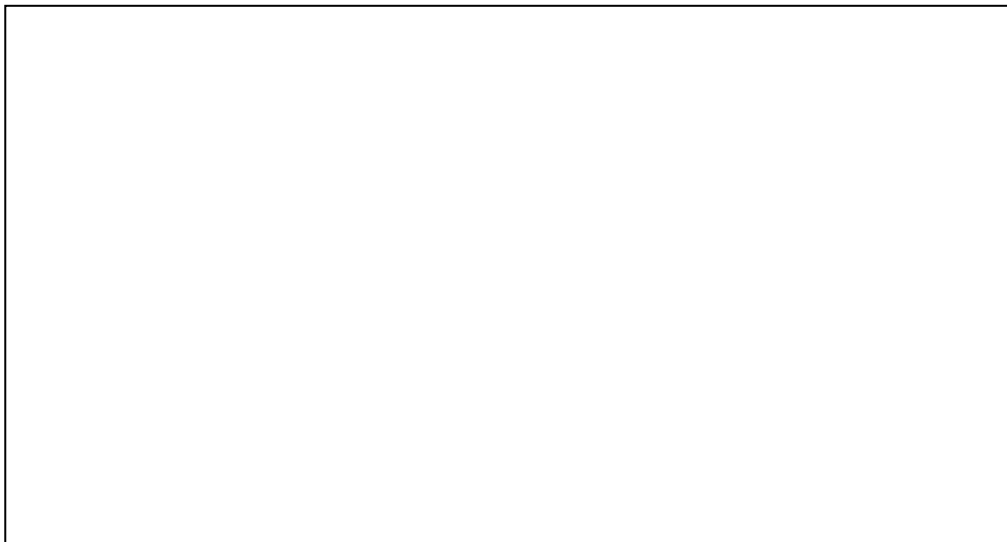
Medication Labels**Directions:** List the six items that must be included on a medication label.

Medication labels must include:

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.

Directions: Design and complete a label using the information below.

Nova Laurent's labrador, Titan, has worms. Dr. Carson of Lakeview Veterinary Clinic, 24 Lake Street, Geneva, NY 14357, 348-9076, has prescribed 50 mg of Droncit twice a day for three days. Each Droncit tablets is 25 mg, so the vet tech fills the bottle with twelve tablets. The directions are to give Titan 2 tablets by mouth twice a day for three days.



Name _____

Determining Dose

Directions: Calculate the medication dose that will be given and the total amount of medication to be dispensed. Then use the back of this sheet and write labels for each problem.

The method used to determine a medication dose is called dimensional analysis. In dimensional analysis the fraction in each part of the equation is arranged so that the units (dimensions) will cancel.

Example:

A 10 lb dog is prescribed aspirin tablets (100 mg) at a dosage of 5 mg/lb.

$$10 \text{ lb} \times \frac{5 \text{ mg}}{1 \text{ lb}} = 50 \text{ mg}$$

$$50 \text{ mg} \times \frac{1 \text{ pill}}{100 \text{ mg}} = \frac{1}{2} \text{ tablet}$$

Note that the lb. units cancel leaving the answer in milligrams.

Problem 1: Mr. Roger's dog, Roy, is being treated by Sam Smith, D.V.M., 524 Garden Street, Ithaca, NY 14850, (607) 256-9604. Roy is a 100lb. Dalmatian. Dr. Smith has instructed you to dispense Tetracycline capsules (250 mg) at a dosage of 5 mg/lb to be given 3 times a day (TID) for 5 days.

Step 1:

Determine how many milligrams Roy needs for his body weight. To do this, multiply Roy's weight by the dosage. This is the total amount Roy will receive in mg.

Step 2:

Now determine how many capsules are needed. Divide the total mg needed by the mg in each capsule. This is the number of capsules that will be given for each treatment.

Step 3:

Determine the total number of capsules needed for 5 days. Multiply the number of capsules for one treatment by the number of treatments per day. Then multiply the answer by 5 days.

Problem 2: Miss Simon's cat, Karley, is being treated by Dan Jones D.V.M., 22 East Meadow Ave., Albany, NY 14830, (518) 234-8337. Karley is a 10 lb Siamese. Dr. Jones has instructed you to dispense metaclopramide liquid (30 mg) at a dosage of 3 mg/lb, twice a day for three days. *Note: liquid is measured in milliliters so in this problem 1 mL of metaclopramide is equal to 30 mg.*

Step 1:

Determine how many milligrams are needed for Karley's body weight. Multiply the weight by the dosage to get the total amount of mg needed.

Step 2:

Determine the number of mL that is equal to the total mg needed.

Step 3:

Determine the total amount of mL needed for the whole treatment.

Student Activity 1:

The Truth About Cats & Dogs

Name _____

Purpose:

To research and debate the issues concerning spaying and neutering.

Materials:

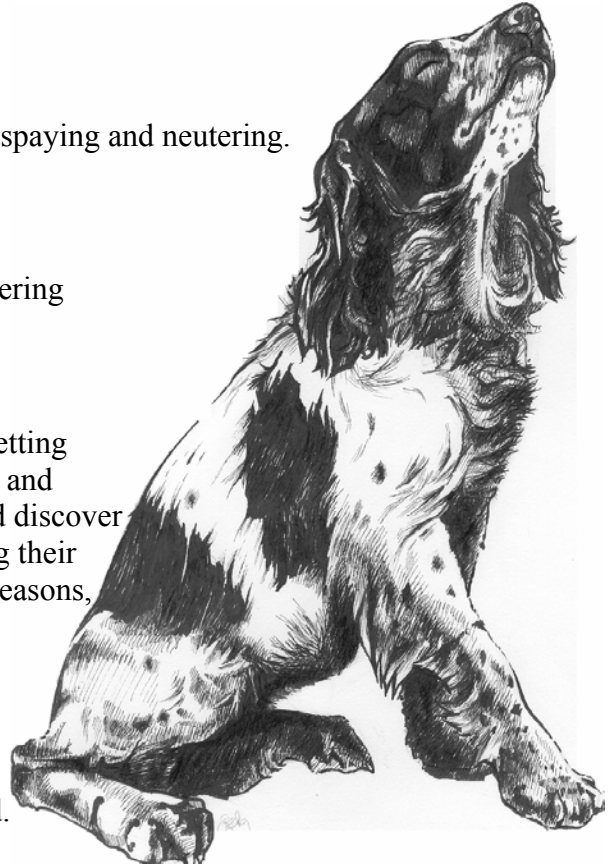
Internet

Publications or pamphlets about spaying/neutering

Procedure:

There are many reasons people give for not getting their pet spayed or neutered. Use the Internet and other reliable sources to do some research and discover the various excuses people give for not having their pet spayed or neutered. Make a list of those reasons, and then respond to the situation below.

Situation: Your best friend has just gotten a new dog and needs to have it spayed/neutered. She has decided not to have this done and e-mails you a list of her reasons why. Use her list and write a friendly letter to her that outlines each of her excuses and then gives reasons why she should change her decision.



Student Activity 2: Teeth Brushing

Name _____

Purpose:

Pets can develop gingivitis and periodontal disease just like humans can. For this reason it is important to brush your pet's teeth regularly with special pet toothpaste.

Objectives:

The students will practice training a cat or dog to allow its teeth to be brushed and learn the correct procedure for brushing teeth.

Materials:

Cats/dogs

Video "Pets Have Teeth, Too!"

Pet toothpaste and toothbrush

Procedure:

1. Watch the video "Pets Have Teeth, Too!"
2. Split into small groups of three or four. Each group should have an animal to work with.
3. Take turns restraining the animal while each person in the group goes through the procedure used to train an animal to allow its teeth to be brushed.
4. Remember to work slowly with animals that have never had their teeth brushed. This should be a pleasant experience, not frightening.

Steps:

1. Begin by handling the animal's mouth. Gently rub your hands around the muzzle and under the lips.
2. When the animal allows its mouth to be handled with minimal resistance, place some pet toothpaste on your finger and rub it under the animal's lips. Allow the pet to taste the toothpaste. It has a pleasant taste that most pets like.
3. The last step is to use the toothbrush. Gently fold back the animal's lips and brush the outer surface of the teeth in a circular motion. It is not necessary to brush the interior surface of the teeth.

Student Activity 3:

Bandaging

Name _____

Purpose:

Bandaging is a common practice in all veterinary hospitals. Animals are bandaged after surgery, when catheters are placed or removed, and to keep wounds clean and medicated. Proper bandaging ensures animal comfort and a snug bandage.

Objectives:

Students will be able to properly bandage leg and abdominal wounds and apply support bandages to horses' legs.

Materials:

Dogs	Gauze rolls
Horse*	Polo wraps (for horse)
Vetwrap	Quilted wraps (for horse)
Cotton rolls	

* In place of a horse, students can bandage each other's legs.

Procedure:

Separate into groups of three or four and complete these bandages—

1. leg wound bandage on a dog
2. abdominal bandage on a dog
3. support bandage on a horse

Station 1: Leg Wound Bandage

- You will need one roll each of gauze, cotton, and Vetwrap.
- Bandage the metatarsal bones on the right hind leg of the dog.
- Wrap the cotton first, then gauze, and then the Vetwrap.
- The cotton and gauze should be wrapped four times around the leg.
- Wrap the Vetwrap until it completely covers the gauze and cotton. Overlap it slightly at the top and bottom so that it sticks to the hair.
- Test your bandage by placing one finger between the bandage and the leg. The bandage should feel snug, but not tight.

Station 2: Abdominal Bandage

- You will need one roll each of gauze, cotton, and Vetwrap.
- Bandage the abdomen of the dog.
- Wrap the cotton first, then gauze, and then the Vetwrap.
- Use a whole roll bandage for each layer.
- Overlap the edges of the bandage as you wrap. Pull the bandage tight to remove wrinkles.
- Wrap the Vetwrap until it completely covers the gauze and cotton. Overlap it slightly at the top and bottom so that it sticks to the hair.
- Test your bandage by placing one finger between the bandage and the leg. The bandage should feel snug, but not tight.

Station 3: Horse Support Bandage

- You will need one quilted wrap and one polo bandage.
- Bandage the left front leg of the horse from the fetlock to the knee.
- Place the quilted wrap on first, then wrap the polo wrap starting on the outside (lateral) of the leg and wrapping towards the back of the leg.
- Start the polo wrap in the middle of the leg and wrap down the leg, then back up to the top.
- Overlap the edges of the bandage by $\frac{1}{2}$ as you wrap. Pull the bandage tight so there are no wrinkles.
- Test your bandage by placing two fingers between the bandage and the leg. The bandage should feel snug, but not tight.

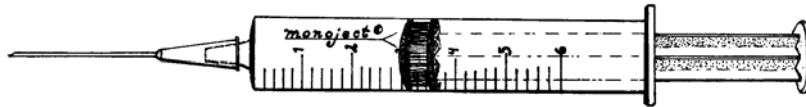
Evaluation:

Leg Wound Bandage	Abdominal Bandage	Horse Support Bandage
Excellent	Excellent	Excellent
Too Loose	Too Loose	Too Loose
Too Tight	Too Tight	Too Tight
Incomplete	Incomplete	Incomplete

Student Activity 4:

Reading a Syringe

Name _____



Purpose:

The ability to correctly read a syringe is critical when medicating animals. An overdose could cause serious damage and even death. Under-dosing an animal is also serious because treatment may take longer or be ineffective.

Objectives:

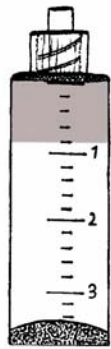
The students will be able to properly read a syringe filled with medication.

Procedure:

Read the amount that is in each syringe and write it in the space provided.
Note: All measurements are in mL.



1. _____



2. _____



3. _____



4. _____



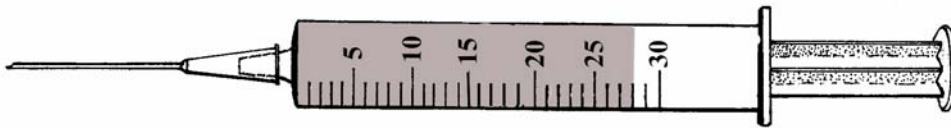
5. _____



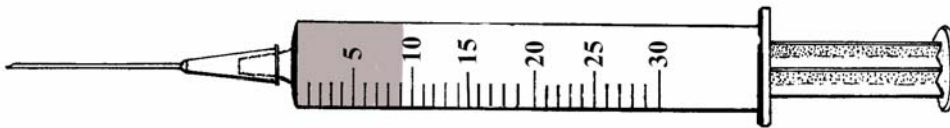
6. _____



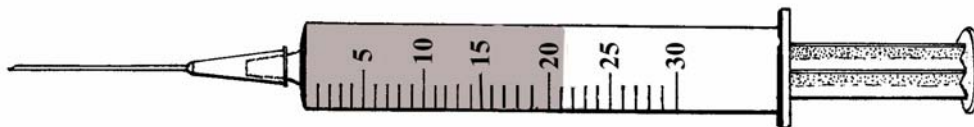
7. _____



8. _____



9. _____



10. _____

Student Activity 5:

Dispensing Medication

Name _____

Purpose:

When medication is prescribed in a veterinary hospital, it is often the veterinary technician or assistant who is responsible for preparing it and filling out the label.

Objectives:

Students will develop math skills needed to dispense medication and be able to fill out a medication label.

Materials:

3 different types of beans
3 large pill bottles
3 small pill bottles per student
Calculators
Determining Dose Handout-10

Procedure:

Determine the amount of medication that needs to be dispensed for each patient, count out the correct number of pills, and correctly fill out a label for each medication. Use the Determining Dose handout as a reference. **Show your work and label answers with the correct units!**

Medication 1: Baytril 50 mg tablets

Phil, a 15 lb cat belonging to Wendy Carlisle, needs to get 25 mg of Baytril twice a day for 7 days.

1. How many total milligrams of Baytril does Phil need for 7 days?

2. How many tablets will be dispensed for 7 days?

Wild Wood Veterinary Hospital
Melvin Turner, DVM
128 Clearbrook Drive
Colorado Springs, CO 75074
(719) 954-1169

Client/Patient Name: _____ Species: _____

Medication: _____ Amount: _____

Directions for use: _____

Date: _____

For Veterinary Use Only.

Medication 2: Prednisone 30 mg tablets

Foster, a 60 lb bulldog belonging to Halle Alvarez, needs to get 90 mg of Prednisone once every other day for 10 days.

3. How many total milligrams of Prednisone does Foster need for 10 days?

4. How many tablets will be dispensed for 10 days?

Wild Wood Veterinary Hospital
Melvin Turner, DVM
128 Clearbrook Drive
Colorado Springs, CO 75074
(719) 954-1169

Client/Patient Name: _____ Species: _____

Medication: _____ Amount: _____

Directions for use: _____

Date: _____

For Veterinary Use Only.

Medication 3: Amoxi-tabs 25 mg tablets

Pants, a 4 lb DLH belonging to Kathe Burrell, needs to get 25 mg of Amoxi-tabs twice a day for 14 days.

5. How many total milligrams of Amoxi-tabs does Pants need for 14 days?

6. How many tablets will be dispensed for 14 days?

Wild Wood Veterinary Hospital Melvin Turner, DVM 128 Clearbrook Drive Colorado Springs, CO 75074 (719) 954-1169	
Client/Patient Name: _____	Species: _____
Medication: _____	Amount: _____
Directions for use: _____ _____	
Date: _____	For Veterinary Use Only.

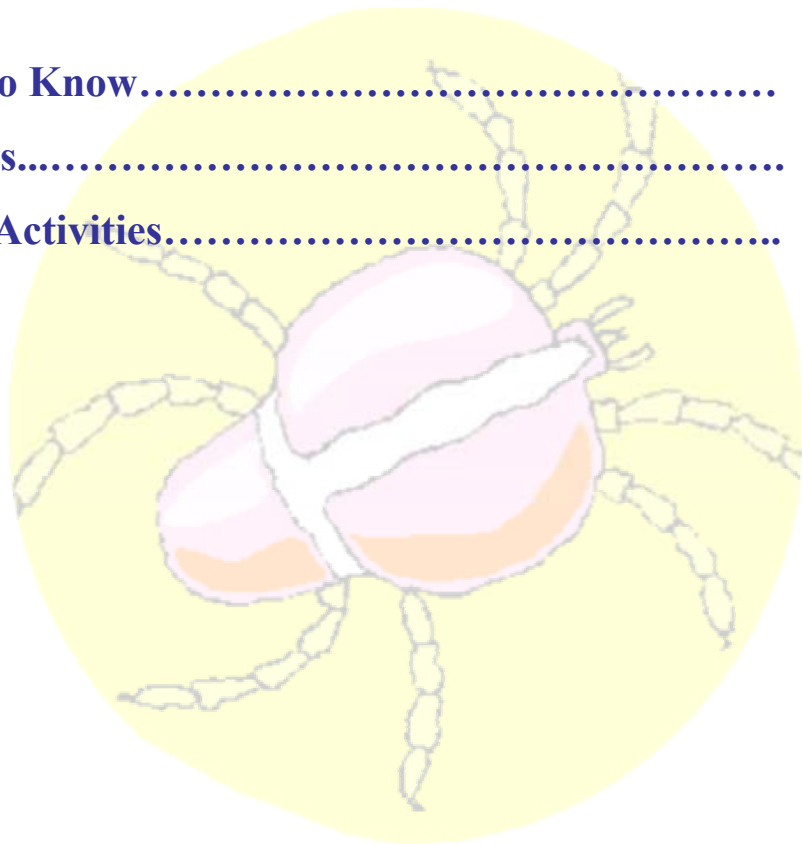
Parasitology

By Elisabeth A. Martinec

This unit covers the most common types of dog and cat parasites, both internal and external, and the methods used to diagnose those parasites.

Unit F Contents

Terms To Know.....	104
Handouts.....	105
Student Activities.....	111



Terms To Know

Anemia – lack of blood

Ectoparasite – a parasite that lives on the host

Endoparasite – a parasite that lives within the host

Host – any animal that harbors a parasite

Intermediate host – host in which a parasite goes through the larval stage of development

Larva – immature stage in the life cycle of a parasite

Meniscus – a curved surface of liquid seen when a test tube is filled just above the top

Microfilaria – the larval stage of the heartworm

Parasitology – the study of parasites

Paratenic host – host that helps spread a parasite without the parasite developing within it

Proglottid – the segment of the tapeworm containing the male and female reproductive organs

Protozoa – a microscopic single-celled animal

Transmammary – route of infection where the parasite is passed through the mammary gland to the host's young

Transplacental – route of infection where the parasite is passed across the placenta of a pregnant animal

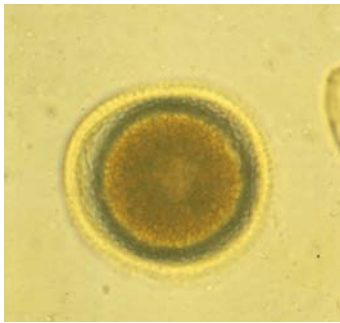
Vector – an animal, usually a tick or insect, that transmits the disease causing organism

Zoonosis – a disease that can be transmitted from animals to humans

Name _____

Internal Parasites

Roundworms



Toxocara canis



Toxocara adults in intestine

Type(s):

Modes of Transmission:

Life Cycle:

Clinical Signs:

Zoonosis:

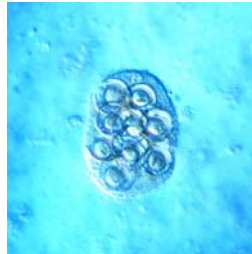
Name _____

Internal Parasites

Tapeworms



Taenia pisiformis



Dipyidium caninum



Adult segment in intestine

Type(s):

Modes of Transmission:

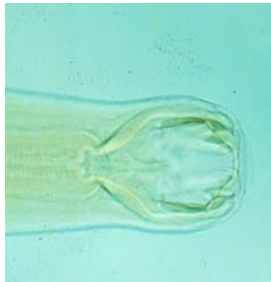
Life Cycle:

Clinical Signs:

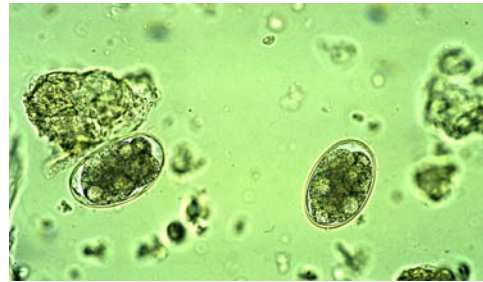
Name _____

Internal Parasites

Hookworms



Magnification of adult head



Ancylostoma

Type(s):

Modes of Transmission:

Life Cycle:

Clinical Signs:

Zoonosis:

Name _____

Internal Parasites

Whipworms



Trichuris vulpis on right
Smaller egg is *Capillaria*

Type(s):

Modes of Transmission:

Life Cycle:

Clinical Signs:

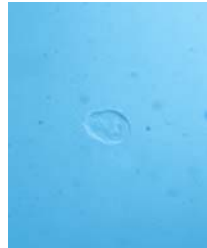
Name _____

Internal Parasites

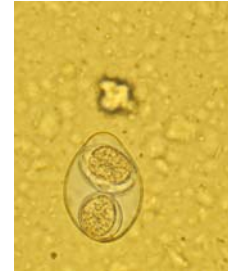
Protozoa



Giardia cyst



Giardia troph



Isospora

Types:

Modes of Transmission:

Life Cycle:

Clinical Signs:

Zoonosis:

Name _____

Internal Parasites

Heartworms

Effects:

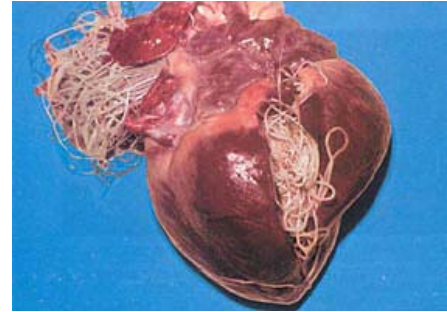
Modes of Transmission:

Life Cycle:

Clinical Signs:

Diagnosis:

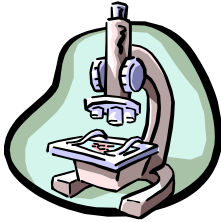
Treatment:



Student Activity 1:

Gross Exam and Direct Smear

Name _____



Purpose:

The gross exam and direct smear are the fastest ways to examine a fecal sample for parasites.

Objectives:

The students will be able to perform two of the most basic diagnostic techniques and be able to identify parasite eggs using a microscope.

Materials:

Fecal samples
Popsicle sticks
Gloves
2 microscope slides and cover slips for each student
Distilled water
Lugol's iodine diluted with distilled water 1:5

NOTE: always wear gloves when handling feces

Procedure:

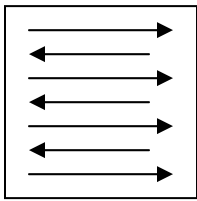
1. Obtain a fecal sample and observe and record the characteristics in the space provided.

Species	Consistency	Color	Blood	Mucus	Age	Parasites
	Normal		Y/N	Y/N	Fresh	Y/N
	Watery				Old	Type:
	Hard					

2. Using your fecal sample, follow the directions below to perform a direct smear.

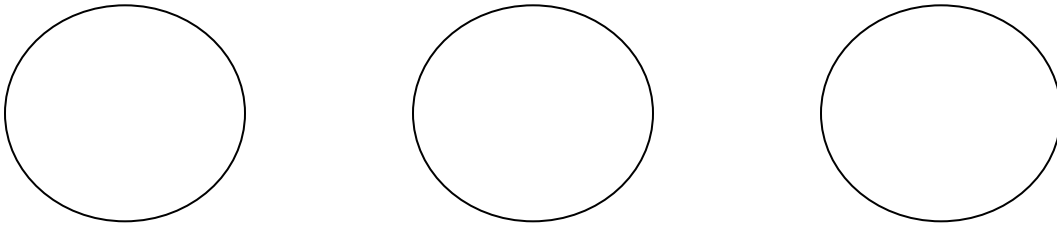
Direct Smear Procedure:

- a. Place a drop of distilled water in the middle of the slide.
- b. Next to the drop of water place a piece of feces that is approximately the same size.
- c. Use the popsicle stick to mix the feces and water together until they are thoroughly combined.
- d. Make a thin smear across the slide using the popsicle stick. The smear should be thin enough to read the print on a piece of paper placed under the slide. Check this by placing the slide on these directions.
- e. Remove any large particles from the slide and place a cover slip over the smear. The cover slip should sit evenly over the smear.
- f. Begin scanning the slide using the microscope. Be sure to follow the correct scanning pattern so that each area of the slide (field) is thoroughly examined. If a parasite is seen, center that area and switch to high power to examine.



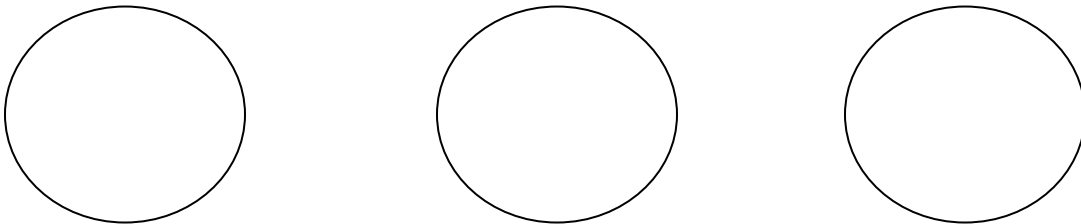
Scanning
pattern

3. In the circles below, draw and label any parasite eggs you find.



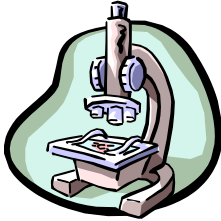
4. Repeat steps a through f using the diluted Lugol's iodine instead of water. Scan the slide looking for parasite eggs and protozoa.

5. In the circles below, draw and label any parasite eggs or protozoa you find.



Student Activity 2: Simple Floatation and the Fecalyzer

Name _____



Purpose:

Simple floatation and the Fecalyzer are the two most commonly used methods for identifying parasite eggs. They are performed routinely in all veterinary hospitals.

Objectives:

The students will be able to perform two of the most commonly used techniques for diagnosing parasitism and will be able to identify parasite eggs using a microscope.

Materials:

Fecal samples
Popsicle sticks
Gloves
Sodium nitrate floatation solution
2 Microscope slides and cover slips
1 Test tube
1 Fecalyzer kit
1 Waxed paper cup (Dixie cup)
1 Gauze square
Test tube holder

NOTE: Always wear gloves when handling feces.

Procedure:

Complete the set-up for the simple floatation first. Then do the Fecalyzer test set-up while waiting for the simple floatation to be ready for scanning.

Simple Floatation Set Up

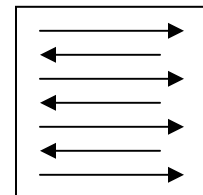
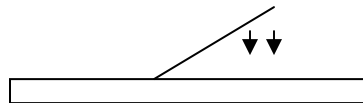
1. While wearing gloves, obtain a fecal sample and place a penny size piece in the paper cup.
2. Add enough floatation solution to the cup to cover the sample and mix thoroughly until no large pieces remain.
3. Bend one side of the cup to form a spout and pour the mixture through the gauze into the test tube. Place test tube in stand.
4. Fill the test tube so that a dome of liquid (meniscus) is formed on the top of the tube. If there is not enough liquid to fill the test tube, add some fresh floatation solution to the mixture in the tube.
5. Place a cover slip gently on top of the tube so that it rests on the meniscus.
6. Leave the cover slip in place for 15 minutes. This allows time for the eggs to rise to the top and adhere to the cover slip.

Fecalyzer Set Up

1. While wearing gloves, obtain a fecal sample and place a penny size piece in the Fecalyzer cup.
 2. Add enough floatation solution to the cup to cover the sample and mix thoroughly until no large pieces remain.
 3. Attach the strainer to the Fecalyzer cup.
 4. Add fresh floatation solution to the cup until a meniscus forms.
 5. Place a cover slip gently on top of the tube so that it rests on the meniscus.
 6. Leave the cover slip in place for 15 minutes. This allows time for the eggs to rise to the top and adhere to the cover slip.
-

Preparing Slides for Scanning

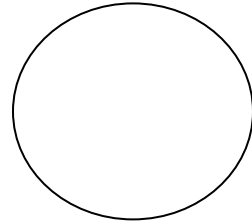
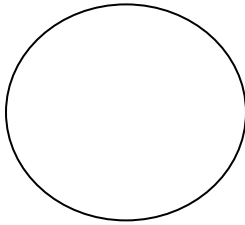
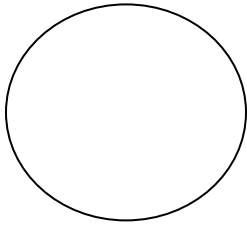
1. After the coverslip has been in place for 15 minutes, remove it from the test tube or Fecalyzer carefully by lifting it straight up. This will prevent eggs that have adhered to the slide from coming off.
2. Place the cover slip onto the slide at an angle to reduce air bubbles from being trapped under it.



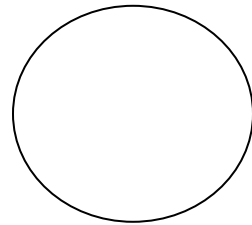
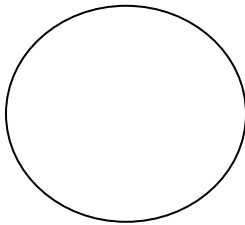
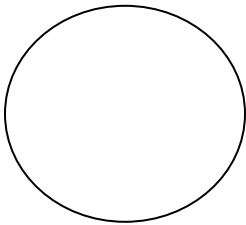
Scanning
pattern

3. Begin scanning the slide following the correct scanning pattern so that each area (field) is thoroughly examined.

4. In the circles below, draw and label any parasite eggs you find.



5. In the circle below, draw and label three types of debris that are commonly seen under the microscope when examining a fecal sample.



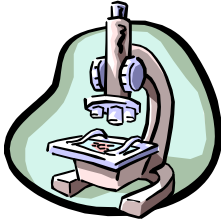
Analysis/Conclusions:

1. What are the advantages of using the Fecalyzer as opposed to the simple floatation method?
2. Look at the slides of your classmates. As a class, what type(s) of parasites were seen most often?
3. What conclusions can be drawn from this?
4. Why do the eggs float to the top in the simple floatation and Fecalyzer?

Student Activity 3:

Sedimentation Techniques

Name _____



Purpose:

Sedimentation is used in laboratories to look for parasite eggs that are heavier than the floatation solutions. These parasite eggs sink to the bottom of the sample.

Objectives:

The students will be able to perform one basic sedimentation technique.

Materials:

Fecal samples
1 Popsicle stick
Gloves
2 Microscope slides and cover slips
1 Test tube
1 Waxed paper cup (Dixie cup)
1 Gauze square
1 Pipette
Tap water
Test tube stand

NOTE: Always wear gloves when handling feces.

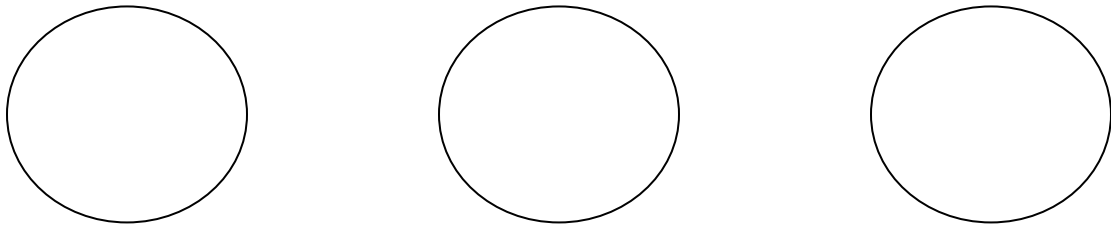
Procedure:

1. Using the Popsicle stick, stir a dime size piece of the fecal sample together with tap water in the paper cup.
2. Once the mixture contains no large pieces, strain it through the gauze into a test tube.

3. Place the test tube in the stand and allow the mixture to sit undisturbed for 20 minutes. This allows the eggs to sink to the bottom.
4. Pour the liquid off the top of the test tube carefully so that the sediment layer on the bottom is not disturbed.
5. Use the pipette to transfer a small amount of material from the top of the sediment layer onto a microscope slide. Then take another sample from the bottom of the sediment layer and place that onto a microscope slide.
6. Mix the sample drops with a drop of tap water to thin them out. Then apply a cover slip, being sure to place it on at an angle to minimize air bubbles.
7. Examine both slides using the proper scanning technique.

Analysis/Conclusions:

1. In the circles below, draw and label any parasite eggs you find.



2. Why might veterinarians choose to use the sedimentation method instead of a floatation?
3. What are the advantages and disadvantages of the sedimentation method?
4. Assuming you performed the test correctly, if no eggs were found does this mean that the animal is free of internal parasites? Why or why not?

Student Activity 4:

Lyme Disease Internet Exploration



Name _____

Purpose:

Lyme disease has been reported in 47 states and is especially common on the east coast. It affects both animals and humans.

Objectives:

The students will be able to discuss all aspects of Lyme disease and understand why it is necessary to protect pets and humans from exposure to ticks.

Procedure:

Answer the following questions using at least three sites on the Internet.

1. What organism causes Lyme disease?
2. How is Lyme disease transmitted?
3. Where are ticks commonly found?
4. What are the symptoms of Lyme disease?

5. How is it diagnosed?

6. How is it treated?

7. What can I do to protect my pet against Lyme disease?

8. How often should a pet be vaccinated?

9. What does the term epidemiology mean?

10. Where are the heaviest concentrations of Lyme disease in the United States?

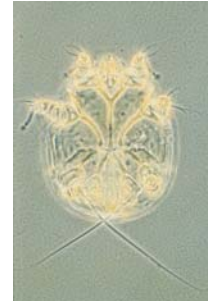
11. How many cases of Lyme disease are reported each year?

12. Find and draw a picture of a deer tick.

13. List three web sites that you used to find this information.

Student Activity 5:

The Ectoparasite Challenge



Purpose:

Identifying ectoparasites is half the battle in getting rid of them.

Objective:

Match each descriptive statement to one of the four main types of ectoparasites: flea, lice, mite, tick.

Materials:

1 set of statement cards

1 set of ectoparasite I.D. cards

4 pieces of plain paper

Tape or glue

Reference books, veterinary manuals, magazine articles, client education pamphlets, Internet sites

Procedure:

1. Working in a group, paste one parasite picture onto each piece of paper and label the parasite with its proper name.
2. Match the pictures of the ectoparasites to the statements that describe it using the reference materials provided or looking on the Internet.
3. Paste the statements under the picture of the parasite that they describe.

NOTE: There are some statements that appear more than once. In these cases, the statement applies to more than one parasite.


Parasite statement cards

Not host specific, but has host preferences	Has two different families: Ixodidae – Hard Argasidae - Soft	Blood-sucking arthropod
Transmits many bacterial, viral, rickettsial, and protozoal diseases	Transmits Lyme disease	To remove this parasite, use forceps and be sure to remove the head
The body of this parasite swells up with its meal	Some species of this parasite harbor an organism called <i>Borrelia</i>	Is most active in summer and fall
Life cycle can take as long as two years	This parasite transmits a major zoonotic disease	Transmits Rocky Mountain Spotted Fever
An intermediate host of the tapeworm <i>Dipylidium</i>	Some animals have an allergic reaction to this parasite's saliva	A small wingless insect
Is not host specific and will attack any source of blood available	Transmits several diseases including Bubonic plague	Its scientific name is <i>Ctenocephalides</i>

Parasite statement cards

Life cycle can be as short as 16 days under proper conditions	The adult can survive several months without feeding	The larvae feed on organic debris including dried blood droppings from the adults
Eggs are not sticky and will fall off the host	To get rid of this parasite, it is necessary to clean up the host and the host's environment	This is the most common parasite of cats and dogs
The two types of this parasite are: Anoplura (sucking) Mallophaga (chewing)	Must live on its host all the time	Infects other animals by direct contact
The egg is referred to as a nit	Life cycle requires 3 to 5 weeks	Likes to live on horses, sheep, and cattle during the winter
Very host specific	A wingless insect	Attaches eggs to the hairs of the host
Very small, but can still be seen with the naked eye	Is not very common in the United States	An infestation with this parasite is generally called mange

Parasite statement cards

<p>Host specific</p>	<p>Live in the hair follicles or burrow into the skin</p>	<p>Infects other animals by direct contact</p>
<p>A microscope is needed to see this parasite</p>	<p>Demodex and Otodectes are two common species</p>	<p>Causes a disease in humans called scabies</p>
<p>A skin scraping is used to diagnose infestation of this parasite</p>	<p>Will cause the host's hair to fall out in patches</p>	<p>One type of this parasite lives in the ear canal</p>
<p>Causes intense itchinness and oozing, crusty patches on the skin</p>		

Parasite ID cards

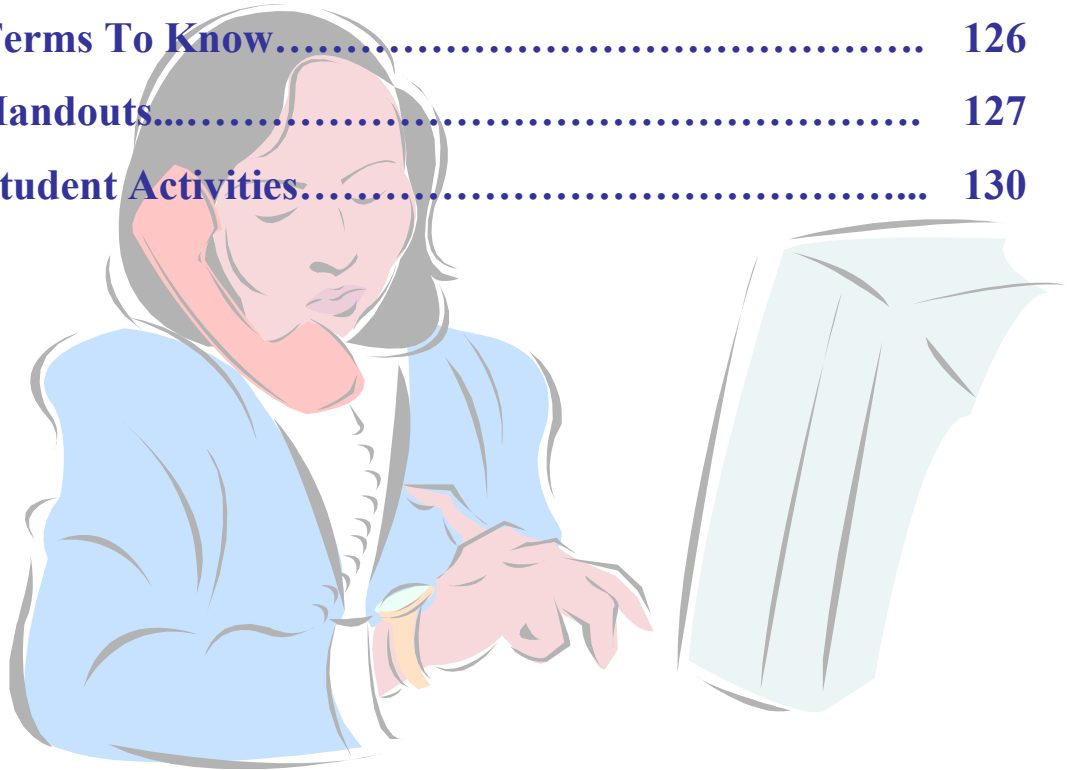


Office Management

By Robin Robbins

Unit G Contents

Terms To Know.....	126
Handouts.....	127
Student Activities.....	130



Terms To Know

Boarding – providing basic care for an animal on a short-term basis for a fee

Communication – the exchange of thoughts, ideas, and feelings to create understanding with others

Empathy – understanding and identifying with a person’s situation and feelings

Euthanasia – the act of inducing death quickly and painlessly, “putting to sleep”

Grieving – the process of feeling sorrow over a loss

Inventory – a collection, often in catalog form, of the total supplies and equipment needed for the immediate and long-term operations of a hospital.

Non-verbal communication – the unspoken elements of communication such as facial expression, posture, vocal qualities, and spatial cues

Sympathy – the feeling or expression of pity or sorrow for the distress of another

Verbal communication – the use of words to express ideas and feelings to others

Name _____

The Neckband & Cage Card

Directions: Fill in the following forms for Kali. Kali is an 8-year-old Springer Spaniel female owned by Ian Calloway of 24 East Avenue, Buffalo NY, 14357, phone 716-327-4429. She is coming in for ear surgery today. Ian brought Kali's favorite pink blanket and squeaky frog toy.

Neckband

--

Cage Card

Name _____	Date _____
Birth Date _____	Species/Breed _____
Sex _____	
Owner _____	
Address _____	

Phone _____	
Procedure _____	
Other _____	

Effective Communication

Verbal Communication – the use of words to express feelings and ideas to others

Verbal Communication Tips:

- 1.
- 2.
- 3.

Non-verbal Communication – the unspoken elements of communication such as: facial expression, posture, and spatial cues

Non-verbal Communication Tips:

- 1.
- 2.
- 3.
- 4.
- 5.

How to Be an Effective Listener:

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.

Name _____

The Grieving Process

The five steps of grieving are: denial, bargaining, anger, guilt, and acceptance.

Denial – the refusal to admit or accept the reality of the eventual loss of the pet

Bargaining – an attempt to resolve the pet’s problem by any means possible

Anger – feeling upset that the death occurred and looking for someone to blame. Often directed towards themselves or the veterinarian and hospital staff.

Guilt – feeling that doing things differently would have made a difference

Acceptance – finally coming to terms with the pet’s death, but not forgetting the pet

Directions: Read the following statements and determine which stage of grieving the owner is going through. Write the answer in the space provided.

1. _____ The owner sends a card to the hospital staff thanking them for taking such good care of George in his final days and includes a picture of her new kitten.
2. _____ The owner insists on having surgery done to remove more of Buddy’s diseased lung tissue even after being told that it would only extend his life for no more than another week.
3. _____ The owner says to the receptionist “If only I had noticed the lump on Katie’s leg a few weeks ago, this never would have happened.”
4. _____ When discussing Rudy’s worsening condition with the veterinarian, the owner keeps telling stories about how Rudy had been worse off than this plenty of times and he always managed to pull through.
5. _____ The owner cries and says that Spot will always remain in her heart and in her memory.
6. _____ On her way out the door, the owner knocks a display off a table and then begins yelling at the receptionist for placing a display so close to the door.

Student Activity 1:

On the Phone

Name _____

Purpose:

The person who answers the phone gives the client a first impression of the veterinary hospital. Because of this, it is crucial that the receptionist be polite, professional, and knowledgeable.

Objectives:

The students will gain practice in handling a variety of situations over the telephone.

Materials:

Two telephones

Role-play cards

Two chairs facing back to back

Procedure:

1. Work in pairs.
2. Decide who will be the client and who will be the receptionist.
3. When it is your turn, sit in the chair facing away from your partner.
4. The “client” will choose a role-play card and read it.
5. Do not show the card to the “receptionist”.
6. The receptionist will start the role-play by answering the phone.
7. The role-play must continue until the “client” has been helped and says goodbye.
8. When you have finished, discuss your role-play with the class.

Analysis/Conclusions:

1. Did the receptionist answer the phone in a pleasant, professional manner?
2. How could the client have communicated his or her needs more clearly?
3. If this were a real call to a veterinary hospital, would you feel confident in their ability to treat your pet?

Role Play Cards

Client 1:

You need to board your two dogs, Max and Trixie, for Tuesday through Friday of next week. You want to know how often they will be walked and if you can bring their beds and toys.

Client 2:

You are extremely upset. You have received a notice saying that because of an unpaid bill your name is being sent to a collection agency. The unpaid bill is for spaying your cat Trudy. You insist that you paid the bill at the time of the surgery. You want the receptionist to correct this error and do something to make up for all the trouble this has caused you.

Client 3:

Your dog, Boswell, was dropped off this morning for hip X-rays. You want to find out if he has come out of anesthesia and is ready to go home.

Client 4:

You are frantic! Your dog just vomited a large amount of blood and is now acting strange. He is staggering around and trembling. You want to know what you should do.

Client 5:

You need to get shots for three puppies and are wondering how much it will cost and how long the appointment will take. Then you want to schedule an appointment for tomorrow evening.

Client 6:

You are upset. You have received a postcard reminding you to bring Digger in for his yearly shots. Digger died three years ago, and you continue to get reminders even though you have called several times to inform the hospital that Digger is deceased.

Client 7:

You are a sales person with Merck Pharmaceuticals and would like to set up an appointment next week to meet with the veterinarian to discuss some new products.

Client 8:

You scheduled an appointment this evening for Kip, your dog, to get her shots. Unfortunately you have to work late. You would like to reschedule for tomorrow.

Client 9:

Cleo, your cat, is being boarded for the week, but because of an extended business trip, you want to know if it would be possible to keep him until Sunday evening. Will you be able to pick her up on Sunday?

Client 10:

You found a rabbit with a broken leg and want to know how to take care of it, or if you can bring it in and have the veterinarian fix the leg for free. You want to know if you could keep it as a pet.

Student Activity 2: Scheduling Appointments

Name _____

Purpose:

No veterinary hospital can run smoothly and efficiently if appointments are not scheduled properly. Clients will become upset if they are made to wait too long, or if their appointment was left out of the schedule.

Objectives:

The students will gain experience scheduling appointments for a variety of purposes.

Materials:

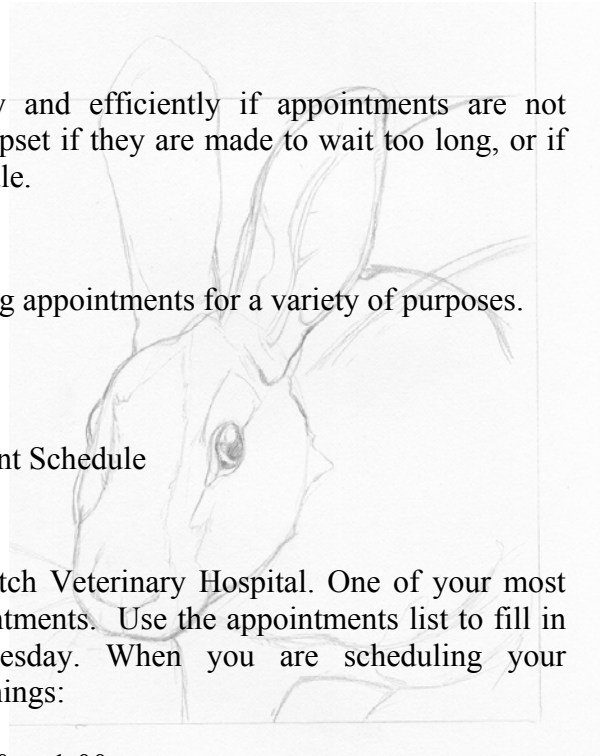
Appointments List

Briar Patch Veterinary Hospital Appointment Schedule

Procedure:

You are now the receptionist for Briar Patch Veterinary Hospital. One of your most important jobs is to schedule all the appointments. Use the appointments list to fill in the appointments for Monday and Tuesday. When you are scheduling your appointments, be sure to do the following things:

5. Block out lunch each day from 12:00 to 1:00.
6. The doctor is in surgery on Tuesday from 8:30 to 10:00.
7. Include the owner name, phone number, pet name, breed (if known), and reason for the visit on the Appointment Schedule.
8. Use arrows to show how long each appointment will be.
9. Any call that could be an emergency needs to be scheduled as soon as possible.
10. For surgeries and any other procedures that require anesthesia, pets can be dropped off first thing in the morning, but they still need to have a space scheduled for them during the day.
11. The first appointment is done for you as an example.



Appointments List:

1. Mike Lowery calls for a yearly checkup for his lab, Kali. He prefers a 1:00 p.m. appointment on Tuesday. It will take 30 minutes. 937-5245
2. Leanne Wilson needs a heartworm check, rabies shot, and nail clip for her dog, Pants. She prefers early Monday morning. It will take 45 minutes. 962-0023
3. Kelsey Wildeman needs stitches removed from her cat, Shelby. She prefers after 5p.m. on Monday. It will take 15 minutes. 937-3575
4. Jim Griffin needs booster shots for three puppies. He prefers early Monday morning. It will take 30 minutes. 936-8852
5. Margaret Barker needs an artificial insemination done on Lucky, an English setter. She will bring in the male for a fresh collection. It must be done early Monday afternoon. It will take 45 minutes. 936-7905
6. Andy Siska has a cat, Trudy, with a recurring skin problem. He prefers late Tuesday afternoon. It will take 45 minutes. 937-3300
7. Erin Smith needs health certificates for two puppies being shipped to England. She prefers after 5p.m. on Tuesday. Each exam will take 15 minutes. 734-1698
8. Marshal Updike wants to schedule a C-section for his bulldog. The surgery will be done on Tuesday when the veterinarian has time in his schedule. The C-section will take at least 1 hour. 962-4430
9. Joyce Winters needs three pygmy goats dehorned. Any time on Monday is fine with her. It will take 30 minutes. 734-9607
10. Frank Larson needs to have a new litter of puppies vaccinated for DHPP. He prefers late Monday afternoon. It will take 45 minutes. 962-4468
11. Tom Stratton's dog, Fly, has stomach problems including vomiting and diarrhea. He prefers Monday morning. It will take 45 minutes. 937-1222
12. Eric Theus needs a heartworm test for his dog, Kodak, and a feline leukemia test for his cat, Phil. He prefers Tuesday afternoon. It will take 30 minutes. 254-4567
13. Shelly Fritz needs acupuncture for her lab, Lucent. It will take 1 hour. 254-1324
14. Mindy Phelps needs a dental cleaning for her pug, Carlisle. It takes 1 hour and can be scheduled when the vet tech is free. 937-6657
15. Elisa Weitzman needs her dog, Rocky's, ears cleaned, nails trimmed, vaccinations updated, and a heartworm test. She can come in Monday or Tuesday afternoon. It will take 1 hour. 937-3748
16. Darcy D'Giacomo needs OFA hip and elbow X-rays taken on her dog, Boswell. It will take 30 minutes for the X-rays, and several hours for the anesthesia to wear off. She would prefer to drop the dog off. 962-9573
17. Wendy Christmas has a cat with a urinary blockage. She can come in any time. 734-6690

Briar Patch Veterinary Hospital Appointments Schedule

DATE: Monday	DATE: Tuesday
8:30	8:30
8:45	8:45
9:00	9:00
9:15	9:15
9:30	9:30
9:45	9:45
10:00	10:00
10:15	10:15
10:30	10:30
10:45	10:45
11:00	11:00
11:15	11:15
11:30	11:30
11:45	11:45
12:00	12:00
12:15	12:15
12:30	12:30
12:45	12:45
1:00	1:00 Mike Lowery 937-5245
1:15	1:15 ↓ Kali – lab, checkup
1:30	1:30
1:45	1:45
2:00	2:00
2:15	2:15
2:30	2:30
2:45	2:45
3:00	3:00
3:15	3:15
3:30	3:30
3:45	3:45
4:00	4:00
4:15	4:15
4:30	4:30
4:45	4:45
5:00	5:00
5:15	5:15
5:30	5:30
5:45	5:45
6:00	6:00

Student Activity 3:

Organize That Inventory

Name _____

Purpose:

Inventory is important! Running out of a drug needed for a client or for surgery can quickly cause a veterinary hospital to lose business. Having too much inventory wastes money that could be spent on other things.

Objectives:

The students will develop an understanding of how inventory control works.

Materials:

- Inventory control cards
- Inventory usage chart and order form
- Shoebox
- Calculator

Procedure:

1. Split into 4 groups. Each group chooses 10 inventory control cards out of the box. On the inventory control card you will see the following information:

Item #	Product name
A description of the product	
The supplier	The amount of the product that is shipped as 1 unit

2. The inventory usage chart shows how much of each item was used in 2 months.
3. Determine how much you need to order to last **4 months**.
4. Use the order form to order enough supplies for 4 months.
5. Your orders will be in **units**. Veterinary supply companies ship most items in large quantities, so 1 unit many contain 5 or 10 bottles of a product. See the example below.

Example:

22-123	Elastic bandage
Self-stick bandage material	
Acme Vet Supply	6 rolls/unit

If 15 rolls were used in 2 months, how much should be ordered for the next 4 months?

$$15 \times 2 = 30 \text{ rolls} \longrightarrow 6 \text{ rolls} \times ? \text{ units} = 30 \text{ rolls} \longrightarrow 6 \text{ rolls} \times 5 \text{ units} = 30 \text{ rolls}$$

Handout-1

Inventory Control Cards

1-01	Vet wrap	1-02	Gauze pads	1-03	Thermometers
Self-cling bandage material		4"x4" bandage pads 500/pack			
Acme Vet Supply	4 rolls/unit	Acme Vet Supply	10packs/unit	Acme Vet Supply	4/unit
1-04	Tape	1-05	70% Alcohol	1-06	Dixie cups
White surgical tape		5 gallon jug		500/pack	
Acme Vet Supply	10 rolls/unit	Acme Vet Supply	1jug/unit	Acme Vet Supply	1 pack/unit
1-07	OtoCleanse	1-08	Cotton swabs	1-09	Microscope slides
Ear cleaning solution		Wooden applicator w/cotton tip		Frosted end 25x75mm	
Acme Vet Supply	5 bottles/unit	Acme Vet Supply	500/unit	Acme Vet Supply	72/unit
1-10	K-Y Jelly	2-01	60mL syringes	2-02	20mL syringes
Lubricant					
Acme Vet Supply	5 tubes/unit	Acme Vet Supply	20/unit	Acme Vet Supply	50/unit
2-03	5mL syringes	2-04	Insulin syringes	2-05	25-gauge needles
Acme Vet Supply	100/unit	Acme Vet Supply	100/unit	Acme Vet Supply	100/unit
2-06	22-gauge needles	2-07	Rabies vaccine	2-08	Droncit wormer
		3 year - single dose vials		500 tablets per bottle	
Acme Vet Supply	100/unit	Acme Vet Supply	100/unit	Acme Vet Supply	1 bottle/unit
2-09	Amoxicillin	2-10	Phenobarbital tabs	3-01	Insulin
Liquid penicillin w/dropper		Controlled drug for seizures		15 mL vials	
Acme Vet Supply	10 bottles/unit	Acme Vet Supply	25 tabs/unit	Acme Vet Supply	30/unit

3-02	Lyme disease vaccine	3-03	Acepromazine	3-04	Ketamine
	Single dose vials		Tranquilizer 50mL bottle		Disassociative drug 20mL vial
	Acme Vet Supply 50 doses/unit		Acme Vet Supply 4 bottles/unit		Acme Vet Supply 4 vials/unit
3-05	Lactated ringers	3-06	Hills Science Diet	3-07	Groom Aid Spray
	1000mL bags – fluid therapy		Dry dog food – 20 lb. bags		Grooming finishing spray
	Acme Vet Supply 20 bags/unit		Acme Vet Supply 1 bag/unit		Acme Vet Supply 6 cans/unit
3-08	Acme Flea Shampoo	3-09	4-0 Surgical gut	3-10	#10 Scalpel blades
	Concentrated 1 gallon jug		Suture material w/ cutting needle		100/box
	Acme Vet Supply 1 gal/ unit		Acme Vet Supply 25 sets/unit		Acme Vet Supply 2 boxes/unit
4-01	Medium latex gloves	4-02	Shoe covers	4-03	Multi Stix
	Non-sterile exam gloves 100/box		100/box		Urine test strips – 500 strips
	Acme Vet Supply 4 boxes/unit		Acme Vet Supply 4 boxes/unit		Acme Vet Supply 1 bottle/unit
4-04	Feline Leukemia test kit	4-05	Heartworm test kit	4-06	Zinc sulfate
	Box of 10 kits		Box of 10 kits		Parasite floatation 100mLs
	Acme Vet Supply 1 box/unit		Acme Vet Supply 1 box/unit		Acme Vet Supply 1bottle/unit
4-07	Roccal-D	4-08	Novasan solution	4-09	Novasan Scrub
	Concentrate floor cleaner 2gal jug		Antiseptic solution 1 gal		Antiseptic scrub 1 gal
	Acme Vet Supply 1jug/unit		Acme Vet Supply 1 gal/unit		Acme Vet Supply 1 gal/unit
4-10	Betadine				
	Iodine surgical scrub – 1 quart				
	Acme Vet Supply 4 qts/unit				

**Inventory Usage Chart
For 01/00 – 03/00**

Item #	Item	Amount Used
1-01	Vet wrap	21 rolls
1-02	Gauze pads	4 packs
1-03	Thermometers	0
1-04	Tape	20 rolls
1-05	70% Alcohol	10 gallons
1-06	Dixie cups	500
1-07	OtoCleanse	2 bottles
1-08	Cotton swabs	250
1-09	Microscope slides	260
1-10	K-Y Jelly	1 tube
2-01	60mL syringes	60
2-02	20mL syringes	70
2-03	5mL syringes	250
2-04	Insulin syringes	200
2-05	25-gauge needles	300
2-06	22-gauge needles	400
2-07	Rabies vaccine	200
2-08	Droncit wormer	½ bottle
2-09	Amoxicillin	35 bottles
2-10	Phenobarbital tabs	100 tabs
3-01	Insulin	50 vials
3-02	Lyme disease vaccine	100
3-03	Acepromazine	1 bottle
3-04	Ketamine	3 bottles
3-05	Lactated ringers	20 bags
3-06	Hills Science Diet	6 bags
3-07	Groom Aid spray	4 cans
3-08	Acme flea shampoo	1 gallon
3-09	4-0 surgical gut	50
3-10	#10 scalpel blades	300
4-01	Medium latex gloves	4 boxes
4-02	Shoe covers	2 boxes
4-03	Multi Stix	1 bottle
4-04	Feline Leukemia test kit	25 kits
4-05	Heartworm test kit	40 kits
4-06	Zinc sulfate 100mL	3 bottles
4-07	Roccal-D	4 gallons
4-08	Novasan solution	2 gallons
4-09	Novasan scrub	1 gallon
4-10	Betadine	5 quarts

Acme Vet Supply

123 Beagle Lane
Horseheads, NY 14831
607.562.7733

Item #	Product Name	Description	Quantity in units
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
16.			
17.			
18.			
19.			
20.			
21.			
22.			
23.			
24.			
25.			
26.			
27.			
28.			
29.			
30.			
31.			
32.			
33.			
34.			
35.			
36.			
37.			
38.			
39.			
40.			

Student Activity 4: How To Say It!

Name _____



Purpose:

The way you communicate with others affects how people respond to you and their attitude towards you. It also shapes their opinion of you. In any business it is important to maintain a professional manner when dealing with clients and coworkers.

Objectives:

The students will develop an understanding of how to communicate professionally and learn methods to use to handle different situations that may arise in the veterinary hospital.

Materials:

Skits

Procedure:

1. Act out the following skits as a class.
2. After each skit, discuss and answer the questions that follow it.

Skit #1: Receptionist and Client

Client: (enters hospital and walks to reception desk)

Receptionist: (is seated and talking on the phone to a friend) (ignores client)

Client: (grows impatient and clears throat several times to get receptionist's attention)

Receptionist: (gets off the phone, crosses arms, and remains seated) "Yeah?" (rudely)

Client: "I'm Mrs. Jones. I have an appointment at 2 o'clock for my dog, Fluffy."

Receptionist: "Have a seat." (points to waiting area) "What was your name again?"

Analysis/Conclusions:

1. What types of non-verbal communication did the receptionist and the client exhibit?

2. Did the receptionist act professionally? Explain why or why not.

3. Did the client's actions influence the way the receptionist acted towards her? Explain.

4. What should the receptionist have done when the client came to the desk?

Skit #2: Veterinarian and Vet Tech

Vet Tech: (is clipping and prepping a dog for the vet to spay)

Veterinarian: (angrily) "No, No, NO! You're doing that all wrong! I can't believe you've been here for three months and still don't know what you're doing.

Vet Tech: (Calmly) "Well, no one ever showed me how you like your surgeries prepped, so I have been doing it the way I learned in school. If you show me how you like them done, I will be glad to do them that way."

Veterinarian: "Here, just give me those clippers. I'll do it myself. What's the point of paying someone if you have to stand over them and watch them all the time?"

Analysis/Conclusions:

1. How has the veterinarian made the vet tech feel?

2. Is it fair for the veterinarian to be upset with the vet tech? Why or why not?

3. What problems might arise because of the way the veterinarian has treated the vet tech?

4. Explain how the veterinarian could have made his point without belittling the vet tech.

Skit #3: Veterinarian and Client

Client: (sitting, upset)

Veterinarian: (standing over client)

“Your dog has osteosarcoma, a fatal bone cancer and should just be put to sleep.”

Client: “Aren’t there any treatments? How long does he have before I need to make a decision?”

Veterinarian: “As I said before, this is a fatal disease. Putting him to sleep is the only thing to do.”

Client: “How is an animal put to sleep?”

Veterinarian: “Well, for a small fee we give them a shot of the “blue juice” and off they go! If you’re looking for a cheaper route, a bullet only cost 25 cents and you can borrow my shovel for free!” (laughs)

Analysis/Conclusions:

1. What was the attitude of the veterinarian?
 2. How could the veterinarian have communicated more sympathy to the owner in a non-verbal way?
 3. What image does the client have of the veterinarian?
-

Skit #4: Vet Tech 1, Vet Tech 2, and Receptionist

VT1: (this is your 3rd day on the job)

VT2: (gossiping) “That Mrs. Johnson is such a pain! She calls about every little scratch that little mutt gets and then I have to spend a hour telling her that the dog’s not going to die.”

Receptionist: “Yeah I know what you mean. But at least when you’re on the phone with her you don’t have to listen to the office manager complain about how messed up the inventory is.”

VT1: “What’s wrong with the inventory?”

VT2: “Nothing. The office manager is just lazy and incompetent. If he bothers me about handing in those stupid inventory cards one more time, I’ll scream.”

Receptionist: “Once you’ve been here a while you’ll see what a pain he is.”

Analysis/Conclusions:

1. What kind of image are vet tech 2 and the receptionist giving to vet tech 1?
2. How will vet tech 1 feel about vet tech 2 and the receptionist?
3. What sort of working environment does this hospital have?

Posology

By Holly Partridge

Posology is the technical term for veterinary math. This unit starts with basic math and works its way through conversions, ratios, percentages and dilutions. It also explains how to use dimensional analysis to solve more difficult equations.

Unit H Contents

Handout.....	144
Problem Sets.....	145

Common Conversions, Formulas, Etc.

Common Conversions:

Weight –

1 kilogram (kg) = 2.2 pounds (lb)
1 gram (g) = 1000 milligrams (mg)

1 ounce (oz) = 28 g
1 gram (g) = 100 kilograms (kg)

Liquid –

1 tablespoon (Tbsp) (T) = 3 teaspoons (tsp) (t)
1 gallon (gal) = 4 quarts (qt)
1 pint = 2 cups
1 qt = 100 mL

1 cup = 16 Tbsp = 8 fluidounces (fl oz)
1 qt = 2 pints
1 fl oz = 30 mL

Linear Measurement –

1 foot (ft) = 12 inches (in)
1 yard (yd) = 3 ft
1 mile = 1760 yds = 5280 ft

1 in = 2.54 centimeters (cm)
1 ft = 0.3048 meters (m)
1 mile = 1.609 kilometers (km)

Formulas:

Temperature –

$$F = (C \times 9/5) + 32$$
$$C = (F - 32) \times 5/9$$

Simple Dose in Tablet Form –

1. What you want to give goes on top
2. Convert to same units
3. Divide by what you have in stock

Dilution –

$$(\text{concentration 1})(\text{volume 1}) = (\text{concentration 2})(\text{volume 2})$$

Determining the Ratio –

1. Convert to same units
2. Reduce to lowest terms

Etc...

OD = once daily

BID = two times a day

TID = three times a day

QID = four times a day

a 3% solution = 3 mg / 100 mL

1 milliliter (mL) = 1 cubic centimeter (cc)

Name _____

Addition/Subtraction of Whole Numbers – LABEL ALL ANSWERS!

1. _____ A veterinary assistant must inventory all supplies each month. She counts the following number of thermometers: 4, 12, 7, 23, and 9. What is the total number of thermometers?

2. _____ A veterinary assistant counts the exam gloves in each room and determines there are 338, 191, 87, 420, 206, and 76 gloves. What is the total number of gloves?

3. _____ A vet tech purchases a new uniform. She spends \$31 for the top, \$28 for the pants, \$56 for shoes, \$7 for socks and \$4 for a name pin. What was her total cost?

4. _____ A veterinarian in a critical care unit determines that one calf was given the following intravenous (IV) solutions in a 24 hour period: 745 milliliters (mL) of 0.9% normal saline, 420 mL of lactated ringers, 1,250 mL of 5% dextrose, and 15 mL of an antibiotic solution. How many total milliliters of IV solution did the patient receive?

5. _____ A veterinary technician inventories the number of medication containers. She finds there are 1,137 safety-lock containers, 963 easy-open containers, 413 15mL bottles, 1,265 30mL bottles, and 258 ointment containers. What is the total number of medication containers?

Problem Set-1 cont.

6. _____ A veterinary technician notes that a dog's leukocyte (white blood cell) count before surgery was 18,645. Two days after the surgery, the patient had a leukocyte count of 8,968. What is the difference in the leukocyte counts?

7. _____ A veterinarian is paid \$53,291 per year. After a raise, her yearly salary increases to \$56,509. What was the amount of her raise?

8. _____ A veterinary technician is calculating the bill for hospital care for a kidney transplant cat. The bill for medical services and care was \$2,685. The owners paid \$1,389 when they picked up the cat. A few weeks later they paid another \$497. How much do they still owe?

9. _____ A cow weighed 1,743 pounds prior to calving. The calf weighed 97 pounds and the placenta and amniotic fluid weighed 189 pounds. How much did the cow weigh after calving?

10. _____ A steer weighed 1,145 pounds before harvest. One half of the carcass with fore quarters weighed 393 pounds and one half of the carcass with rear quarters weighed 341 pounds. How much of the steer could not be consumed?

Name _____

Multiplication/Division of Whole Numbers – LABEL ALL ANSWERS!

1. _____ An anatomy student learns that the bones of the fingers and toes are called phalanges. Each thumb and big toe has two phalanges. All other fingers and toes have three phalanges each. What is the total number of phalanges?

2. _____ A technician is using a microscope to examine a specimen. If the eyepiece on the microscope has a power of 15x (x means times; a power of 15x magnifies an object 15 times) and the objective has a power of 100x, what is the total number of times she is magnifying the specimen? **Hint:** to find total magnification on a microscope, multiply the power of the eyepiece times the power of the objective.

3. _____ An animal shelter worker is preparing formula for orphaned puppies. There are 9 puppies and each needs 2 ounces of formula. How many ounces of formula must be prepared?

4. _____ A secretary maintains the accounts and writes the paychecks for a veterinary facility. Eight vet techs earn \$13 per hour. If everyone works 40 hours per week, what is the total amount of money needed for the payroll each week?

5. _____ The lab receives a prescription order from the veterinarian. He wants the patient to take 40 milligrams (mg) of amoxicillin four times a day for 25 days. The lab has 20 mg amoxicillin tablets. How many tablets should the vet tech give to the client for the 25-day period?

Problem Set-2 cont.

6. _____ A dairy calf raiser orders 25 bags of calf milk replacer for \$1,050. How much did each bag cost?

7. _____ A New York City veterinary technician makes \$40,532.00 per year. He is paid every two weeks. What is his gross pay per paycheck? (Remember there are 52 weeks in a year)

8. _____ A microbiologist is staining bacterial slides. He uses a bottle of Gram stain that contains 144 milliliters (mL) of solution. If each slide requires 18 mL of the solution, how many slides can he stain with one bottle of solution?

9. _____ A dairy milker's gross pay per week is \$546. If she works 30 hours per week, how much does she earn per hour?

10. _____ A zookeeper gives a pot-bellied pig 1200 milligrams (mg) of Streptomycin in a 24-hour period. How many mg does he give the pig per dose if he gives the medication every 6 hours (q6h)?

Name _____

Multiple Operations with Whole Numbers – LABEL ALL ANSWERS!

1. _____ A veterinary assistant at a large hospital is asked to buy 6 calculators at \$27 each, 12 thermometers at \$4 each, 4 bottles of 70% alcohol at \$5 each, 20 bags of cotton balls at \$2 each and 10 packages of X-ray film at \$30 each. How much did he spend?

2. _____ A groomer is ordering thinning shears for her shop and needs 12 of them. Supplier A is offering a dozen thinning shears for \$96, while Supplier B charges \$9 for each pair. If the thinning shears are of equal quality, which is the better buy?

3. _____ A veterinarian takes blood samples from cows for brucellosis testing. One morning he fills 16 vacutainers (vacuum tubes) with 10 cubic centimeters (cc) of blood, 31 with 9.5 cc of blood, 28 with 7 cc of blood, and 15 with 8.5 cc of blood. How many cc of blood did he obtain from all the cows?

4. _____ A veterinary technician earns \$14 per hour. He is paid double for any hours over 40 hours per week. If he works 52 hours in a week, what is his gross pay?

5. _____ A veterinary technician is counting leukocytes (white blood cells). She counts four areas on the hemocytometer counting chamber, adds the four numbers together and then multiplies by 50 to obtain the correct leukocyte count. If the counts are 23, 27, 28 and 34 what is the correct leukocyte count?

Problem Set-3 cont.

6. _____ A zookeeper feeds three bales of hay each to 4 elephants, 6 bales of hay to each of 10 pens of reindeer, 2 bales of hay to each of 6 pens of llamas and 3 pens of mountain goats, 4 bales of hay to the draft horses, and 6 bales of hay to each of three pens of giraffes. How much does it cost to feed all of these animals each day if hay costs \$5.00 per bale?

7. _____ An animal health technician is stocking a cabinet with flea control products. He stocks three cases of spray containing 24 cans per case, 13 cases of shampoo with 12 bottles per case, 5 boxes of foam with 10 cans per case, and 6 cases of powder with 8 boxes per case. Three days later he calculates that 35 cans of spray, 18 bottles of shampoo, 5 cans of foam and 21 bottles of powder have been sold. How many total items of flea killing preparations are left in the cabinet?

8. _____ A sheep owner is caring for a sick lamb that has a severe navel infection. He gives the lamb 2 cc of Ampicillin 4 times a day for three days. If each cc contains 125 mg of Ampicillin what is the total number of mg of Ampicillin given to the lamb?

9. _____ A dairy milker earns \$11 per hour when she works days and \$14 per hour when she milks at night. One month she works 6 four-hour days, 3 eight-hour days, 3 ten-hour days, 4 six-hour nights, and 2 eight-hour nights. What is her gross monthly pay?

10. _____ A technician is staining blood film slides with Wright's stain. The Wright's stain bottle contains 120 mL. He uses 12 mL of the Wright's stain for each slide and stains 6 slides. How many additional slides can be stained with the Wright's stain?

Name _____

Addition/Subtraction of Fractions – LABEL ALL ANSWERS!

1. _____ A vet tech gives a dog $\frac{1}{2}$ ounces (oz) of cough medicine at 6 PM and $\frac{1}{4}$ oz of cough medicine at 10 PM. What is the total amount of cough medicine received?

2. _____ A dog delivers five puppies. They weigh $\frac{1}{2}$ pound (lb), $\frac{7}{8}$ lb, $\frac{3}{4}$ lb, $1 \frac{1}{8}$ lb and $\frac{15}{16}$ lb. What is the total weight of all five puppies?

3. _____ A vet tech is developing X rays. He follows the time chart recommended for the film he is using. What is the total time required to complete the developing process?

<u>Developing Process</u>	<u>Time Required</u>
Developer	2 $\frac{1}{4}$ minutes
Rinse	$\frac{3}{4}$ minute
Fix solution	3 $\frac{1}{2}$ minutes
Final wash	19 minutes

4. _____ A vet tech uses $\frac{1}{2}$ oz, $\frac{3}{4}$ oz, and $\frac{5}{8}$ oz of solution to perform three urinary analysis tests. How much total solution does she use?

5. _____ A racehorse trainer is asked to gradually increase a horse's workouts over a week. During the course of the week how many total miles did the horse run using the following schedule?

Sun.	$\frac{1}{4}$ mile
Mon.	$\frac{1}{3}$ mile
Tues.	$\frac{5}{8}$ mile
Wed.	$\frac{9}{12}$ mile
Thurs.	$\frac{3}{4}$ mile
Fri.	$\frac{7}{8}$ mile
Sat.	1 mile

Problem Set-4 cont.

6. _____ A vet tech is in charge of the construction of a new X-ray development unit. She knows that to prevent radiation the walls must be at least $2 \frac{5}{8}$ inches (") thick if gypsum sheet rock is used or $\frac{1}{16}$ " thick if sheets of lead are embedded in the wall to prevent the passage of radiation. What is the difference of thickness in the two walls?
7. _____ A microbiologist notes that the average length of a bacterium is $\frac{1}{1000}$ micrometer (mcm). Viruses range in size from $\frac{1}{2500}$ to 1500 mcm. How much longer is a bacterium than the smallest virus in mcm?

Name _____

Multiplication/Division of Fractions – LABEL ALL ANSWERS!

1. _____ A zoo administrator must decrease the staff size by $\frac{1}{12}$ because of budget cuts. If the zoo employs 456 people, how many people must be dismissed?

2. _____ A veterinary pharmaceutical company technician uses a 480-milliliter (mL) flask of rabies vaccine solution to fill individual vials. If each vial holds $\frac{1}{30}$ of the volume of the flask, how many mL of vaccine are in each vial?

3. _____ After developing X-rays, a veterinary technician finds that the image is too dark. He knows that the milliamperage per second (MaS) for the X-ray machine should be reduced to $\frac{1}{4}$ of the original setting to correct the problem. If he used 80 MaS the first time, what MaS should he use to correct the problem?

4. _____ A veterinary technician works $7\frac{1}{2}$ hours a day. He spends $\frac{1}{2}$ of the time in the operating room, $\frac{1}{8}$ in the recovery area, $\frac{1}{4}$ consulting patients, and $\frac{1}{8}$ on records. How many hours did he work combined in recovery and on records?

5. _____ A calf raiser mixes a batch of milk replacer for 15 calves. Each calf gets two quarts of milk replacer. If the calf raiser uses 960 oz. of replacer and needs to add $\frac{3}{4}$ as much water as milk replacer, how many ounces of water does she need?

Problem Set-5 cont.

6. _____ A zoo's annual budget for animal care is \$83,595. The director calculates that $\frac{1}{6}$ of that is spent on educational programs for zookeepers. What is the cost for zookeeper education?

7. _____ A veterinary technician uses the following formula to determine the milliamperage (MA) setting for the X-ray machine. If she uses 10 MaS for $\frac{1}{20}$ of a second, what should the MA be?

$$MA = \frac{\text{milliamperage per second (MaS)}}{\text{exposure time in seconds}}$$

8. _____ A records clerk notes that in a one-year period 2 out of 8 animals for a total of 7,733 animals were treated for skin problems. How many animals total were seen this year?

9. _____ A veterinary assistant works $47\frac{1}{2}$ hours in a five-day week. If she worked the same number of hours each day, how many hours did she work each day?

10. _____ Two veterinary technicians work five days a week. Mary works $4\frac{3}{4}$ hours per day and Anne works $6\frac{1}{2}$ hours per day. In one week how much does Anne work?

Name _____

Multiple Operations with Fractions – LABEL ALL ANSWERS!

1. _____ A vet tech in an urban practice earns \$11 per hour and works $7\frac{3}{4}$ hours each day. A tech in a small practice earns \$ 8 per hour and works $8\frac{1}{2}$ hours per day. If they both work 5 days a week, how much more does the city tech earn each week?

2. _____ A bottle of staining solution contains 30 oz. A blood test requires $\frac{3}{4}$ oz of solution. A tissue test requires $\frac{1}{2}$ oz of solution. If 8 blood tests and 12 tissue tests are performed, how many ounces are left in the bottle?

3. _____ A vet tech weighs a 500mg capsule of Ampicillin and finds it weighs $\frac{3}{20}$ of an ounce. Assuming half the amount weighs half as much, how much would 50 capsules containing 250 mg weigh?

4. _____ A milk plant employs 256 people. If $\frac{1}{8}$ of the employees work in the lab, $\frac{1}{2}$ work in the warehouse, and $\frac{3}{16}$ produce bottled milk, what is the total number of people working in these areas?

5. _____ A vet prescribes Mylanta for a dog with an irritated stomach. If the dog gets $1\frac{1}{2}$ oz every other hour beginning at 6am and ending with a final dose at 10 pm, how many days would a 72 oz bottle last?

Problem Set-6 cont.

6. _____ A farm loan officer has a four-drawer file cabinet. One drawer is $\frac{3}{5}$ full, one drawer is $\frac{1}{2}$ full, one drawer is $\frac{2}{3}$ full and one drawer is $\frac{3}{4}$ full. Can the contents be combined into three drawers? Explain.

7. _____ A milker works 40 hours a week for \$10 an hour. His gross pay is reduced by $\frac{1}{5}$ for federal tax, $\frac{3}{50}$ for state tax, $\frac{1}{100}$ for local tax, and $\frac{1}{30}$ for retirement. How much money does he receive for two weeks after deductions are taken out?

8. _____ A one-month-old lamb drinks $3\frac{1}{2}$ oz of formula every four hours except when the farmer sleeps from 10 pm until 6 am. How many ounces does the lamb drink in a week? (assume a feeding is given at 6 am and 10 pm.)

9. _____ An arthritic dog is taking $2\frac{1}{2}$ mg of Rymidal three times a day. If each tablet contains 5 mg, how many tablets will the dog take in seven days?

10. _____ A groom at the racetrack notes that \$90 was taken out of his paycheck for federal tax, state tax, local tax, and FICA. This was $\frac{3}{10}$ of his paycheck. What was his gross pay per hour if he worked $37\frac{1}{2}$ hours?

Name _____

Addition/Subtraction of Decimals – LABEL ALL ANSWERS!

1. _____ A racehorse owner with a sick horse receives a vet bill that lists the following charges: farm call- \$51.50, blood test- \$37.75, urinalysis- \$18.25, and medication- \$63.95. Calculate the total amount due to the vet.

2. _____ A veterinary student pays - \$2,738.90 for tuition, \$2,348.50 for room and board, \$896.48 for books, \$52.00 for parking, and \$473.75 for lab fees. What is the total cost?

3. _____ A dog with pulmonary edema is given an initial dose of 0.4 mL of Lasix. At 11 am the dog receives another 0.4 mL, at 1 pm 0.6 mL, and at 7 pm 0.8 mL. What is the total dosage?

4. _____ A board certified veterinarian uses a manometer on a Great Dane to measure oxygen usage at one-minute intervals. She records the following readings: 1.823 L, 1.3635L, 1.332 L, 1.908 L, and 1.876 L. How many liters of oxygen were used?

5. _____ An obese Lab receives Cytomel, a thyroid drug for hypothyroidism. The first dose it is given 0.025 mg. The next dose is increased 0.0125 mg. What is the total for the second dose?

Problem Set-7 cont.

6. _____ An animal caretaker at the Buffalo zoo checks his pay stub to note the deductions taken out of his gross pay. If his weekly gross pay is \$489.90 and the deductions are: federal tax - \$92.13, state tax - \$32.69, FICA - \$22.15, and city tax - \$4.34, how much will he take home this week?

7. _____ A therapist at an equine clinic checks the temperature in a whirlpool bath finding it to be 35.6°C . To raise the temperature to 39.4°C , how many degrees increase is needed?

8. _____ The maximum permissible dose (MPD) of radiation exposure for a vet tech is 5 rem (radiation equivalent man). If the tech's dosimeter badge (a device worn to measure radiation) shows 2.8563 rem, how much more exposure can the vet tech have before reaching her MPD?

9. _____ Porcine blood has a pH of 7.4. The pH of pig urine is 5.8. What is the difference in pH between blood and urine?

10. _____ A bacillus bacterium measures 8.6 micrometers (mcm) while a virus measures 0.07392 mcm. How much longer is the bacterium?

Name _____

Multiplication/Division of Decimals – LABEL ALL ANSWERS!

1. _____ A vet tech buys a scrub top for \$26.95 plus 8% sales tax. How much will she spend on five scrub tops?

2. _____ A milker makes \$465 a week and 0.0765 of the total is taken for social security. How much money is paid to social security?

3. _____ A dog takes 0.625 mg of Premarion twice a day for five days. What is the total dose?

4. _____ A six-month-old dog weighs 27.41 kg. If one kg equals 2.2 lb, how many lbs does the dog weigh?

5. _____ A single Unopette used for blood cell counts costs 39 cents. If a laboratory orders 25 dozen Unopettes, what is the total cost?

Problem Set-8 cont.

6. _____ A vet buys sixteen stethoscopes for \$85.98. What is the cost of each stethoscope?

7. _____ A veterinarian has 7 g of sodium chloride to prepare bacterial cultures. If each culture requires 0.025 g of sodium chloride, how many cultures can be made?

8. _____ A veterinarian can purchase X-ray film at \$74.76 for 24 exposures or \$108.90 for 36 exposures. If both films are of equal quality, which is the best buy?

9. _____ A dog is put on a low dose of aspirin for arthritis. The prescription calls for a total of 35 grains (gr) to be taken twice a day over 7 days. How many gr will the dog get each time if each treatment is the same amount?

10. _____ A herpetologist in a zoo works 189.25 hours in 23 days. If he works the same number of hours each day, how many hours does he work per day?

Name _____

Multiple Operations with Decimals – LABEL ALL ANSWERS!

1. _____ A dairy farm has a real estate tax rate of \$57.26 per thousand dollars of assessed value. If the farm is assessed at \$665,500.00 what is the real estate tax?

2. _____ A dog's normal body temperature is 101.5° F. A dog with pyometra (infection of the uterus) has a temperature of 106.2° F. How much higher is this than normal?

3. _____ A receptionist orders 64 patient charts one month, 92 the second month and 128 the third. What is the total cost of the charts based on the price chart below?

PATIENT CHART PRICE LIST

Number of charts	1-25	26-50	51-75	76-100	101-200
Price/chart	\$1.23	\$1.12	\$0.98	\$0.80	\$0.64

4. _____ A calf raiser buys a coat for \$78.99, boots for \$63.45, and gloves for \$13.49. Sales tax is 0.0575. What was the total cost including sales tax?

5. _____ A rabies clinic charges \$5.00 for vaccination. Each vaccine costs \$0.48, a syringe and needle cost \$0.09 and the labor for the veterinarian is \$1.35. If 168 pets are vaccinated, what is the profit after all expenses are subtracted?

Problem Set-9 cont.

6. _____ A vet assistant orders supplies for the office. What is the total cost?

QUANTITY	UNITS	ITEM	COST PER ITEM
3	cases	latex gloves	\$27.65 per case
2	boxes	syringes	\$5.68 per box
18	each	vet wrap	\$12.60 per dozen
24	pints	alcohol	\$7.65 per dozen

7. _____ Emergency vet techs earn \$586.40 for a forty-hour week. A veterinary assistant earns \$394.80 for a forty-hour week. What is the total cost of labor for a 3½-hour surgery if two vet techs and one vet assistant help with the procedure?
8. _____ A zookeeper earns \$8.55 an hour. He works 40 hours plus 2.5 hours overtime that is paid double time. Amounts deducted from his pay are: 0.17 of the total pay for federal tax, 0.03 for state tax, 0.015 for city tax, and 0.0765 for FICA. What is his take home pay?
9. _____ A professor orders supplies for a cardiopulmonary resuscitation (CPR) class. A package of five masks cost \$18.75 and a package of 10 airway bags costs \$17.50. He must order full packages. Will the cost per student be higher if 9 students or 14 students are in the class?
10. _____ An accountant is calculating the pay roll. Six receptionists earn \$7.25 per hour, four vet assistants earn \$ 6.95 per hour, eight vet techs earn \$11.46 per hour, a senior tech earns \$14.94 per hour, and four vets earn \$25.50, \$28.75, \$34.95 and \$42.10 per hour respectively. If they each work 40-hour weeks, what is the total payroll for one week?

Name _____

Percent & Averages – LABEL ALL ANSWERS!

1. _____ A dog's body contains 208 bones. If the phalanges represent 56 of these bones, what percentage of all the bones are phalanges?

2. _____ A zoo is building a new educational complex for a cost of \$1,238,547.00. Building guidelines state that landscaping expenses should be about 14% of the amount spent for the building. What is the cost of the landscaping if the director spends the suggested amount?

3. _____ The total cost for a heartworm test is \$21. If the laboratory adds 8% for profit to this cost and the veterinarian adds another 10% for his profit, what does the client pay for the blood test? (round to the nearest dollar)

4. _____ The FICA deduction on gross pay includes payment for Social Security and Medicare. The deduction for Social Security is 6.2% of earnings up to a maximum of \$60,600.00. The deduction for Medicare is 1.45% of all earnings. If the gross wages for a year are \$88,946.56, what is the total amount deducted for FICA?

5. _____ A bank loans a veterinarian \$37,500 to buy an X-ray machine. The interest rate is 8%. What is the yearly interest payment?

Problem Set-10 cont.

6. _____ A dairy farmer orders supplies totaling \$1,234.56. If he receives a 12% discount for payment within thirty days, how much would he pay if he pays on delivery?

7. _____ A veterinary clinic buys a computerized blood cell counter for \$12,659. They receive a 12% discount for trading in an old model, and an 8.5% discount for payment within thirty days. What is the final cost if they pay on day 15?

8. _____ A secretary checks the electric bills for the clinic for a 6-month period. The bills are \$178.34, \$165.97, \$192.91, \$183.26, \$175.44, and \$168.75. To prepare an annual budget for the clinic, what amount should she use for an average yearly electricity cost?

9. _____ A veterinary student in a parasitology course has taken two tests with grades of 87% and 92%, each worth 25% of his final grade. He still has to take the final exam, which is 50% of his grade. What grade must he get on the final to receive a 93% final grade?

10. _____ A dairy science student is budgeting for college. He bought books the first semester cost \$432.56, \$296.32 the second semester, \$337.79 the third semester, and \$355.21 the fourth semester. How much should he budget for books for the fifth semester?

Name _____

Linear Measurement– LABEL ALL ANSWERS!

1 ft = 12 in, 1 km = 1000 m = 0.621 miles, 1 in = 0.0254 m, 1 m = 1.094 yards.

1. _____ A 4-H leader is purchasing rope to make rope halters with her 4-H dairy club. If a halter requires 5 feet of rope and there are 23 4-H kids, how many yards of rope should she buy?

2. _____ A racehorse in training gallops 3.65 kilometers. How far did he gallop in miles?

3. _____ A builder is finishing a new vet clinic and wants to install a drip edge along the roof. If the edging comes in six yard rolls and he needs 100 feet of edging, how many rolls should he buy?

4. _____ A dog groomer is trying to calculate part of her costs for the day. She knows that 5 feet of ribbon cost her \$2.25. She used $6\frac{1}{2}$ yards of ribbon for bows. How many feet did she use?

5. _____ A newborn puppy measures 8.75 inches from nose to tail. What is its length in meters?

Problem Set-11 cont.

6. _____ A large roll of adhesive tape is 18 m, and a small roll is 150 cm. How many small rolls would he need to buy to equal 3 of the large rolls?

7. _____ A large animal vet travels 165,345 meters in a day. How many miles does he drive?

8. _____ A microbiologist measures the length of a bacterium as 0.000163 m and the length of a yeast spore as 0.0087 mm. Which is longer?

9. _____ A veterinary office is wallpapering a border around the edge of all the exam rooms. Two rooms measure 10 ft 2 in by 8 ft 3 in, and the other two rooms measure 11 ft 5 in by 9 ft 4 in. The border comes in 6 ft rolls. How many rolls of paper will be needed for the four rooms? (Each room has four walls)

10. _____ A veterinary technician is transferring blood into a tube that is 4 inches long. To reach the bottom of the tube, should she use an 8 cm or 12 cm pipette?

Name _____

Liquid Measurement #1 – LABEL ALL ANSWERS!

8 oz = 1 cup, 2 c = 1 pint, 2 pt = 1 quart, 4 qt = 1 gallon

1. _____ Quatricide is prepared by adding 2 oz to one gallon of water. How much Quatricide would be used to prepare 1 qt of solution?
2. _____ If nine gallons of film developer cost \$567.00, how much will two quarts cost?
3. _____ A tech determines that she has 1 gallon of Oatmeal shampoo, 2 quarts of flea shampoo, and 12 cups of Green Apple conditioner? What is the total amount of shampoo and conditioner in pints?
4. _____ A sick lion at the zoo drinks 4 quarts of water, 3 cups of broth, 16 tablespoons of honey, 1 pint of milk and 6 ounces of antibiotic. What was his total fluid intake for the day in ounces?
5. _____ Nolvasan solution is prepared by mixing 1 oz per gallon of water. If a mop pail holds 40 quarts of water and you want to fill it, how much Nolvasan should be used to get the proper dilution?

Problem Set-12 cont.

6. _____ Green Apple shampoo can be bought in 5 gallon pails. If a groomer uses a 16 oz bottle of shampoo, how many bottles can he get out of the 5 gallon pail?

7. _____ Milk replacer is mixed 8 oz to 2 qt of water for each calf. If you want to bottle feed 35 calves, how many quarts of dry milk replacer powder do you need?

8. _____ A calf with scours needs to have electrolytes for five feedings. If the calf drinks two quarts at each feeding and the electrolytes are mixed at a rate of 1 oz per pint, how many ounces of electrolyte powder need to be purchased?

9. _____ A gallon of Lemon Yellow Disinfectant is used at a rate of 2 oz per gallon. How many gallons of cleaning solution will one gallon of Lemon Yellow make?

10. _____ A solution to kill parvovirus germs is mixed 1 cup Clorox to 1 qt water. If 2.5 gallons of water is used, how much Clorox needs to be added?

Name _____

Liquid Measurement #2 – LABEL ALL ANSWERS!

Conversions

$1000 \text{ mL} = 100 \text{ cl} = 10 \text{ dl} = 1 \text{ L} = .01 \text{ dal} = .001 \text{ hl} = .0001 \text{ kl}$

$100 \text{ mL} = 1 \text{ qt} \quad 5 \text{ mL} = 1 \text{ tsp}$

1. _____ If a dog is given 3 L of IV fluid, how many mLs is it given?

2. _____ Prepared puppy formula comes in 1 L cans. If a puppy drinks 50 mL per feeding how many feedings are in one can?

3. _____ During a 24-hour period a dog receives 2.5 L of IV solution and drinks 2,440 cc of fluids. In the same period he urinates 3,100 cc of urine. How much more total intake did he have in cc's than his total urine output?

4. _____ To perform a Gram's stain a technician uses 5 mL of gentian violet, 8 mL of Gram's iodine, 1.4 cl of acetone-alcohol, 1 cl of safrinin and 0.05 L of distilled water. How many liters total does she need to perform 150 slides?

5. _____ A beaker of diluting solution holds 1.5 L. If a blood test uses 3 mL of diluting solution, how many tests can be performed with one beaker?

Problem Set-13 cont.

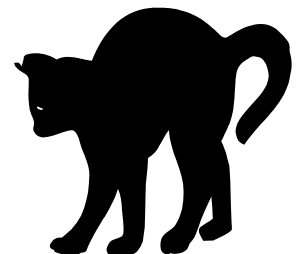
6. _____ A water bottle for guinea pigs holds 6 oz of water. How many mL are in the water bottle?

7. _____ An adult Bernese mountain dog has between 5000 and 6000 mL of blood. How many quarts of blood is this?

8. _____ A lamb receives 2 tsp of penicillin orally every six hours. How many mL of penicillin will the lamb receive in a 24-hour period?

9. _____ A calf raiser is feeding 10 calves 2 quarts of fresh milk each. How many liters of milk do the ten calves drink in four days if they are fed two times a day?

10. _____ One rabbit has a 1-quart water bottle. If it gets $\frac{1}{2}$ teaspoon of vita-sol per 4 oz of water and the water bottle is changed daily, how long will a 120 mL bottle of vita-sol last?



Name _____

Weight – LABEL ALL ANSWERS! $2.2 \text{ lb} = 1 \text{ kg}$

1. _____ A German shepherd weighs 56.8 lb. How much does it weigh in kg?

2. _____ Trudy the cat weighs 6 lb. What is her weight in kg?

3. _____ Jack weighs 42.5 lb and Mocha weighs 9.6 kg. What is the difference in their weights in kg?

4. _____ Lisa's Morgan horse weighs 700 lb and needs to get a medication that is 10 mg per 100 kg. What is the horse's weight in kg?

5. _____ A snake at the Dallas zoo weighs 14.6 kg. How much does it weigh in lb?

Problem Set-14 cont.

6. _____ A Yorkshire terrier weighs 1.4 kg. How much does it weigh in lb?

7. _____ Ruby weighs 14.6 lb and Rocky weighs 26 kg. What is the difference in their weights in lb?

8. _____ Three kittens weigh 0.5 lb, 1.1 lb, and 0.8 lb. What is their total weight in kg?

9. _____ An 18 kg dog had a 1.2 lb tumor removed. How many kg does the dog weigh without the tumor?

10. _____ A duck weighing 12 kg lays 5 eggs each weighing 0.1 kg. What is the total weight of the duck and all her eggs?

Name _____

Temperature – LABEL ALL ANSWERS!

$$C = (F - 32) \times 0.5556 \qquad F = (C \times 1.8) + 32$$

1. _____ A calf's body temperature is 101.5 °F. What is body temperature in Celsius?
2. _____ A cow has a fever of 105 °F. What is her temperature in Celsius?
3. _____ A certain bacteria like to grow at 37 °C. What °F do these bacteria like?
4. _____ If a horse has a body temp of 18 °C what would be your observation?
5. _____ If you were told to add water that was 48 °C to milk replacer and you only had a Fahrenheit thermometer, what temperature water would you add?

Problem Set-15 cont.

6. _____ A dog is constipated due to eating too much bone marrow. A veterinarian has to administer an enema. The enema solution is 108 °F. What is the temperature in °C?

7. _____ A calf is found in a pasture, wet and cold. A temperature reading indicates his internal temperature is 37 °C. What is it in °F?

8. _____ A bottle of penicillin states to store the medicine between 36 and 82 °F. What is this temperature range in °C?

9. _____ Rabies vaccine must be stored between 2 and 7 °C. What is this in °F?

10. _____ Bil-jac, a frozen dog food will last for six months at 37 °F. What is this in °C?

Name _____

Simple Ratios – LABEL ALL ANSWERS!

1. _____ If seven quarts of quantricide are used in 5 weeks, how many quarts are used in 16 weeks?

2. _____ If a 0.5 liter solution of bichloride contains 1 gram of bichloride, then 250 mL will contain how many grams of bichloride?

3. _____ If one dose of elixir is 6 mL, how many doses are there in 500 mL?

4. _____ In order for Clorox to act as a disinfectant for teat dipping the solution must be a 2:5 ratio. If the solution has 0.5 liters of distilled water, how many mL of bleach does it contain?

5. _____ Quantricide is mixed 2 fl oz to one gallon of water to give the proper dilution for disinfecting. What is the ratio of Quantricide to water?

Problem Set-16 cont.

6. _____ Lemon disinfectant is mixed 4 oz to one gallon. How much Lemon disinfectant needs to be added to 6 gallons of water?
7. _____ The ratio of Green Apple shampoo is 1 fl oz shampoo to 18 fl oz water. How much shampoo is needed to fill a one-gallon container?
8. _____ The ratio of Brilliant Blue shampoo is 1 part shampoo to 4 parts water. How much shampoo will be needed if we use 28 cups of water?
9. _____ To do a load of laundry in the grooming room, we add 1 cup of bleach per load of laundry. If the machine holds 5 gallons of water what is the ratio of bleach to water in the wash?
10. _____ When a bottle of milk replacer is made we add 1 cup of powdered milk to a 12 qt bottle. What is the ratio of powder to water?

Name _____

Dilution Using Ratios – LABEL ALL ANSWERS!

1. _____ How many mL of water are needed to prepare a 3:200 footbath solution if you use 0.4 g of copper sulfate?

2. _____ In making 1200 mL of a 3% Lysol solution, how many grams of Lysol are used?

3. _____ Quanticide is made up at 2 oz per gallon of water. If you make 1 qt of solution, how much Quanticide will you use?

4. _____ A salt solution is made by dissolving 9 g of salt in 1 L of water. How much salt should be added to 350 mL of water?

5. _____ How many mg of pentobarbital are required to make 23 mL of a 30 mg/100 mL solution?

Problem Set-17 cont.

6. _____ How many grams of solute will be needed to make 30 mL of a 40 mg/10 mL solution?

7. _____ How many grams of stock solution are needed to prepare 10 mL of a 4 g/mL solution?

8. _____ If 22 mL of glucose solution contains 4 g dextrose, then 1 liter of a similar solution will contain how many grams of dextrose?

9. _____ Roccal-D is mixed at a rate of 6 oz per 2 gallons of water. If you need to make 15 gallons of solution, how much Roccal-D will you use?

10. _____ How many mL of Formalin are needed to make 200 mL of solution if it is mixed 2:4?

Name _____

Simple Dose in Tablet Form – LABEL ALL ANSWERS!

Use formula: what you want to give goes on top, convert to same units, then divide by what you have in stock.

1. _____ The vet ordered 0.75 g of Novobiocin and in stock there are 250 mg capsules. How many capsules should be dispensed?

2. _____ Tablets come in 0.25 g and you must administer 1000 mg. How many tablets do you give?

3. _____ You must give 250 mg of Droncit and the tablets are 0.5 g. How many tablets do you give?

4. _____ You administer 750 mg of medicine that is available as 0.25 g per capsule. How many capsules do you give?

5. _____ Tablets come in 0.5 g and you must administer 1000 mg. How many tablets do you give?

Problem Set-18 cont.

6. _____ Carprofen is available as 0.6 g/tab and you must administer 300 mg. How many tablets do you give?

7. _____ You must administer 0.25 g of a medication that is available as 125 mg/tab. How many tablets do you give?

8. _____ You must give 1.5 g of a drug that is available as 750 mg/capsule. How many capsules do you give?

9. _____ Tablets are available in 400 mg. To give 100 mg, how many tablets do you need?

10. _____ A drug comes in 0.25 mg tablets and you must administer 0.75 mg. How many tablets do you need?

Name _____

Simple Dose in Tablet Form Over Time– LABEL ALL ANSWERS!

Use formula: what you want to give goes on top, convert to same units, then divide by what you have in stock, and then multiply by the amount of time.

1. _____ The vet prescribed 0.5 g of Novobiocin and in stock there are 250 mg capsules. How many capsules should be dispensed if the tablets are given three times a day (TID) for five days?
2. _____ Tablets come in 0.25 g and the dog needs a dose of 1000 mg. How many tablets will you give to the client if they must be administered twice a day (BID) for 10 days?
3. _____ You must give 750 mg of medication and the tablets are 1.0 g. How many tablets will you give to the client so they have enough for one treatment a day (OD) for ten days?
4. _____ You administer 500 mg of medicine which is available as 0.25 g per capsule. How many capsules do you give for eight days if the medication must be given BID?
5. _____ Phenobarbital tablets come in 0.5 g and you must administer 1000mg. How many tablets do you give so there is enough for treatment BID for three days?

Problem Set-19 cont.

6. _____ A drug is available as 0.6 g/tab and the vet prescribes 300mg per treatment. How many tablets should be dispensed to give four treatments per day for three days?

7. _____ You must administer 0.25 g. The medication is available as 125 mg/tab. How many tablets do you need for seven days of treatment TID?

8. _____ You must give 1.5 g of a drug that is available as 750 mg/capsule. How many tablets will be dispensed if treatments are BID for ten days?

9. _____ Tablets are available in 400 mg. To give a 100 mg dose, how many **total** tablets do you need to treat a dog TID for 21 days?

10. _____ A drug comes in 0.25 mg tablets and you must administer 0.75 mg. How much medication is needed if it is given BID for two weeks?

Name _____

Dosages of Injectables – LABEL ALL ANSWERS!

1. _____ A veterinarian orders Streptomycin 500 mg IM. The dosage available for use contains 1 g/ 2 mL. How many mL should be injected?

2. _____ A doctor orders 75 mg of Demerol IM every 4 hours for pain. It is available in 50 mg/ mL. How much should be injected over a 24-hour period?

3. _____ The vet orders Librium 50 mg IM. It is available in a concentration of 100 mg/ mL. How many mL should be injected?

4. _____ The vet orders 250 mg of Penicillin G IM. It is available in a concentration of 1000 mg /5 mL. How many cc should be injected?

5. _____ The vet orders 60 mg of Gentamicin Sulfate to be given for three days. It is available in a concentration of 80 mg / 2 mL. How many cc **total** will be injected?

Problem Set-20 cont.

6. _____ A fecal exam reveals a Giardia infection in a 500 g African Grey parrot. The treatment of choice is Metranidazole injectable at the dosage of 30 mg/kg for three days. How many mg will be given for **one** treatment?

7. _____ The vet orders Phenylbutazone to be given to an 800 lb horse at a dosage of 5 mg/kg. The drug concentration is 200 mg/mL. How many mL should be given?

8. _____ The veterinarian prescribes penicillin G procaine for a 25 lb dog to be given at a dosage of 40,000 units (U)/kg. The drug concentration is 300,000 U/mL. How many mL will be administered?

9. _____ An 8 lb cat with a laceration on its hip is to be given ketamine HCl for anesthesia. If the dosage 15 mg/kg and the concentration is 25 mg/mL, what is the dose?

10. _____ The vet orders 4 U (units) of regular insulin to be given to a diabetic cat. The regular insulin is labeled as 40 U/mL. How many cc will be administered?

Name _____

More Dosages – LABEL ALL ANSWERS!

1. _____ The veterinarian orders 15 mg of Vitamin K. The vial is labeled 10 mg/mL. How many mL will be administered?

2. _____ A dog gets cut on the leg from barbed wire and develops an infection. The veterinarian orders 500 mg of amoxicillin BID for 10 days. Capsules are available in 250 mg. As a vet tech, how many capsules should you dispense?

3. _____ A dog develops a hot spot and the veterinarian feels the best way to treat it is to use Prednisone (a steroid). Tablets contain 5 mg/tablet. The dog weighs 75 lbs and the recommended dosage is 5 mg /25 lbs. How many tablets will be given over five days if the medication is to be given OD?

4. _____ A horse weighs 1200 lbs. Through a fecal exam, he has been diagnosed with strongyles and pinworms. The treatment is Strongid paste. The normal dosage is 3 mg/lb of body weight. How many grams should be administered?

5. _____ A dog weighs 88 lbs and is found to have roundworms. The veterinarian recommends liquid Strongid to be given orally. As a vet tech, how much should you dispense if the dosage is 2 mL/10 kg?

Problem Set-21 cont.

6. _____ A dog weighing 22 lbs is to be spayed. The anesthesia to be used is ketamine HCl. The vet asks you to administer 15 mg/kg IM. The concentration is 100 mg/mL. How many cc will you give to the dog?

7. _____ You purchased 4 calves from an auction and need to treat them for scours due to the potential stress of moving. You have had good luck with SMZ-TMP in the past and choose this drug. The normal dosage is 1 tablet for every 50 lb. for five days. How many tablets will you need to treat all the calves if each calf weighs 150 lb?

8. _____ A cat has developed a severe abscess on its jaw and the veterinarian prescribes Antirobe Aquadrops to be given orally as treatment. The dosage is 20 mg/ kg/day and the drops you have are equivalent to 25 mg/mL. The cat weighs 8.8 lbs. How many mL should the cat receive each day?

9. _____ A sheep with pneumonia is given Penicillin G, which is known to be effective against pneumonia. The sheep weighs 225 lbs. The bottle contains 300,000 U/mL. It is recommended to give 1 mL/100 lbs body weight /day. How many units of medicine will the sheep get each day?

10. _____ Zeus bit Zack in the foot. After looking at the wound, the veterinarian prescribed amoxicillin BID for 10 days. The dosage is 5 mg /lb twice a day. If Zack weighs 100 lbs, how many 500 mg capsules should be dispensed?

Name _____

Dosages Again! – LABEL ALL ANSWERS!

1. _____ An animal weighs 54 lbs. The desired dosage is 150 g/kg. How many tablets do you give if there are 250 g/tab?
2. _____ A calf weighs 220 kg. The vet orders Penicillin G given twice a day. The recommended dosage is 3 cc/100lbs. How many cc should be given over five days?
3. _____ A pig weighs 230 lbs. It cut its leg and the vet recommends giving it Penicillin G twice a day for three days. If the dosage is 3 cc/100lbs, what is the total amount of Penicillin given?
4. _____ A cat has roundworms. Strongid given orally is the prescribed treatment at the rate of 1 cc/10 lbs. If the cat weighs 7 lbs, how many cc should be given?
5. _____ The recommended dosage for Sulfasalazine is 30 mg/kg. A sheep weighs 110 lbs and is given the medication 3 times a day. How many mg are given in **one** day?

Problem Set-22 cont.

6. _____ A dog weighing 44 lbs is to receive Cefadroxil every twelve hours. The dosage is 30 mg/kg. How many mg will the dog receive in 24 hours?

7. _____ The normal dosage for injectable amoxicillin is 5 mg/kg. A dog weighs 88 lbs. How many mg should be given for one treatment?

8. _____ How many capsules of amoxicillin should be given to a dog weighing 100 lbs if the dosage is 5 mg/lb twice a day for 10 days and the pills come in 500 mg capsules?

9. _____ The veterinarian prescribes aminophylline to be given three times per day for 14 days to a 15 lb dog. If the dosage is 10 mg/kg, how many mg does the dog for one day?

10. _____ Drontal is given for tapeworms. The dosage is 1 tablet per 25 lbs. If a dog weighs 75 lbs, how many tablets should he be given?

Name _____

Mixed Problems! – LABEL ALL ANSWERS!

1. _____ A dog gets one teaspoon of nutritional yeast for every 10 lbs of body weight. If a dog weighs 60 lbs, how many tablespoons of yeast does he get?

2. _____ As a groomer, you want to mix enough shampoo to last for 5 days. If you want to make 10 gallons of Green Apple Shampoo and the dilution rate is 1oz: 9 gallons water, how much concentrated shampoo will you use?

3. _____ A horse with arthritis needs 1 cc of Bute for every 500 lbs. If the horse weighs 1250 lbs, how many mL of Bute need to be given?

4. _____ Two vet techs are going to a professional conference for one day and the rooms cost \$79.95. If there are four people per room, what is the total bill including 8% sales tax for the two vet techs?

5. _____ A dog needs $\frac{1}{2}$ tablet of Rimadal every day for 90 days. What will be the cost if each pill is \$2.50?

Problem Set-23 cont.

6. _____ How much water will be required to prepare a 3 g: 200 mL solution from 0.4 g of a solid substance?

7. _____ How much salt is needed to prepare 1.5 liters of a 1.2 mg/mL salt solution?

8. _____ A prescription calls for 960 mg of SMZ-TMP. The tablets available are 240 mg. How many tablets should be dispensed?

9. _____ If you need to give 500 mg of Amoxicillin and tablets are 250 mg, how many should be given?

10. _____ A vet orders 500 mg Amoxicillin BID for 15 days. There are 250 mg capsules that cost \$0.55 each, and 750 mg capsules that cost \$0.70 each. Which will be cheaper?

Name _____

More Mixed Problems! – LABEL ALL ANSWERS!

1. _____ Lollipop Farm has 102 puppies to vaccinate for parvovirus. 82 are under 10 weeks old, and 20 are over 16 weeks old. If the dosage is 1 cc up to 10 weeks of age, 1.5 cc for puppies 10-16 weeks, and 2 cc for puppies over 16 weeks of age, how many vaccine vials are needed if each vial contains 30 mL?

2. _____ A 19 lb monkey is prescribed a drug to be given for 5 days. The dosage is 28 mg/lb body weight. The drug is supplied as an 85 mg/mL solution. What is the total number of mL given over five days?

3. _____ If Nembutal is used to anesthetize rabbits at a dosage of .09 mg/g of body weight, and the concentration of the solution is 60 mg/mL, how many mL are needed to anesthetize a 4 lb rabbit?

4. _____ A sick cat weighs 3.5 kg. You must give it 20 mg/lb of a drug QID. What is the total dose?

5. _____ Given a stock solution of 60mg/mL of Nembutal, how many mL are needed to prepare 300 mL of a 3 mg/mL solution?

Problem Set-24 cont.

6. _____ How many mg of solute are in 8 mL of a 30 mg/mL solution?

7. _____ Atropine is given at a dosage of 0.01 mg/lb of body weight. If the concentration is 0.5 mg/mL, how many mL should you give a 12 kg beagle?

8. _____ The vet prescribes chloramphenical, 250 mg TID for 7 days. The tablets are 1 g. How many tablets should be dispensed?

9. _____ A farmer wants to vaccinate her lambs for tetanus. If she has 57 lambs, each needing 2.5 cc of vaccine, and the bottle contains 150 mL, will there be enough to vaccinate all the lambs?

10. _____ Clear Brook Animal Hospital declawed 75 cats last year. Each declaw uses $\frac{1}{2}$ roll of gauze, and $\frac{1}{4}$ roll of vetwrap. If the vetwrap costs \$3.78 per roll and gauze is \$1.25 a roll, how much was spent on all 75 cats?

Name _____

Mixed Problems Again! – LABEL ALL ANSWERS!

1. _____ The veterinarian prescribes 15 mg of Prednisone every day for 10 days. If the tablets are 10 mg, how many should be dispensed?

2. _____ A farmer has 10 calves weighing approximately 100 lb each. They are being treated for a coccidia infection with Corid powder for 10 days. To make Corid solution, mix 3 oz in 1 qt of water. The dosage for drenching with Corid is 1 oz/100lbs body weight. How much solution is needed for 10 cows for 10 days?

3. _____ A greyhound weighing 45 kg is being anesthetized with Acepromazine at a dosage of 1mg/kg. If the concentration is 5 mg/mL, how many mL should be given?

4. _____ A 35 lb corgi is given Baytril at a dosage of 25 mg/kg. How many 0.00035 g tablets should you give him?

5. _____ The vet gives SMZ-TMP for an infection in a calf that weighs 200 lbs. If the dosage is 1.5 capsules/100 lb given once a day for 5 days, and each capsule costs \$0.45, what is the total cost of the treatment?

Problem Set-25 cont.

6. _____ A solution is made by dissolving 350 mg of a drug in 1 mL of solution. Calculate how many g/mL are in the solution.

7. _____ If you had a 500 mg drug and wanted to make a 5% solution, how many mL could you make?

8. _____ If you needed to give 23 mg of valium, how many mL would you give using 10 mL bottle of solution containing 100 mg?

9. _____ A lab weighs 46.7 kg. What is his weight in pounds?

10. _____ Atropine is given at a dosage of .5 mg/kg. How much would a 3.5 lb terrier receive?

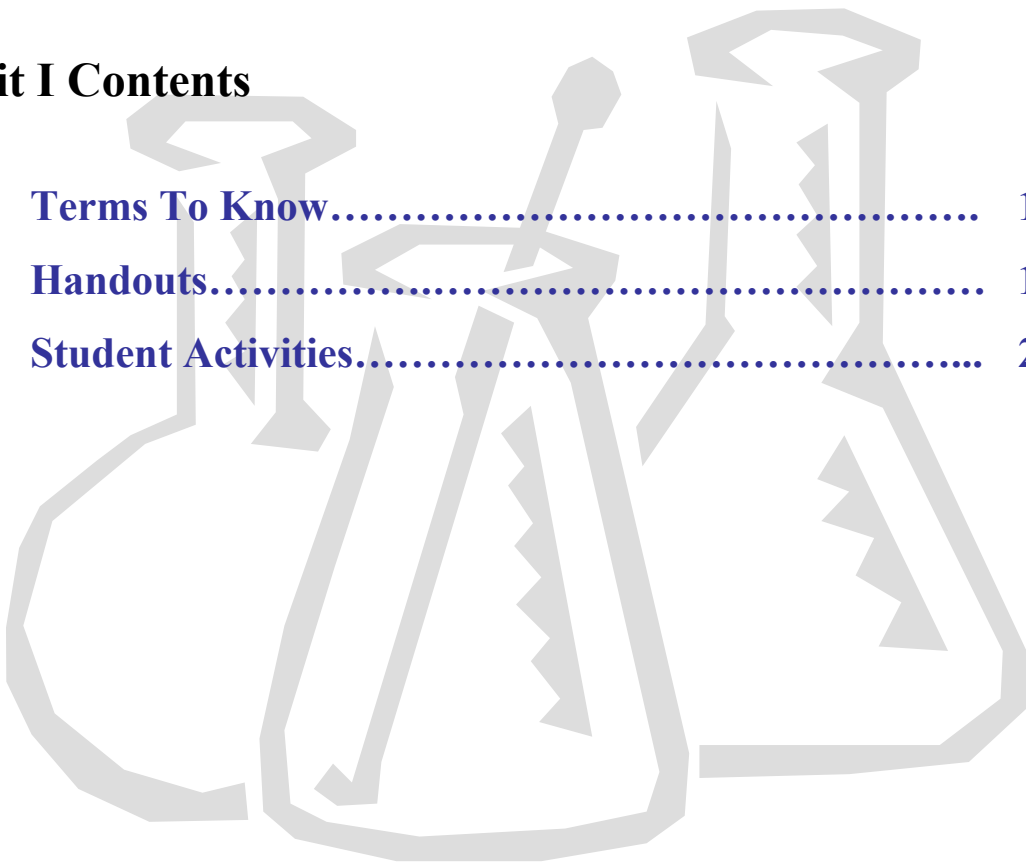
Laboratory Techniques

By Elisabeth A. Martinec

The purpose of this unit is to introduce some of the common laboratory procedures and provide background information to go with those procedures. Topics covered include: the circulatory system, hematology, the urinary system, urinalysis and susceptibility testing.

Unit I Contents

Terms To Know.....	196
Handouts.....	197
Student Activities.....	210



Terms To Know

Anemia – lack of blood

Artery – a thick-walled vessel that carries oxygenated blood throughout the body

Capillary – a microscopic vessel that creates a network between arteries and veins

Endocardium – a thin layer that lines the interior of the heart

Epicardium – a thin layer that lines the surface of the heart

Erythrocyte – red blood cell

Hematology – the study of the structure of blood and the tissues that form blood

Hematopoiesis – the production and formation of blood cells

Hemoglobin – the iron containing pigment in red blood cells that carries oxygen

Leukocyte – white blood cell

Lymph – transparent, whitish-yellow liquid that contains white blood cells

Myocardium – the muscular layer of the heart wall

Nephron – functioning unit of the kidney that filters and extracts waste from the blood

Pericardium – the fibrous sac that encloses the heart

Phagocytosis – to ingest foreign bodies, microorganisms, and other cells

PCV – packed cell volume

Plasma – the clear, straw colored, liquid portion of blood

Thrombocyte – platelet

Urinalysis – a series of laboratory tests used to evaluate urine

Vein – a thin-walled vessel that returns deoxygenated blood to the heart

Zone of Inhibition – area where the growth of bacteria is lessened or stopped

Name: _____

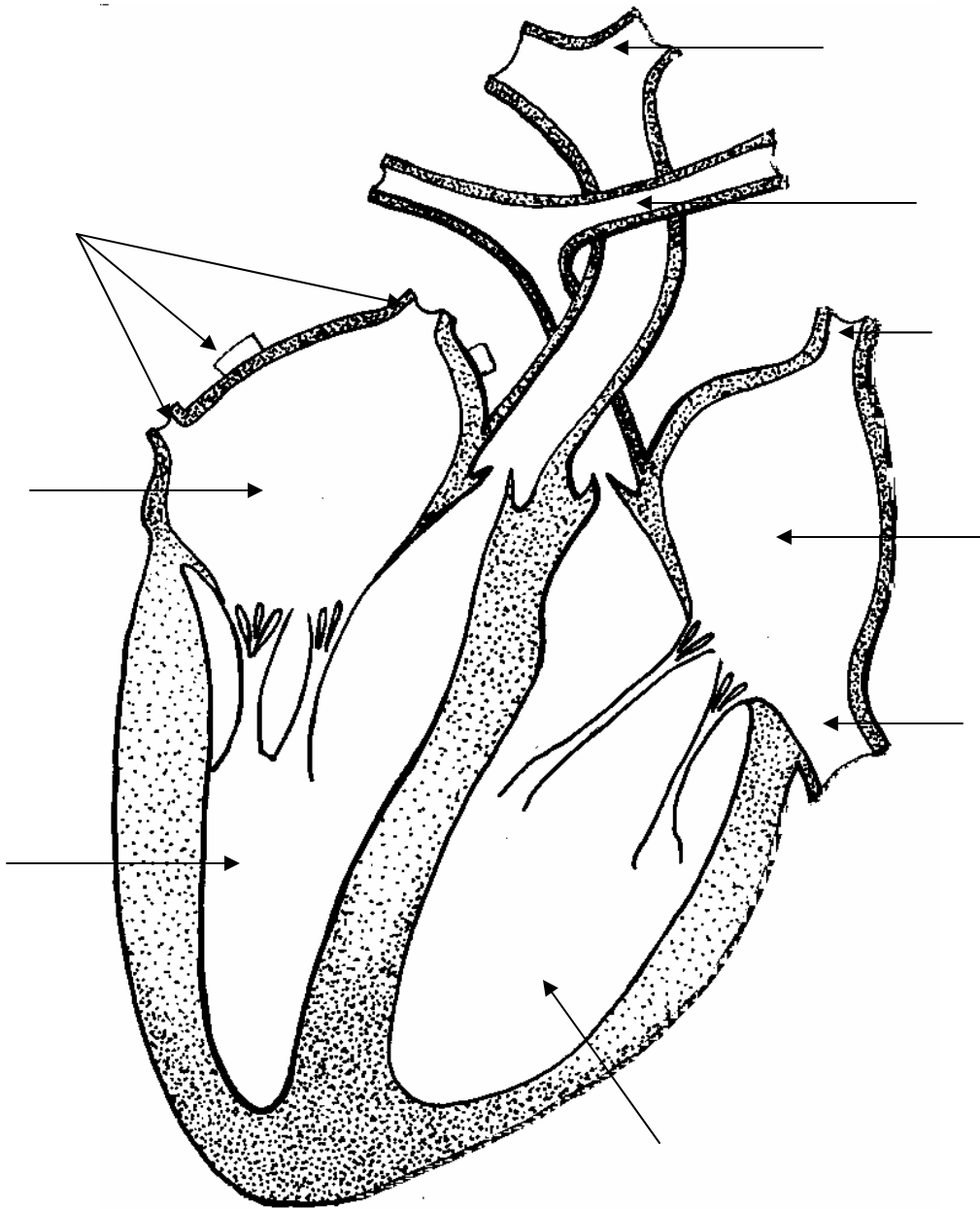
Heart Circulation

Directions: Label the parts of the heart and draw arrows to show the path of blood traveling through it.

Cranial vena cava
Caudal vena cava
Right atrium

Pulmonary artery
Pulmonary veins
Left atrium

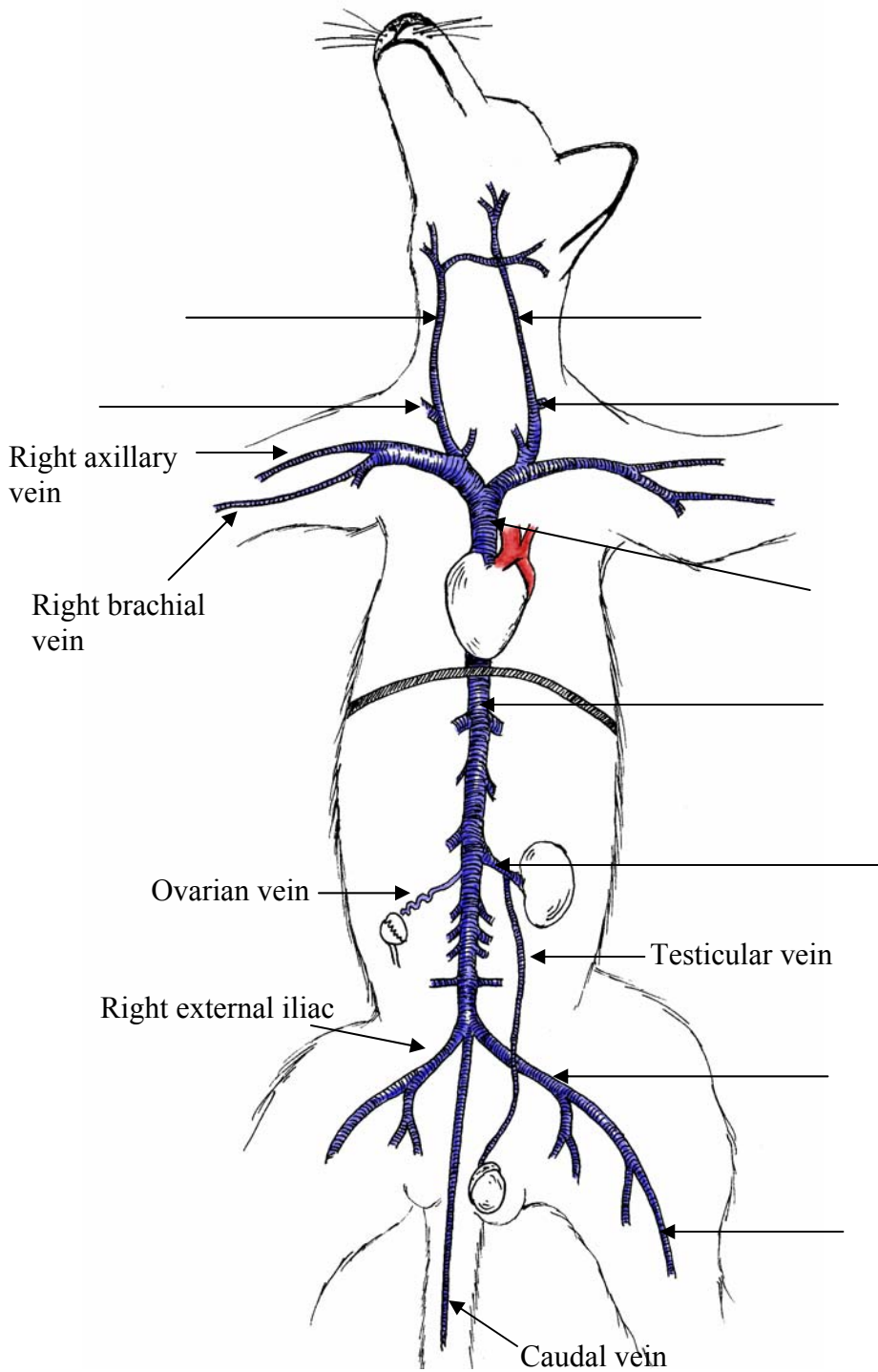
Right ventricle
Left ventricle
Aorta



Name: _____

Major Veins & Arteries

Directions: Label the major veins on this page and arteries on the next page.



Veins

- Cranial vena cava
- Caudal vena cava
- Cephalic vein
- Jugular vein
- Renal vein
- Femoral vein
- Saphenous vein

Arteries

Aorta

Common carotid arteries

Femoral artery

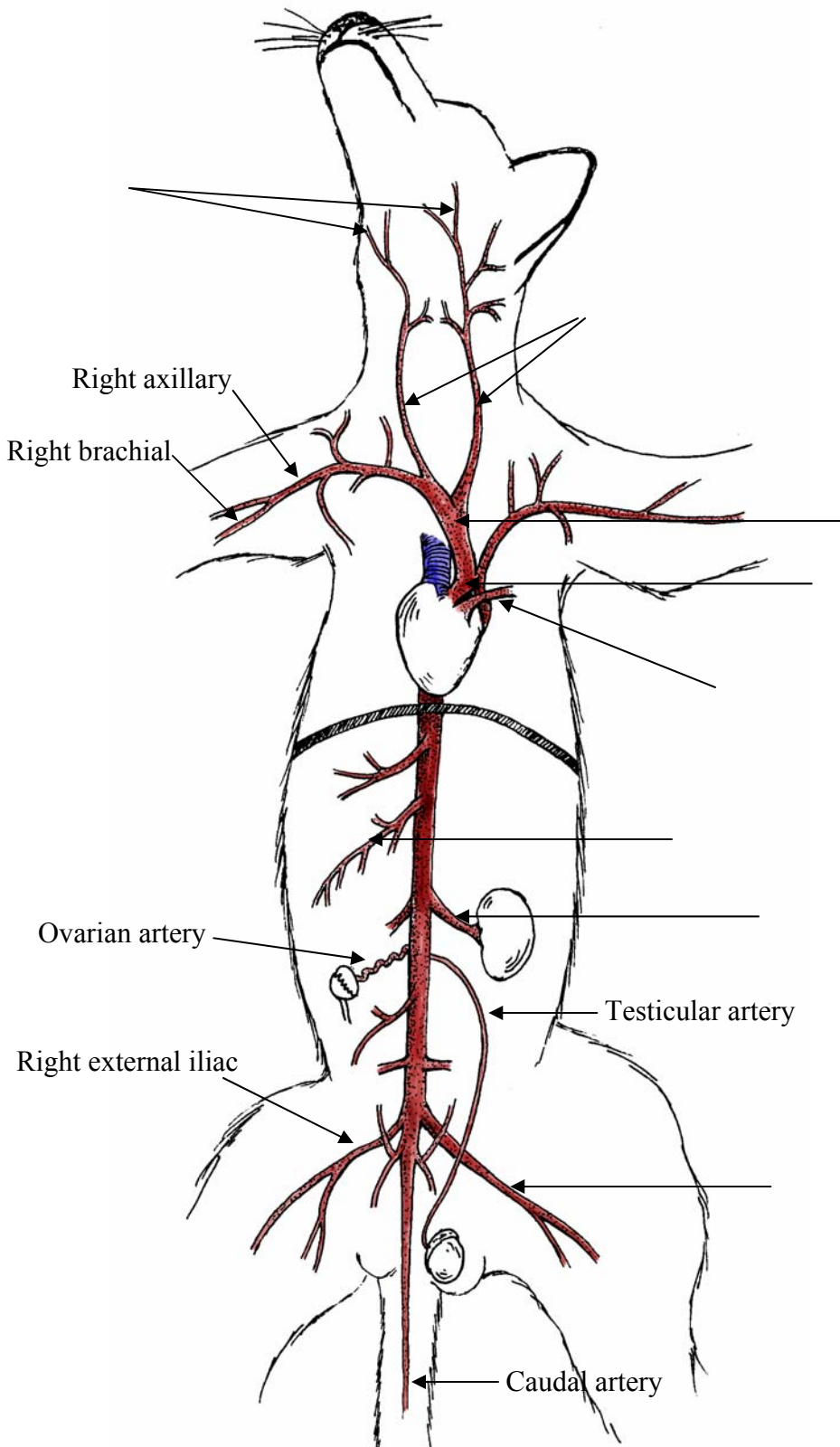
Facial arteries

Pulmonary artery

Brachiocephalic

Renal artery

Mesenteric arteries



Name: _____

Blood Cells

Definitions:

Hematology –

Hematopoiesis –

Hemoglobin –

Erythrocyte:

Function –

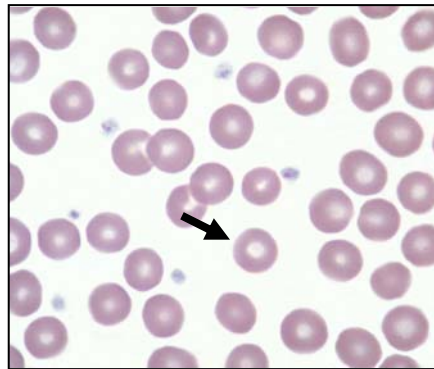
Life Span –

120 days – dog and human

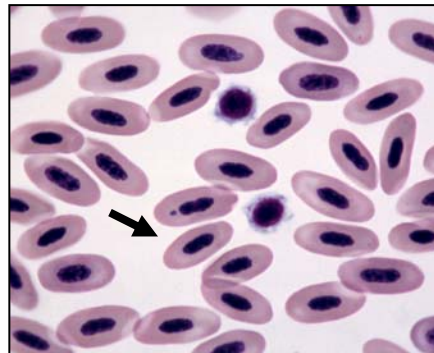
70 days – cats

145 days – horse

Mammal



Avian & Reptile



Leukocytes:

Leukocytes are colorless (leuk = white) cells capable of movement that provide body defense

Five Types:

Granulocytes – have granules in the cytoplasm

1. Neutrophil
2. Basophil
3. Eosinophil

Agranulocytes – have no granules in the cytoplasm

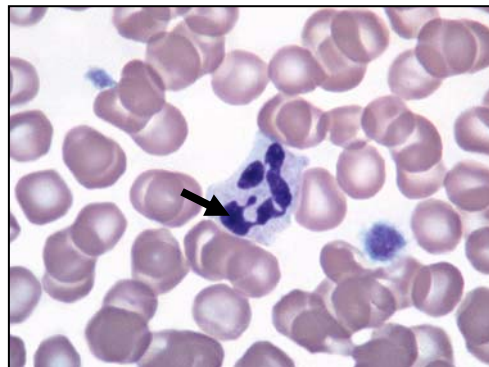
4. Lymphocyte
5. Monocyte

Neutrophil

Function –

Phagocytosis –

Bacteriocidal –



Basophil

Functions –

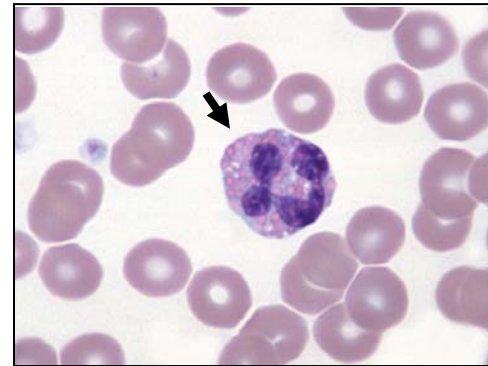
- 1.
- 2.
- 3.



Eosinophil

Functions –

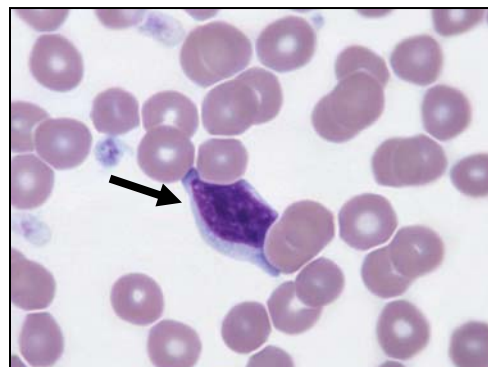
- 1.
- 2.



Lymphocyte

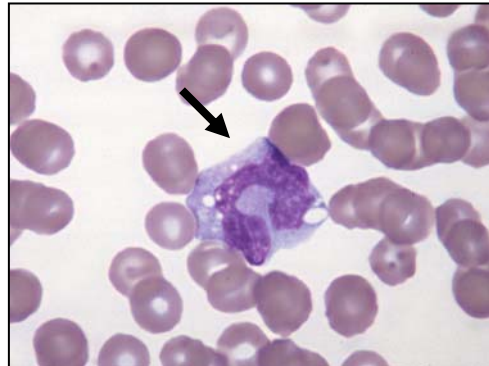
Functions –

- 1.
- 2.



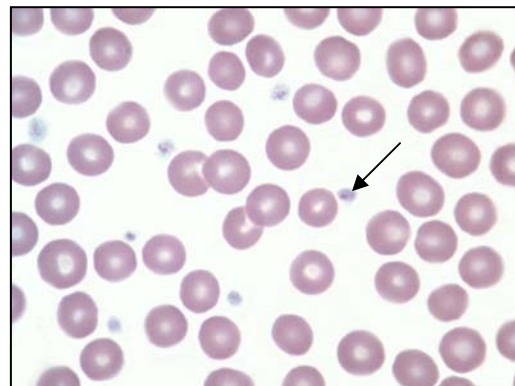
Monocyte

Function –



Thrombocytes:

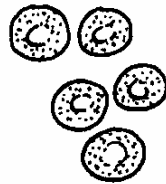
Function –



Name: _____

RBC Abnormalities

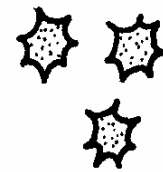
The following drawings represent abnormalities that are commonly seen in red blood cell films. Many of these abnormalities occur with specific diseases or as a result of incorrect film preparation by the technician or veterinarian.



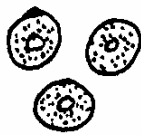
Normal



Ghost cells



Acanthocyte



Spherocyte



Agglutination



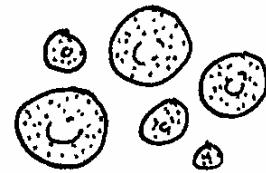
Rouleaux



Schistocyte



Heinz body

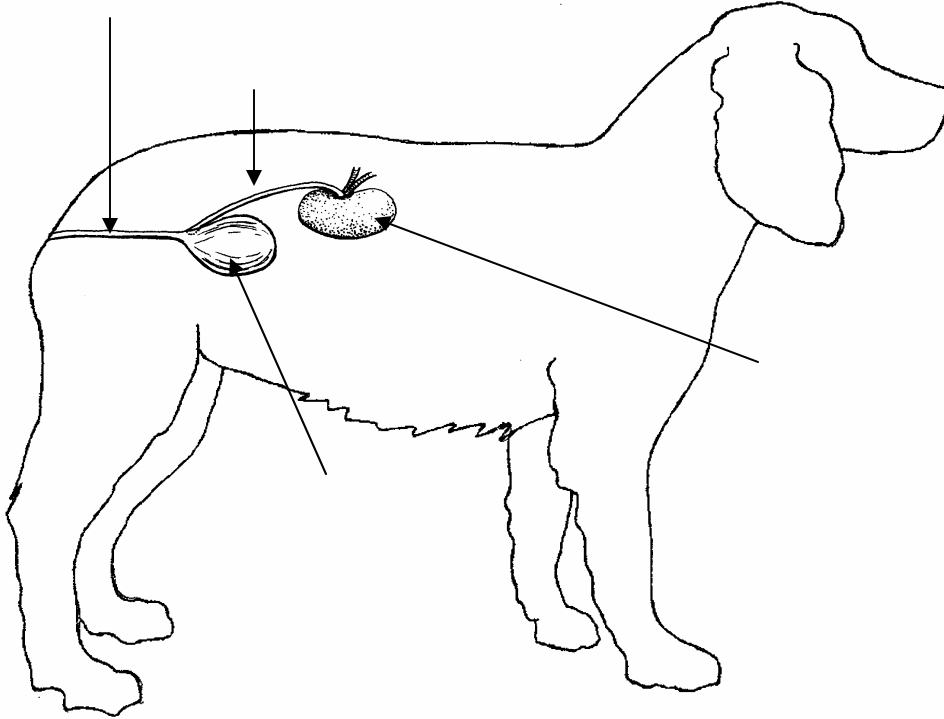


Anisocytosis

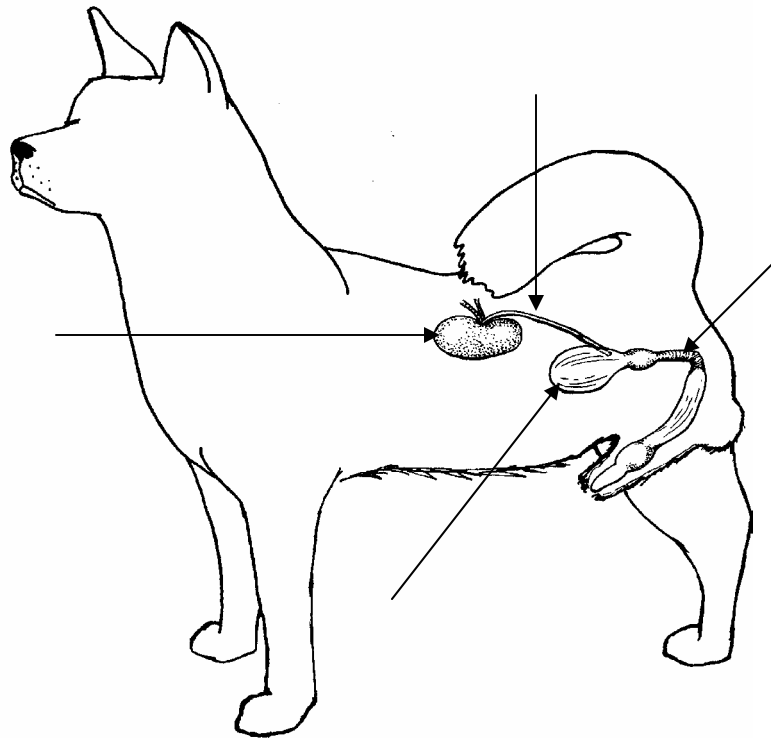
Name: _____

Urinary System

Directions: Label the parts of the urinary system.



Bladder
Ureter
Kidney
Urethra

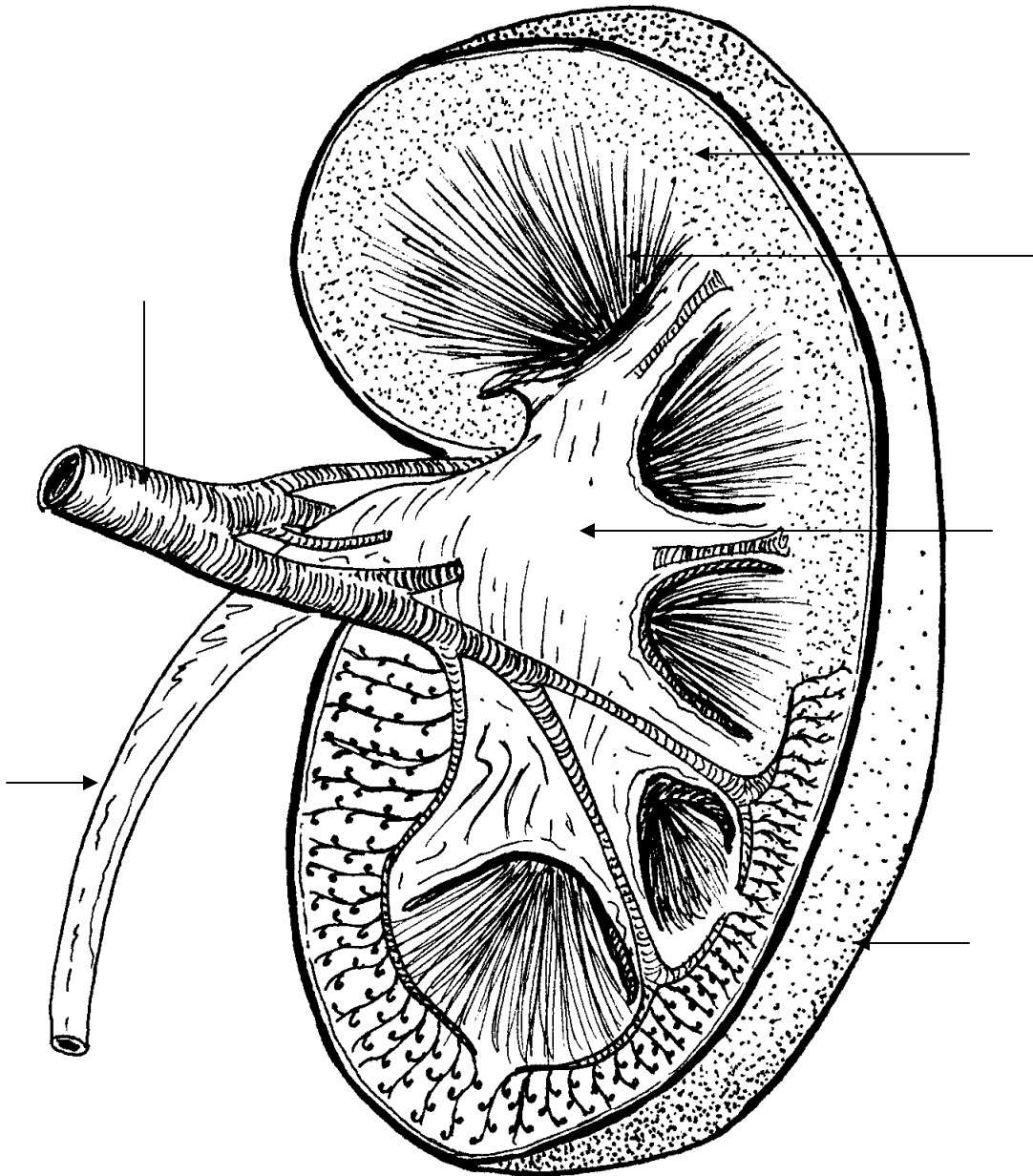


Name: _____

Kidney

Directions: Label the parts of the kidney.

Cortex	Renal artery
Medulla	Renal capsule
Ureter	Renal pelvis



Name: _____

Nephron

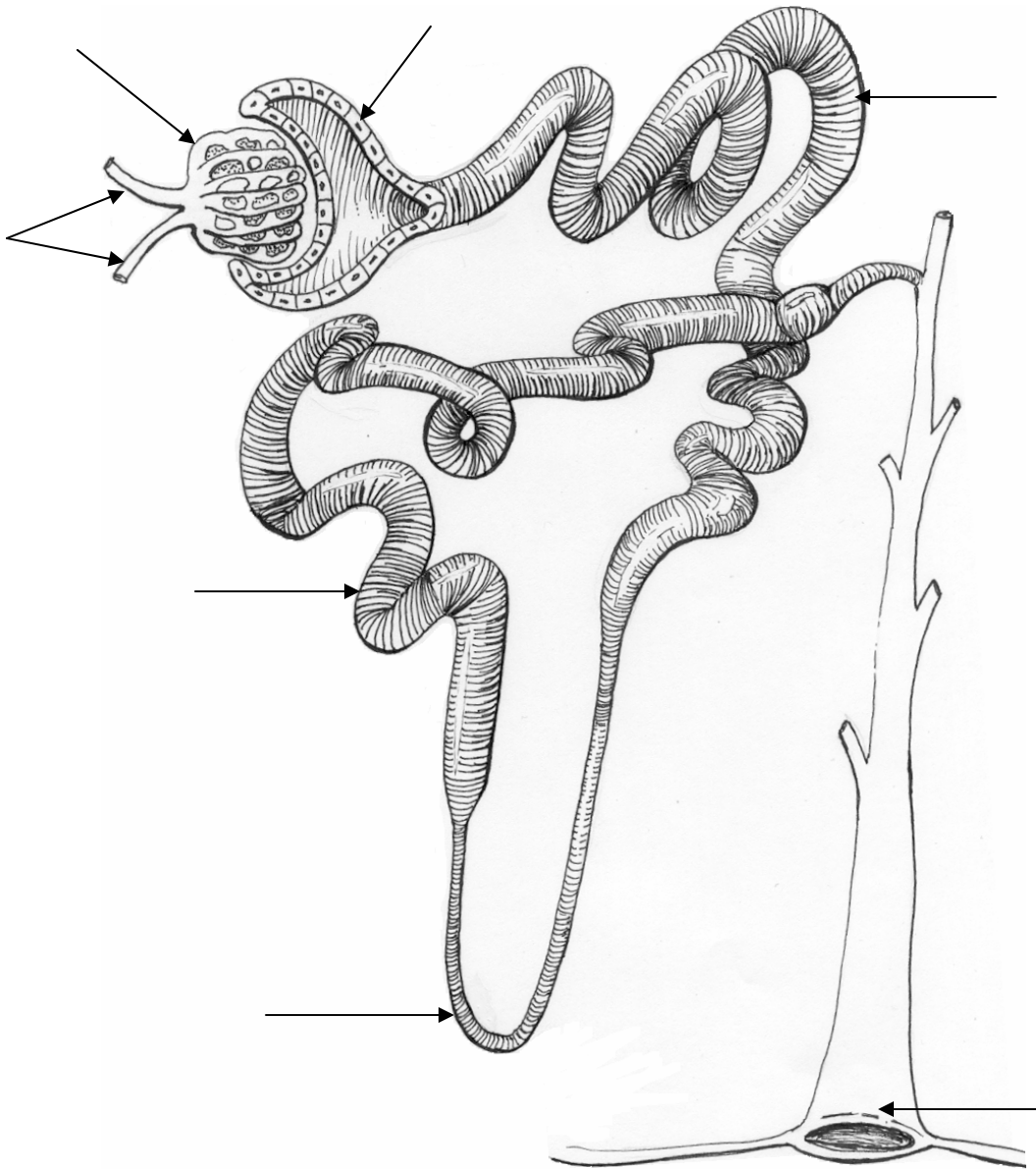
The nephron is the functioning unit of the kidney.

Directions: Label the parts of the nephron.

Arterioles
Glomerulus
Loop of Henle

Bowman's capsule
Collecting duct

Proximal convoluted tubule
Distal convoluted tubule



Name: _____

Urinalysis

Directions: Write a description of each of the following characteristics.

Urine is evaluated on the following characteristics:

Color:

Transparency:

Specific gravity:





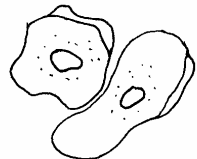
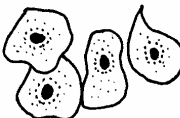





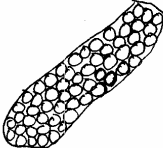

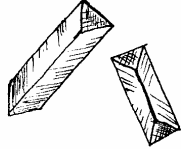


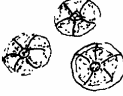

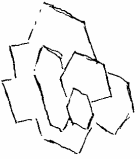
Chemistry:

Sediment:

Name: _____

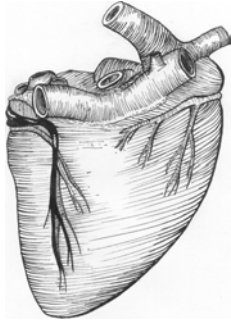
Cells Found in Urine Sediment

The chart represents some of the most common types of urine sediment. Each type of sediment indicates disease or illness.

RBC's	 Red Blood Cells	 Ghost RBC's	 Crenated RBC's			
Epithelial Cells	 Renal	 Squamous	 Transitional	 Caudate		
Other Cells	 White Blood Cells	 Yeast	 Sperm			
Casts	 Fine Granular	 Blood Cells	 Hyaline			
Crystals	 Triple Phosphate	 Calcium Carbonate (normal in the equine)	 Tyrosine	 Leucine	 Calcium Oxalate	 Cystine

Student Activity 1:

Blood Film Evaluation



Name _____

Purpose:

85% of all diseases cause some sort of change in the blood. For this reason blood film evaluation is one of the most important tests performed in the veterinary lab.

Objectives:

The students will be able to prepare, stain, and examine blood films and will be able to identify the seven different blood cells.

Materials:

Blood samples
Gloves
Microscope slides – 2 for each blood sample
Wright's stain & buffer
Pipette
Handouts 3 & 4 – Blood Cells & RBC Abnormalities
Distilled water
Immersion oil

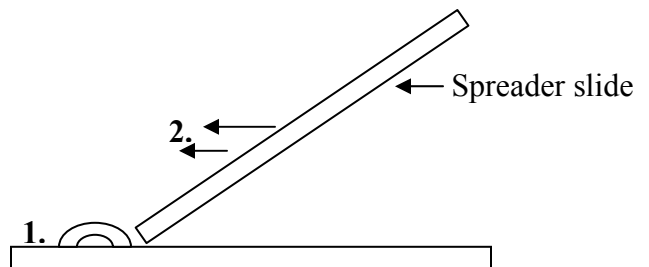
**NOTE: Always wear gloves
when handling blood.**

Procedure:

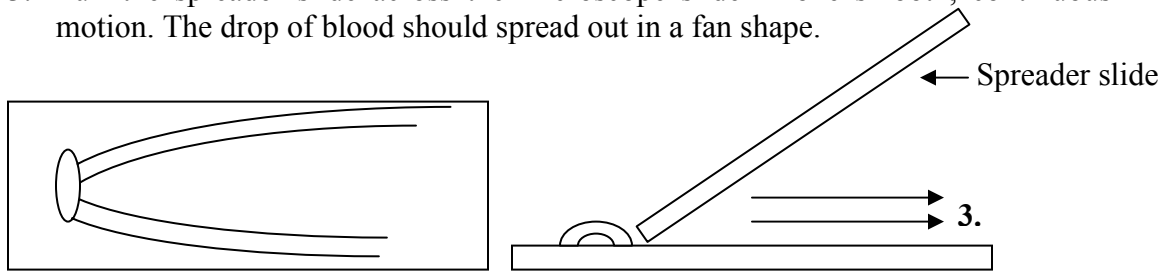
1. Using a pipette or applicator stick, place a drop of blood that is approximately the size of this circle at one end of a microscope slide.





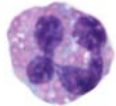


2. Place the spreader slide on the slide containing the drop of blood at a 45° angle. Push the spreader slide into the drop of blood until the blood travels across the edge of the spreader slide.



3. Pull the spreader slide across the microscope slide in one smooth, continuous motion. The drop of blood should spread out in a fan shape.

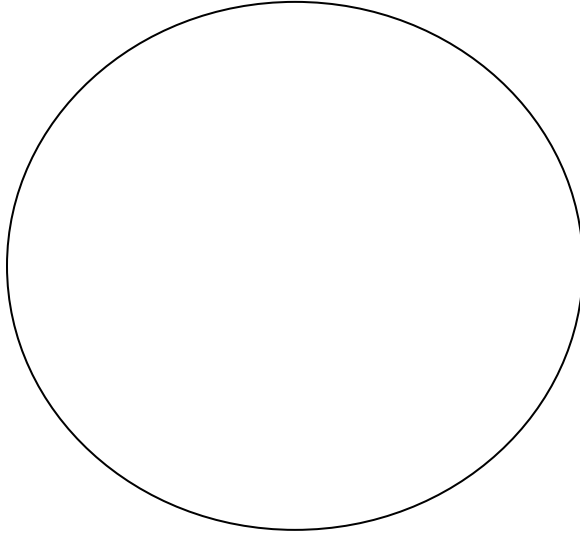


4. Place the slide in a vertical position with the drop end down to dry.
5. After the slide has dried completely stain it using Wright's stain, following these steps:
 - a. Place 9 drops of Wright stain on the smear and let stand for 3 minutes.
 - b. Holding the slide level, add 9 drops of buffer to the stain. Blow gently on the liquid for 2 to 3 seconds to help mix the stain and buffer.
 - c. After 1 ½ minutes, tilt the slide to drain off the buffer. Then add 9 more drops of buffer to the smear.
 - d. After 8 minutes, flush the slide with distilled water.
 - e. Dry the slide completely by waving it in the air. (this will take a while)
6. Once the slide is dry, place it on the microscope, add a drop of immersion oil, and examine with an oil immersion lens. No cover slip is needed.
7. Using your Blood Cells Handout, scan the slide and identify each cell type and abnormal cells.
8. In the chart below, for row 1 count cell types until you reach 100 total cells. Then, in row 2 determine the percentage for each cell type by multiplying row 1 by 100%.

	Neutrophil	Basophil	Eosinophil	Lymphocyte	Monocyte	
						
Row 1						=100 total cells
Row 2						=100%

Analysis/Conclusions:

1. In the circle below, draw and label a pie graph that shows the percentage for each white cell type found on your slide.



2. Why is it important to hold the spreader slide at a 45° and pull it across the microscope slide in one smooth continuous motion?
3. Did you see any abnormal cells? Draw 2 examples of abnormal cells.
4. If you look at the edges of a blood film you will find more white blood cells and cells that are lysed (broken); why?

Student Activity 2: Simulated Urinalysis

WARD'S

Simulating Urinalysis Lab Activity Student Study Guide

Background:

Recognition of the presence of disease is based to some extent on the existence of objective signs or recognizable abnormalities known as symptoms. Groups of signs and symptoms occurring in a characteristic pattern (referred to as syndromes) are of value in diagnosis and in determining the distribution as well as the cause, or etiology, of diseases.

The process of diagnosing a disease involves several steps. First, the patient will consult with the physician and describe any particular symptoms that he or she has previously noticed. The physician will then examine the patient and note any signs that may be further indicative of the problem. Based on this initial assessment and the patient's medical history, the physician may then make a diagnosis of the disorder. However, in some cases it may be necessary to go a step further and order various laboratory tests, possibly including X-ray examinations. This serves not only to arrive at a correct diagnosis, but also to rule out any other disorders which may share the same signs and/ or symptoms.

There are many different types of specimens used in laboratory diagnosis, including blood, feces, sputum, stool, urethral and vaginal secretions, and cerebrospinal fluids. Urine testing is another very important diagnostic tool that involves the physical, chemical, and visual examination of a urine sample. A thorough urinalysis may provide more information about the general condition of the body than any other set of tests. Urinary tract infections, kidney malfunction, diabetes, and liver disease are just some of the medical problems that can be diagnosed through urinalysis.

DID YOU KNOW?

The first pregnancy test was invented in ancient Egypt. Egyptian women moistened a sample of barley and wheat with urine. If the barley grew it meant the woman would have a male child. If the wheat grew it meant that the woman would have a female child. If neither grew it meant the woman was not pregnant.

Urinalysis is often used for the screening of drugs. A urine sample can be tested for drug overdose and toxicity, or for the presence of abused drugs, commonly including amphetamines, barbiturates, cannabinoids, cocaine, methadone, benzodiazepines, methaqualone, and opiates. This test is very useful as a pre-employment drug screen. One limitation, however, is that this test provides only qualitative detection of drugs. Quantitation of drug levels is not recommended because urine levels are time and clearance dependent and are not directly related to toxic symptoms seen clinically.

Another important use of urinalysis is for pregnancy testing. When a woman becomes pregnant, a hormone known as human chorionic gonadotropin begins to be secreted by the embryonic tissues shortly after fertilization. HCG secretion then increases until it reaches a peak in about fifty to sixty days; thereafter, the HCG concentration drops to a much lower level and remains relatively stable throughout the pregnancy. Because HCG is excreted in the urine, urinalysis is used to detect this hormone, thereby indicating the presence of an embryo. Such a pregnancy test may give positive results as early as eight to ten days after fertilization. Several factors are examined when analyzing a urine sample. These include appearance of the urine, odor, pH, specific gravity, and microscopic observations.

Appearance

The color of normal urine can range from pale yellow to amber, depending on the concentration of the pigment urochrome, which is the end product of hemoglobin breakdown. The appearance of the urine may serve as an indication of a pathological condition. For instance, pale yellow urine may indicate diabetes insipidus, granular kidney, or may simply be very dilute due to ingestion of copious amounts of water. A milky color might signify fat globules or pus corpuscles, the latter possibly indicating a urogenital tract infection. Reddish colors may be due to food pigments (such as beets), certain drugs, or blood in the urine. Greenish colors indicate either bile pigment jaundice) or certain bacterial infections, such as those caused by several species of *Pseudomonas*. Lastly, brown-black urine can indicate phenol or metallic poisonings or hemorrhages due to conditions such as renal injury or malaria.

DID YOU KNOW?

Phosphorous was first discovered in urine. German chemist Hennig Brand was examining urine as a substance that might help him turn other metals into gold.

Odor

The odor of urine can vary greatly according to both diet and pathology. An ammonia smell may result from certain foods, while a fishy smell may indicate cystitis. A fecal smell could be due to an intestinal-urinary tract fistula. Other distinctive smells could be indicative of disorders such as acetonuria, which has an overripe apple smell, or diabetes, the urine of which can also be noted to be sweet-smelling.

pH

The pH of normal urine ranges from 4.5 to 8.0, the acidity or alkalinity of which can fluctuate depending on the type of food ingested. Pathological conditions can also affect the pH of urine. Fevers and acidosis lower the pH, whereas anemia, vomiting, and ischuria (urine retention) raise the pH.

Specific gravity

Yet another component of urinalysis is the determination of specific gravity. This is a measure of the density of a substance in g/ mL as compared to the density of water, which has a specific gravity of 1.00 g/ mL. The specific gravity of urine usually ranges between 1.015 and 1.025, although numbers slightly higher or lower may be normal for people with diets either very high or low in fluid content. Specific gravity is generally inversely proportional to urinary volume. A pathological low specific gravity indicates nephritis, whereas a pathological high specific gravity indicates either nephritis or diabetes mellitus.

Microscopic observations

The microscopic examination of urine is a vital aspect of routine urinalysis. Urine is made up primarily of water, with some salts and organic materials dissolved in it. Inorganic substances normally found in the urine include sulfates, chlorides, phosphates, and ammonia. Casts, cells, crystals, and microorganisms are some of the significant elements found in the urine sediment.

DID YOU KNOW?

Human urine contains urea and other toxic chemicals, but contains no bacteria.

Casts

Casts in the urine are particularly significant because they represent cylindrical molds formed in the renal tubular lumina. They are formed by the precipitation of proteins and agglutination of cells within the renal tubules. Casts are classified into several major types: hyaline, epithelial, granular (coarse and fine), fatty, waxy, red-blood cell, and white-blood cell. Because casts originate within the renal parenchyma, their presence in the urinary sediment often provides important diagnostic clues as to the underlying renal pathology. For example, the presence of red blood-cell casts is always indicative of renal parenchymal disease, especially glomerulonephritis. The formation of casts is favored in a number of pathologic conditions in the nephron. These include: (1) the presence of protein constituents in the tubular urine, (2) increased acidification, and (3) increased osmolar concentration. A reasonable conclusion, then, is that casts will be formed principally within the distal convoluted tubules and the collecting ducts because the urine becomes maximally acidified and concentrated in this segment of the nephron.

Cells

Cells are exfoliated from different parts of the genitourinary tract for various reasons, including normal "wear and tear", degenerative and inflammatory processes, or secondary processes due to infarction or tumor formation. The metabolic activity of the cells found in a urine sample has been impaired to varying degrees, resulting in membrane changes in permeability and selectivity, and causing variations of hydration, intracellular osmolality, density, and microscopic characteristics. Swelling, shrinking, or intracellular structural changes may also occur due to exposure for ill-defined periods of time to wide variations in urine osmolality and pH, toxic substances, excreted drugs and metabolites, and bacterial actions. Cell types include urothelial (transitional), columnar epithelial, prostatic, seminal vesical, decoy, multinucleated giant, squamous, tubular epithelial, oval fat, redblood cell, and white-blood cell. Microscopic evaluation of cells in urinary sediment may help in the diagnosis of neoplastic disease (carcinoma) and some non-neoplastic diseases of the urinary tract.

DID YOU KNOW?

First synthesized in 1828, urea is now commercially manufactured by heating carbon dioxide and ammonia under high pressure and used as fertilizer as well as an animal feed additive.

Crystals

The variety of crystals and amorphous compounds found in the normal urinary sediment may represent both the end product of tissue metabolism and the excessive consumption of certain foods or drugs. The type of crystal or amorphous compound depends to some extent on the pH and osmolality of the urine. The presence of some crystals are of little or no significance while others constitute a positive diagnostic test. Common crystals may be present normally in acid, neutral, or alkaline urine. However, abnormal types of crystals are almost always associated only with acid or neutral urine.

DID YOU KNOW?
 Human urine contains a chemical (2-methoxy-3-isobutylpyrazine) that stimulates chickens to lay larger eggs and improve their memory. The same substance is used as a flavor enhancer in some processed foods.

Urine Type	Crystal Type	Possible Indications
Alkaline	Calcium Phosphate	Calculi (stone) formation
Alkaline	Triphosphate	Calculi formation
		Obstructive uropathy
		Urinary tract infection
		<i>Proteus mirabilis</i> infection
Alkaline	Calcium carbonate	Calculi formation
Acid	Calcium oxalate	Excessive intake of oxalate rich food (eg. spinach, garlic, tomatoes, oranges)
		Hyperoxaluria
		Ethylene glycol poisoning
		Diabetes mellitus
Acid	Uric acid	Gout
		Leukemia
		High purine metabolism
		Chronic nephritis
Acid	Hippuric acid	No clinical significance
Abnormal (Acid to Neutral)	Leucine	Severe liver disease (leucine & tyrosine may occur together)
	Tyrosine	
	Cystine	Calculi, congenital cystinosis, congenital cystinurea (cystine present)

DID YOU KNOW?
 For every 4,400 pints of blood that get filtered through the kidneys, only three pints of urine are produced.

Albumin, glucose, and ketones

The presence of various substances in the urine that are not normally there can, in some cases, be an indication of a disorder. For example, the presence of albumin (a plasma protein that helps regulate the osmotic concentration of the blood) in a urine sample may indicate a kidney malfunction since kidneys are supposed to filter albumin and glucose out of the waste material and return them to the body. And as such, the presence of glucose in urine may also be a positive indication of a disorder, namely, diabetes mellitus. The hallmark of diabetes is an increase in the concentration of blood sugar (hyperglycemia). When the blood sugar reaches a certain high concentration, it exceeds the renal threshold and the kidneys begin to excrete the excess. At this point, glucose appears in the urine (glycosuria). Another substance that might be found in the urine to indicate diabetes is ketones. These occur when fats are metabolized at abnormally high rates, thus causing ketone bodies to accumulate faster than they can be oxidized.

Ketones may also appear in the urine when carbohydrate metabolism is inadequate. So a person may also have ketonuria when he or she suddenly begins a very low carbohydrate diet. Other symptoms of diabetes mellitus include the classic triad, that is, excessive urine output (polyuria), dehydration accompanied by great thirst (polydipsia), and increased appetite (polyphagia). The person is also likely to lose weight and the ability to grow or repair damaged tissues is decreased.

DID YOU KNOW?

Approximately 15.7 million people, or 5.9% of the population in the United States have diabetes. Each day, approximately 2,200 people are diagnosed with this disease.

Phenylketonuria

Urinalysis is also useful in assisting in the detection of a condition known as phenylketonuria. PKU is a failure of the body to produce the enzyme necessary to oxidize phenylalanine to tyrosine, namely, phenylalanine hydroxylase. PKU is a recessive genetic trait whose incidence is somewhat over 1:11,000 in the United States. PKU causes nerve and brain damage, accompanied by mental retardation if left untreated. However, by reducing or eliminating phenylalanine from the diet, retardation does not occur. Because the phenylketones appear in the urine, infants with PKU often have diapers with distinctive odors; this observation by Swedish mothers ultimately led to the conclusion by scientists that PKU may be detected by checking the urine. However, urinalysis is not used as an initial screening for PKU. Ideally, newborns should be screened via a blood test when they are between 48 to 120 hours of age and have been on a milk (protein) feeding for at least 24 hours. After birth, 2-6 weeks may pass before phenylpyruvic acid is excreted in the urine. After PKU has been diagnosed, urine screening type tests may be used to make sure the disease is being controlled properly. (Look at the nutrition label of carbonated drinks.

DID YOU KNOW?

A cat's urine will glow under a black light.

Some state that they contain phenylketonurics, namely phenylalanine). State laws require PKU testing of infants within 28 days or less; in some states, testing is required prior to hospital discharge regardless of age.

Case Studies

Case 1 - Jeff Jones is 19 years old. He notices that he has increased urine output (polyuria), increased appetite (polyphagia), and great thirst (polydipsia). He has also experienced unexplained weight loss.

Case 2 - Mr. Thompson is 60 years old and has been unusually tired for several weeks. He occasionally feels dizzy and lately he finds it increasingly difficult to sleep at night. He has swollen ankles and feet and his face looks puffy. He experiences a burning pain in his lower back, just below the rib cage. He also notices that his urine is dark in color. He goes to see his physician, who finds that he has elevated blood pressure, and that the kidney region is sensitive to pressure.

Case 3 - Ms. Smith is 27 years old and has been experiencing painful and difficult urination (dysuria), frequency of urination and urgency. Her urine has a milky color. She also has fever and malaise, which is evidence of infection. Upon seeking treatment, she is given antibiotic therapy. After a few days on antibiotics, her symptoms disappear.

Case 4 - Normal sample (control)

DID YOU KNOW?

Research has indicated that eating garlic can cut the risk of high blood pressure and of retaining protein in the urine.

Objectives:

Learn about urinalysis and its application to the diagnosis of medical disorders.

Perform urinalysis on four simulated urine samples.

Examine the information obtained from gross observation, chemical testing, and microscopic examination.

Apply principles of urinalysis to the diagnosis of various medical disorders.

Materials:

MATERIALS NEEDED PER GROUP

10 mL each simulated urine sample pH strips

Graduated plastic pipets Medicine cups

Microscope slides

Coverslips

Test tubes

SHARED MATERIALS

400 mL beaker

Hot plate

Heat protective gloves

Procedure:

Using the information about the various aspects of urinalysis, analyze the following four simulated urine samples and fill in the table. Compare your observations to the chart detailing possible disorders according to pH and crystal type. Based on these results, as well as the information given in the other sections, try to match each sample to a corresponding case study (one will be a control, representing normal urine). Finally, see if the combination of signs/symptoms and urinalysis results can lead you to a possible diagnosis of the person's condition.

Physical Characteristic Observations

1. Label four medicine cups 1-4.
2. Shake each urine sample thoroughly and dispense 10 mL of each sample into the properly labeled medicine cup.
3. For each urine sample provided, observe and record the color, clarity, and smell of the urine. Record your findings in Table 1 in the Analysis section.

Testing pH

1. Dip a pH test strip into the simulated urine from Patient #1.
2. Compare the color of the test strip to the comparator chart within 30 seconds of sampling. Record the pH in Table 1.
3. Repeat steps 1 and 2 for the remaining samples.

Testing for sugar (Benedict's Test)

1. Place 250 mL of water into a 400 mL beaker and place on a hot plate.
2. To a test tube, add 3 mL of the simulated urine sample from Patient #1 and 3 mL of Benedict's solution.
3. Record the color of the solution.
4. Using a test tube holder, place your test tube in a hot water bath and allow it to boil for 2 minutes. Remove the sample from the hot water bath and record any color change. Record your results in Table 2.



Be sure to use heat protective gloves when handling hot objects.

5. Repeat steps 1-4 for the remaining samples.
6. A positive reaction will result in a yellow to red color. Examine your data and note whether it was a positive or negative reaction in Table 2.

Testing for protein (Biuret Test)

1. Remove 3 mL of the simulated urine sample from Patient #1, and place into a test tube.
2. Add 1 mL of Biuret solution to the urine and swirl.
3. Record the color of the solution in Table 3.
4. Repeat steps 1-3 for the remaining samples.
5. A positive reaction will result in an orange-red color, and a negative reaction will give in a green color. Examine your data and note whether it was a positive or negative reaction in Table 3.

Microscopic Observations

1. Label four microscope slides 1-4.
2. Gently swirl the urine specimen from Patient #1.
3. Place one drop of simulated urine on a slide and place a coverslip over it.
4. Scan the slide for any cells, red blood cells (visible as small red spheres) or leukocytes (visible as small blue spheres) that may be present.
5. Also look for any crystals that may be within the urine.
6. Repeat steps 2-5 for the remaining samples.

Further Microscopic Observations

1. View the provided microscope slide and identify the crystals.

Analysis/Conclusions:

Table 1 Physical Characteristics

Sample	Color	Clarity	Smell	pH
Patient #1				
Patient #2				
Patient #3				
Patient #4				

Table 2 Benedict's Test

Sample	Color before heating	Color after heating	Result (+ or -)
Patient #1			
Patient #2			
Patient #3			
Patient #4			

Table 3 Biuret Test

Sample	Initial Color	Final Color	Result (+ or-)
Patient #1			
Patient #2			
Patient #3			
Patient #4			

Table 4 Microscopic Observations

Sample	Red Blood Cells	White Blood Cells	Crystals
Patient #1			
Patient #2			
Patient #3			
Patient #4			

1. What disorder does Jeff Jones probably have? Why do you believe this to be so? What type of crystals might be present in his urine?
2. What diagnosis would you give Mr. Thompson? What type of casts might be found in his urine?
3. After examining the urine specimen from Ms. Smith and studying her case history, what disorder does she probably have? What type of crystals do you believe would be found in her urine? To what would you attribute the milky color of her urine?
4. Why is it important to perform tests on a control urine sample not containing any chemical substances?
5. A urine sample from a patient contains albumin, chloride, glucose, and phosphate molecules, while a control urine sample contains only chloride and phosphate molecules. What does this tell you about one of the functions of the kidneys?
6. The presence of blood and/ or casts in the urine can indicate a serious kidney problem. Why are kidney problems so serious?
7. Suppose a urine sample revealed abnormal results, such as protein in the urine. If there is a result differing from the norm (e.g., color, pH, substances present), should the physician always make an immediate diagnosis of a disorder? Why or why not?

8. Why is it important to develop a case history of the physical symptoms of each patient to be used along with the physical tests performed on the patient's urine specimen?

9. Urinalysis is an important diagnostic tool for the determination of medical disorders. Urinalysis has many other uses. Research one such use and describe it below. Be prepared to share your findings with the class.

10. Create a poster showing the various structures of the kidney. Label the individual structures and explain the function of each in the excretory system. In your poster, include a diagram of a nephron and label and explain its features as well.

Student Activity 3:

Urine Sediment Evaluation

Name _____

Purpose:

Examination of urine sediment is a valuable tool for diagnosing kidney and bladder disorders and infections.

Objectives:

The students will be able to prepare, stain, and examine urine sediments and will be able to identify cells, crystals, and casts found in urine.

Materials:

Urine samples
*Centrifuge
Gloves
Microscope slides
Cover slips
Conical centrifuge tube
Wright's stain
Pipette
Handout 9 – Cells Found in Urine Sediment

**NOTE: Always wear gloves
when handling urine.**

*This lab can be done without the use of a centrifuge

Procedure:

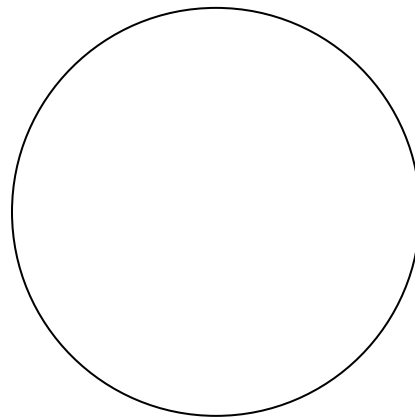
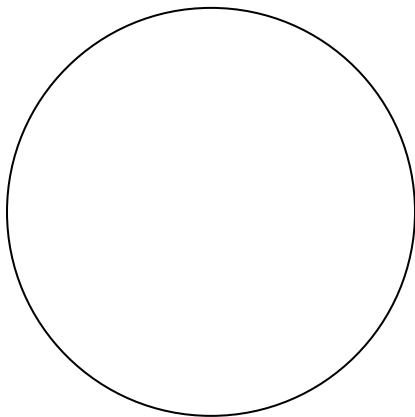
1. Obtain a urine sample.
2. Fill a conical centrifuge tube with 8 mLs of urine and centrifuge at 1500 rpm for 5 minutes.
 - * If you don't have a centrifuge simply take a few drops from a urine sample that has been allowed to sit undisturbed for at least an hour.
3. After the sample has gone through the centrifuge, pour off the urine until only an 1/8 of an inch remains in the test tube. This is called the supernatant. It is a concentration of the sediment in the urine.

4. Mix the supernatant by tapping the test tube with you finger.
5. Use a pipette to take a few drops of the supernatant and place them on a slide.
6. Mix the supernatant with one drop of Wright's stain on the microscope slide and place a cover slip over the mixture.
7. Scan the urine sample using a microscope. Lower the condenser and reduce the light intensity in order to view sediment more clearly. **NOTE: if you don't do this you might not be able to see anything at all!**
8. Scan under 10X and switch to 40X to identify sediment. Use your handout to help identify cells.
9. Look at 10 fields and count the number of casts, RBC's, epithelial cells, and WBC's seen in each field. Record the number in the chart below.
10. Look at 10 fields and estimate the number of crystals, sperm, fat droplets, and bacteria seen in each field. Record the estimate in the chart below.

Cell Type	Field 1	Field 2	Field 3	Field 4	Field 5	Field 6	Field 7	Field 8	Field 9	Field 10
RBC's										
WBC's										
Casts										
Epithelial cells										
Triple Phosphate										
Calcium Carbonate										
Tyrosine										
Leucine										
Calcium Oxylate										
Cystine										
Fat droplets										
Sperm										
Bacteria										

Analysis/Conclusions:

1. Seeing a lot of epithelial cells is an indication of what?
2. What are two possible reasons that bacteria would show up in urine sediment?
3. Why do you centrifuge the urine before examining it under a microscope?
4. Draw two types of cells that you saw in the urine sediment.



Student Activity 4:

Antibiotic Sensitivity

WARD'S

Bacteria Antibiotic Sensitivity

Introduction:

Bacteria, like all organisms, must compete for their place in the environment. During the course of evolution, many bacterial species developed substances that would inhibit or destroy competing species of bacteria. Pharmaceutical chemists utilized this characteristic to develop drugs known as antibiotics,

Like the bacteria's own defense agents, antibiotics inhibit some part of the cell's metabolism. Tetracycline and streptomycin, for example, act at the ribosomes, the location of protein synthesis. By blocking RNA molecules from carrying essential amino acids, or by preventing their binding to the ribosomes, these antibiotics interrupt the formation of proteins critical to the bacteria's survival. Antibiotics such as penicillin inhibit bacteria by altering the cell wall to prevent reproduction. Still other antibiotics interrupt important processes within the nucleus, such as the replication of DNA.

The highly specific way in which antibiotics function-by only affecting the disease organisms do not pose as great a danger to the patient as more generally acting chemicals. This also means that an antibiotic's effectiveness will vary, depending on the type of bacteria. The effectiveness of a given antibiotic can also be affected by its concentration and solubility.

Antibiotics are often divided into two groups: those affecting bacteria which give a negative reaction to the Gram stain and those which affect positively reacting organisms. This kit contains two common bacterial species. *Bacillus subtilis*, a laboratory contaminant and soil organism, is rod shaped, nonpathogenic, Gram positive, and forms spores. It is related to the pathogenic *Bacillus anthracis*, which infects livestock. *Escherichia coli*, a normal inhabitant of the human intestinal tract, is rod shaped, Gram negative, and does not form spores. Species of *Escherichia* are frequently the cause of appendicitis, peritonitis, and sporadic infections of the internal organs.

The effectiveness of antibiotics can be demonstrated by placing discs impregnated with antibiotics on a bacteria culture. If the antibiotic is effective against the bacteria, a clear zone will appear around the disc. The relative effectiveness of each antibiotic can then be obtained by comparing the area of the clear zones

Materials:

- 1 Bottle Tryptic Soy Agar
- 1 *Escherichia coli* Culture
- 1 *Bacillus subtilis* Culture
- 4 Sterile Petri Dishes
- 1 Package Antibiotic Test Discs
- 2 Sterile Pipets
- 2 Tubes Physiological Saline 1 Pair of Forceps
- 1 Wax Pencil
- 2 Sterile Swabs

Lab Preparation:

Safety: The bacterial species included in this kit are considered nonpathogenic. In spite of this, it is recommended that all bacteria be treated with caution. The containers and plates have been packaged aseptically to prevent contamination of the plates with other bacteria.

Prepare Petri dishes on the day of the lab, at least three hours before conducting the investigation:

1. Loosen the cap of the tryptic soy agar bottle to allow it to vent.
2. Place the bottle in a 100°C water bath or a beaker of boiling water. Make sure the water level reaches the level of the agar. The agar will melt in approximately 20 minutes.
3. Pour agar into the four Petri dishes, to a depth of approximately 5mm. Two plates will be used for each type of bacteria. Allow the agar to solidify.

Note: To prevent contamination, cover each Petri dish immediately after pouring the agar.

4. Add a tube of physiological saline to each bacteria culture tube; be sure to replace the top on the saline tube. Swirl the culture tubes to mix.
5. Using a sterile pipet transfer 0.25mL of the contents of one bacterial tube onto two agar plates.
6. Spread a thin layer over the entire surface of each plate with a sterile cotton swab.
7. Repeat with the contents of the second bacteria tube.
8. Allow 5 to 10 minutes for the liquid on the plates to be absorbed.
9. Label each plate with the name of the bacteria.

Procedure

1. Using sterile forceps, add one of each type of antibiotic test disc to each plate. The discs should be placed about 3cm apart.

C Chloromycetin
Te Tetracycline
P Penicillin G
Nb Novobiocin
S Streptomycin
E Erythromycin

Note: To avoid contaminating the plates, flame the forceps after each application, and uncover the plates as little as possible when placing the discs on the plates.

2. Invert the plates and incubate for 48 hours at 25°C.

Note: If an incubator is not available, the plates may be kept in a location that maintains a constant temperature. Additional time may be required when not using an incubator. If it is not possible to observe the plates immediately at the conclusion of the 48-hour incubation period, refrigerate the cultures until the investigation can be completed.

Analysis/Conclusions:

1. Which antibiotic was most effective against the Gram negative *E. coli*?
2. Which antibiotic was most effective against the Gram positive *B. subtilis*?
3. Which was the least effective antibiotic? Suggest some reasons for this.
4. What are some factors other than an antibiotic's inherent ability to inhibit bacteria that might influence the drug's effectiveness when administered to humans?

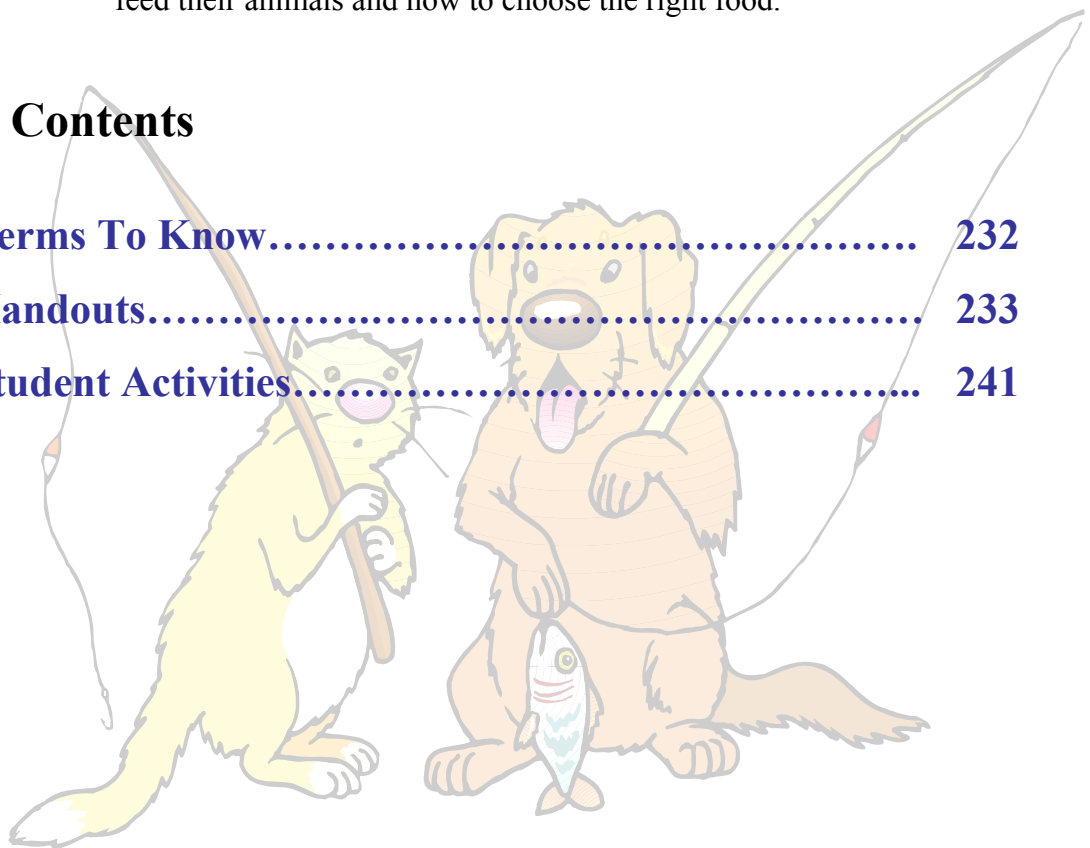
Animal Nutrition

By Mary Lou Genaway

This unit covers the various types of digestive systems, the digestive process and major nutrients. It also focuses on animal feed marketing, factors that influence how owners feed their animals and how to choose the right food.

Unit J Contents

Terms To Know.....	232
Handouts.....	233
Student Activities.....	241



Terms To Know

AAFCO – American Association of Feed Control Officials: a regulating body that develops standards for uniformity for: definitions, policies for manufacturing, labeling, distribution, and sale of animal feeds

Abomasum – the fourth compartment or true stomach of the ruminant animal

Absorption – the process by which digested nutrients are taken into the bloodstream

Cecum – a pouch located at the point where the small intestine joins the large intestine which aids in the digestion of fibrous feeds

Crude Protein – the total amount of protein in a feed

Cud – regurgitated food not fully digested in the rumen; animal chews on this and then swallows again for further digestion

Diffusion – a method of absorption where the nutrients move from an area of higher concentration to an area of lower concentration

Digestion – the breakdown of food materials and the absorption of nutrients

Enzyme – a complex protein substance produced by the body that is necessary for biochemical reactions to occur

Metabolism – the physical and chemical processes that take place in an animal's body that produce the energy necessary for the body's activities

Monogastric – having a simple stomach

Nutrient – a substance that promotes growth

Nutrition – receiving a proper, balanced ration so that an animal can grow, maintain its body, reproduce, and produce what we expect from it

Omasum – the third compartment of the ruminant stomach

Osmosis – a method of absorption where nutrients under pressure move across semi-permeable membranes from an area of higher concentration to an area of lower concentration

Palatable – good tasting

Peristalsis – muscular contractions that cause food to move through the digestive system

Reticulum – the second compartment of the ruminant stomach

Roughage – a feed containing more than 18% crude fiber when dry

Ruminant – an animal that has a stomach divided into several compartments

Rumen – the first and largest compartment of the ruminant stomach

Name _____

Types of Digestive Systems

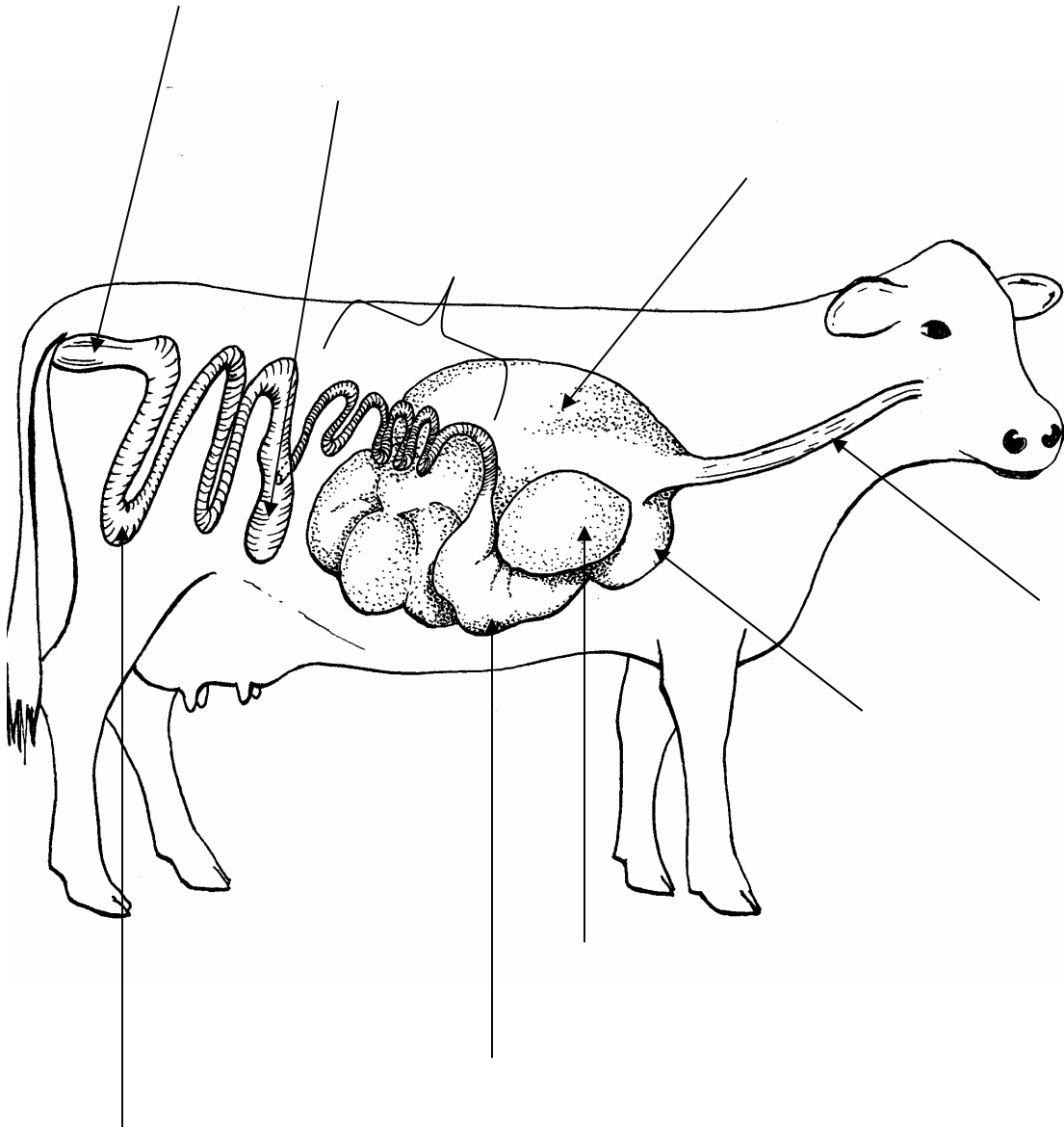
Directions: Label the drawings with the following terms.

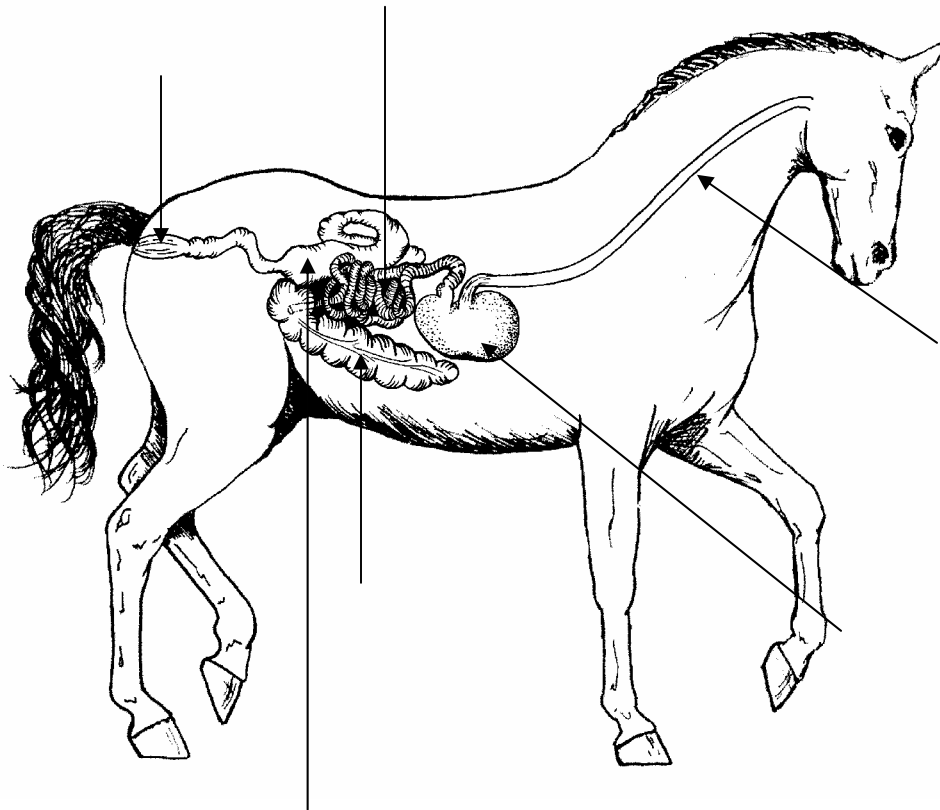
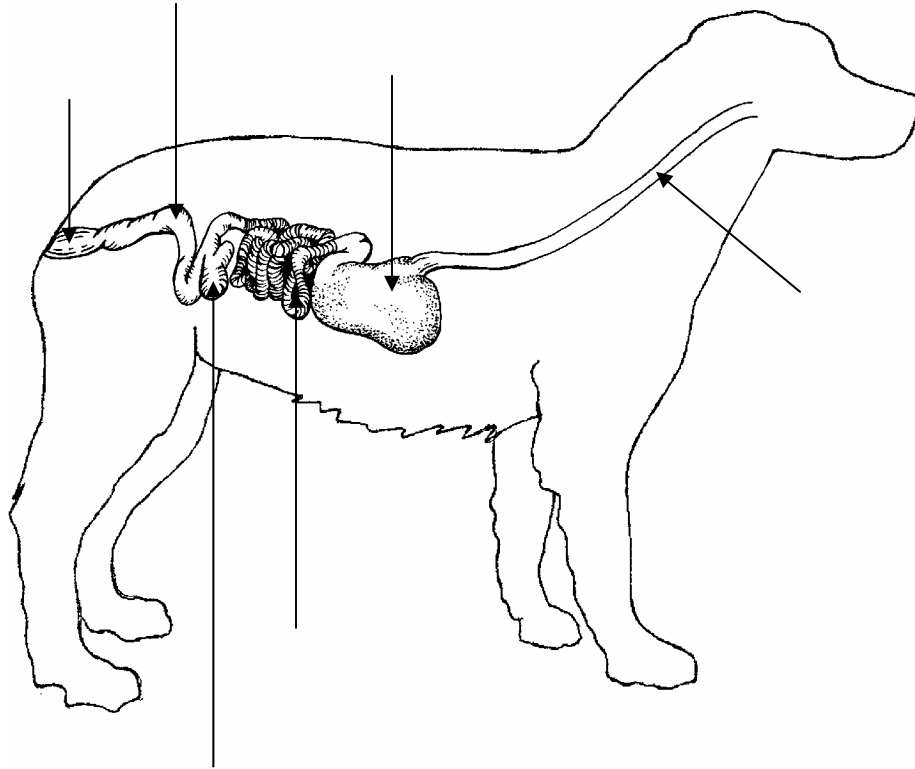
Stomach
Rectum
Omasum

Small intestine
Reticulum
Esophagus

Colon
Rumen

Cecum
Abomasum

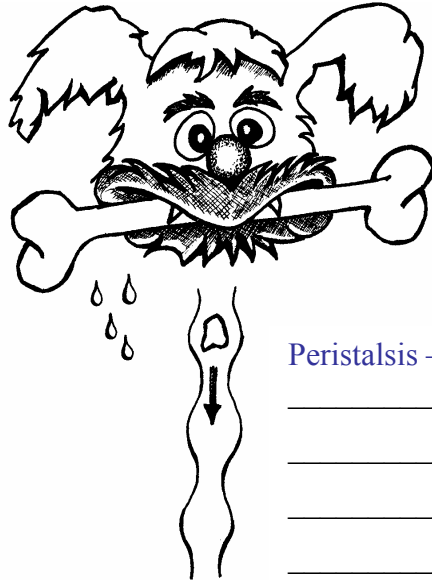




Name _____

The Digestion Process

Directions: Outline the digestive process using the spaces provided.



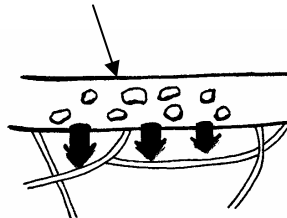
Mechanical digestion –

Peristalsis –

Chemical digestion –

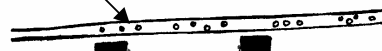
Absorption –

Small intestine

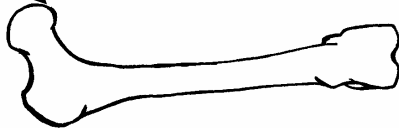


Metabolism –

Capillary

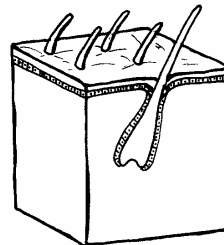


Bone



Hair

Skin



Major Nutrients

Directions: Fill in the function of each of the following nutrients.

Nutrient	Composition	Description	Function	Digestive Process
Protein	Contain carbon, hydrogen, oxygen, and nitrogen	25 amino acids are found in animal feeds. Essential amino acids (EAA) are not produced by the body and must be supplied in the diet. Dogs require 10 EAA's and cats require 11. Cats need taurine, dogs do not.		Proteins are broken down into amino acids and are carried to various parts of the body via the bloodstream.
Carbohydrates	Contain carbon, hydrogen, and oxygen chains	Two categories 1. Soluble: monosaccharides and disaccharides such as glucose and sugar beet. 2. Insoluble: polysaccharides such as starch, lignin, and peanut hulls.		Used to stimulate intestinal contractions, normalize intestinal transit time, and aid in management of constipation and diarrhea.
Lipids “concentrated energy source”	Contain carbon, hydrogen, and oxygen chains; provide 2.25 times as much energy as an equivalent amount of carbohydrates and proteins	Fats – solid at room temperature Oils – liquid at room temperature Waxes, Resins, Organic Acids, Fat Soluble Vitamins (A, D, E, K) Part of the cell membrane, nerve tissue, and brain		Essential fatty acids (Linoleic acid, Arachidonic acid, Linolenic acid) are needed for normal health and are digested, absorbed through the bloodstream, and transported to various body parts and stored as fat deposits for reserve energy.

Major Nutrients cont.

Nutrient	Composition	Description	Function	Digestive Process
Water	Vital factor in animal nutrition Found in every cell of the body	Most important nutrient Makes up 55-65% of an animal's body		Water is absorbed into the body
Vitamins	Organic compounds essential for health, needed only in trace amounts	Two categories 1. Water Soluble B-complex, C 2. Fat-soluble A, D, E, K		Vitamins do not become part of the animal's body during metabolism, but instead act as catalysts in the body's chemical reactions.
Minerals	Macrominerals – calcium, include	Two categories 1. Macromineral – required in large amounts 2. Microminerals – required in small amounts		Essential for metabolic processes to take place.

Marketing Concepts – Pet Food

Directions: Describe each of the following marketing concepts and how pet food manufacturers to entice buyers into purchasing a specific food use them.

Nutritional value –

All purpose –

Price –

Palatability –

Directions: Give an example of a slogan used by pet food companies to market their pet food using each marketing concept.

1. Nutritional value -
2. All purpose -
3. Price -
4. Palatability -

Name _____

Feed Cost Comparison

Directions: Using the two feeds given, calculate which feed is the most economical. Assuming that both feeds are nutritionally equal, what feed would you select for your dog? Show all work! **Hint: 1 lb. = 16 oz.**

1. Gravy Boat
\$11.56/20 pounds
1 cup = 3.9 ounces
The dog eats 3.5 cups

2. Trails Ahead
\$4.39/20 pounds
1 cup = 3.7 ounces
The dog eats 5 cups

<i>Step</i>	Description	Gravy Boat	Trails Ahead
A	Cost per bag		
B	Cost per pound of diet (A/weight of bag in lbs.)		
C	Cost per ounce (B/16 oz.)		
D	Ounces/cup		
E	Feeding amounts in ounces per day		
F	Days bag will last (Weight of bag in ounces/E in ounces)		
G	Cost per day (C x E in ounces)		
H	Cost per year (G x 365 days)		

Student Activity 1:

Testing For Food Nutrients

Name _____

Purpose:

Manufacturing companies use a variety of methods to formulate their pet foods so that they meet certain standards for animal maintenance and growth requirements. The AAFCO ensures that companies meet the advertising claims they make about the nutritional value of their pet foods.

Objectives:

The students will be able to identify what nutrients are present in animal feeds – sugars, starches, fats, and proteins by testing several different types of pet foods.

Materials:

Sugar source – Karo syrup
Protein source – milk
Fat source – vegetable oil
Starch source – bread or biodegradable packing peanuts
Samples of several pet foods*
Safety glasses
A 250mL beaker
Test tubes
Paper towels
Hot plate
Pipettes
Benedict's Solution
Biuret Solution
Lugol's Iodine Solution
Sudan IV



*Be sure to test a variety of pet and animal feeds in order to see the variation in nutrient content from one feed to another. See the suggested list below.

Puppy/kitten foods
Tuna fish (often fed to cats)
Specialty dog/cat foods
Rabbit food

weight loss diet
dog/cat treats
adult dog/cat foods
lettuce, carrots

canned food
raw hamburger
semi-moist foods
alfalfa hay

Procedure: For each of the following tests a color change indicates a positive result. Karo Syrup, breadcrumbs, vegetable oil, and milk are used as controls to obtain positive results. In part 2, a pet food will be substituted for these items.

Part 1:

Sugar Test – blue or reddish orange is positive.

1. Place 5 drops of water and 5 drops of Karo Syrup into a test tube.
2. Add 5 mL of Benedict's Solution.
3. Fill 250 mL beaker 2/3 full with water. Place test tube in beaker. Place beaker on the hot plate and boil for 5 minutes.
4. Observe for a color change and record results. _____

Starch Test – blue black is positive.

1. Place 5 drops of water and a small amount (1/2 teaspoon) of breadcrumbs into a test tube.
2. Add 2 drops of Lugol's iodine solution.
3. Observe and record results. _____

Fats Test – reddish stain is positive.

1. Place 5-10 drops of vegetable oil in a test tube.
2. Add 2-5 drops of Sudan IV.
3. Observe and record results. _____

Protein Test – pink to violet is positive.

1. Place 5 drops of milk in a test tube.
2. Add 5 drops of Biuret solution.
3. Observe and record results. _____

Part 2:

1. Conduct the same tests on various feed samples and determine the presence or absence of each nutrient. Use one or two pieces of food for each test.
2. Before conducting the tests, predict what nutrients will be present by visual observation.

Sugar Test – blue or reddish orange is positive.

1. Place 5 drops of water and 2 pieces of pet food into a test tube.
2. Add 5 mL of Benedict's Solution.

3. Fill 250 mL beaker 2/3 full with water. Place test tube in beaker. Place beaker on the hot plate and boil for 5 minutes.
4. Observe for a color change and record results in chart below.

Starch Test – blue black is positive.

1. Place 5 drops of water and 2 pieces of pet food into a test tube.
2. Add 2 drops of Lugol’s iodine solution.
3. Observe and record results in chart below.

Fats Test – reddish stain is positive.

1. Place 2 pieces of pet food in a test tube.
2. Add 2-5 drops of Sudan IV.
3. Observe and record results in chart below.

Protein Test – pink to violet is positive.

1. Place 2 pieces of pet food in a test tube.
2. Add 5 drops of Biuret solution.
3. Observe and record results in chart below.

Name of Feed	Sugar (+/-)	Starch (+/-)	Fat (+/-)	Protein (+/-)
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				

Analysis/Conclusions:

1. Base on your tests and observations, which foods are good/poor sources of the following nutrients:
 - a. Sugars:
 - b. Starches:
 - c. Fats:
 - d. Proteins:

2. How accurate were your predictions to your tests?

3. If you were an animal nutritionist, what other information might you need to evaluate these nutrients that was not determined in the tests you performed?

4. Now read the label from the pet food you tested. Did the pet food company make any claims about specific nutrients? What were they? Did your tests prove or disprove their claims?

5. How can your results be applied to an animal's eating habits?

Student Activity 2: It's All in the Name!

Name _____

Purpose:

The pet food industry is highly competitive; companies are constantly searching for new marketing avenues and advertising strategies. Pet foods are commonly marketed on price, nutritional value, purpose, and palatability.

Objectives:

The students will design a pet food name and label and develop a marketing strategy.

Materials:

Sample pet food labels

Paper or poster board

Colored pencils

Art supplies (glue, markers....)

*A design program (Microsoft Publisher or PageMaker)



*Optional

Procedure:

You have recently inherited the Perfect Pooch Pet Food Company. It has not been doing very well in the past few years; however, the development team has recently produced a new pet food. All it needs is a good name and a marketing strategy to make it a success.

5. Working with a team of two or three people, design a name and a label for your pet food. Look at some sample labels for ideas and then draw some sketches for your label.
6. Using poster board or graphic design programs, produce a “mock up” of the finished pet food label.
7. Next, develop a marketing strategy. Come up with a slogan and an idea for a TV advertisement. You must use at least **two** of the following marketing concepts: price, nutrition, purpose, or palatability.
8. Use poster board or a graphic design program to illustrate your ideas.
9. Give a presentation on your marketing ideas and pet food labels to the stockholders of the Perfect Pooch Pet Food Company. (your classmates)

Student Activity 3: Palatability Study

Name _____

Purpose:

Pet foods are marketed to us, the pet owner, but what ultimately determines the food we buy is whether or not Fido will eat it and love it. How do these canine connoisseurs make up their minds? Lets' find out!

Objective:

Students will conduct a comparative study to determine what factors lead to a palatable animal feed.

Materials:

A minimum of 5 pet foods for each dog (one sample should be the dog's normal food)
Feed labels from the feeds being used to conduct the study
Plates/bowls
Dogs

Procedure:

1. Have students bring in their dogs for this study. All dogs must be vaccinated, and have a clean bill of health.
2. Make sure the dogs are hungry.
3. Test one dog at a time so they are less distracted.
4. Place 5 feed samples on individual plates or bowls in a straight line approximately 12 inches apart.
5. Allow the dog to explore the feed samples and make a preference selection.
6. Once a selection has been made, remove that sample and give the animal a chance to make a second choice.
7. Repeat step 4 until only 1 food sample is left.
8. Record all observations in the chart on the next page. Put a star next to each dog's normal food.

Name of Feed	Description of Feed Sample Odor? Size? Main Ingredient? Growth, High Activity, Weight Loss?	Ranking of Preference				
		Dog 1	Dog 2	Dog 3	Dog 4	Dog 5
1.						
2.						
3.						
4.						
5.						

Observations Noted:

<hr/> <hr/> <hr/> <hr/>

9. Tally the rankings for each food using the chart above to determine its overall rank. Fill in the results in the chart below.

Name of Feed Sample	Overall Rank	Comparisons Made From The Label What marketing concept(s) were used? What factors do you think made this feed more/less palatable?
1.		
2.		
3.		
4.		
5.		

Analysis/Conclusions:

Based on your findings, write a conclusion on the factors that affect palatability. Consider such factors as odor, appearance, texture, and food composition.

Student Activity 4:

The Feeding Frenzy – Calculating Feed Costs

Name _____

Purpose:

Anyone involved in the business of feeding animals knows how important it is to buy foods that are both nutritious and economical. Many businesses involved with animals are on a tight budget, or exist on donations.

Objectives:

The students will be able to determine the feed budget for a small animal care facility.

Materials:

Calculator

Procedure:

Complete the following problem. Be sure to show all work! **Hint! 1 lb = 16oz**

You are managing an A.S.P.C.A. facility that houses 50 cats and 100 dogs each and every day. Although each animal has slightly different feeding requirements, the average food consumption rate for cats is 2 cups of dry food per day. The dry cat food weighs 3 ounces per cup, and a 5 lb. bag of food costs \$6.95. The guaranteed analysis for this food is:

Crude Protein – not less than 22%

Moisture – not more than 12%

Ash – not more than 3.2%

The dogs consume 3.5 cups of dry food per day. The dry food weighs 4 ounces per cup, and 40 lb. bag of dog food costs \$13.99. The guaranteed analysis is:

Crude Protein – not less than 18%

Moisture – not more than 11%

You have an annual budget of \$22,500 to feed these animals. Determine if you have enough money to feed all the animals for the year. **Show all work!**

1. Calculate the ounces eaten by each cat per day.

2. Calculate the ounces eaten by each dog per day.

3. Calculate the ounces eaten per year by each cat.
4. Calculate the ounces eaten per year by each dog.
5. Calculate the total ounces eaten per year by 50 cats.
6. Calculate the total ounces eaten per year by 100 dogs.
7. Calculate the total pounds eaten per year by 50 cats.
8. Calculate the total pounds eaten per year by 100 dogs.
9. Calculate the cost per pound for the cat food.
10. Calculate the cost per pound for the dog food.
11. Calculate the total cost to feed all the cats.
12. Calculate the total cost to feed all the dogs.
13. Calculate the total cost to feed all the animals.

Analysis/Conclusions:

1. Did you have enough money to feed all the animals? By how much were you over or under?

2. How many more pounds of cat food could you buy if you had a surplus budget of \$650.00?

Student Activity 5:

Calculating Dry Matter

Name _____

Purpose:

Calculating dry matter is the best way to accurately determine the daily nutrient intake for a particular food. Water dilutes the nutrient concentration, so by calculating it out the actual nutrient concentration can be found.

Objectives:

Students will be able to calculate the dry matter content of any pet food and use that information to conduct a dry weight analysis of the actual daily nutrient intake.

Materials:

Calculator

1 can of canned cat food*

1 bag of dry cat food*

*dog food may also be used

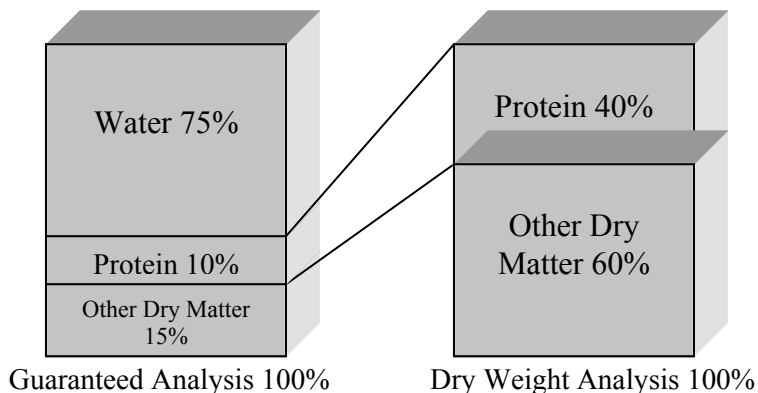
Procedure:

1. Obtain a guaranteed analysis including moisture content of the canned and dry foods you will be using by reading the food label or calling the manufacturer.
2. Use the example below as a guide to complete a dry matter analysis of canned vs. dry pet food.

The example shows a canned cat food with a label of 10% protein. The moisture (water) is 75%. A dry weight analysis shows that the protein content is 40%.

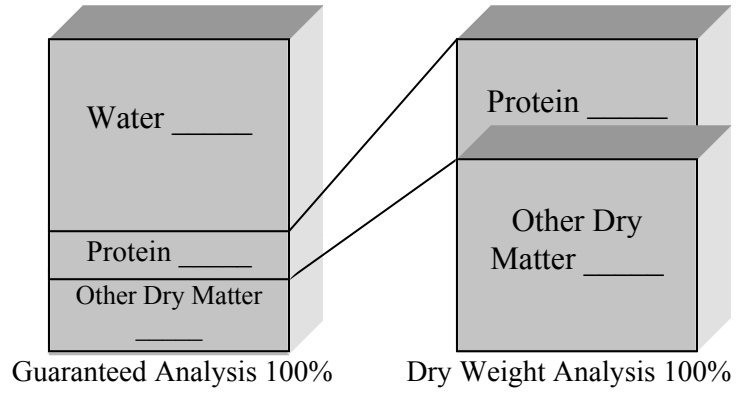
$$100\% - 75\% \text{ water} = 25\% \text{ dry matter}$$

$$10\% \text{ protein} / 25\% \text{ dry matter} = .4 \times 100 = 40\% \text{ protein by dry weight analysis.}$$

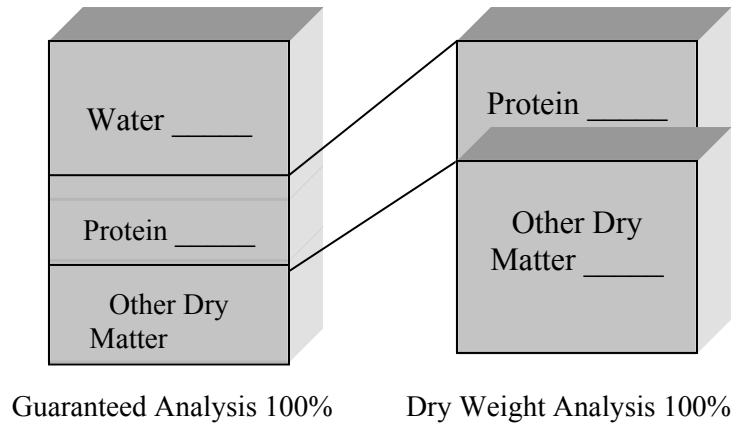


3. Now calculate the dry matter content for your canned food and dry food. Show your work.

Canned:



Dry:



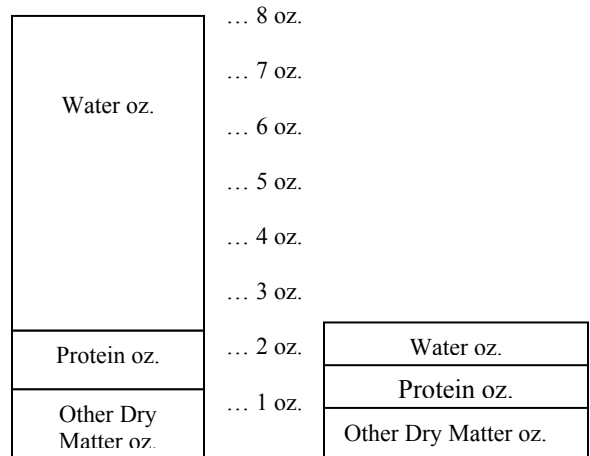
4. The dry weight analysis is expressed in percentages. How much of each nutrient is consumed depends upon how much of that food is required per day. To determine the actual daily nutrient intake the percentages must be converted to ounces.

Canned cat food

Dry cat food

Protein 40%
Other Dry Matter 60%

Protein 34%
Other Dry Matter 66%



Student Activity 6:

Calculating MER

Name _____

Purpose:

Maintenance energy is the amount of calories needed to maintain an animal at a healthy weight for its activity level and environment. Factors such as work, growth, and lactation will change maintenance energy requirements (MER).

Objectives:

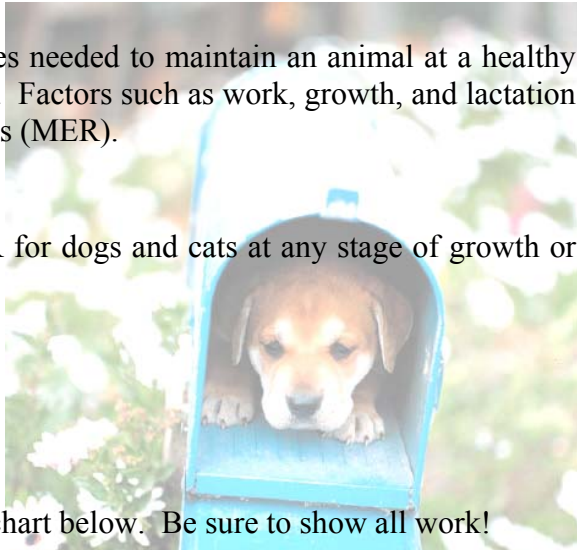
The students will be able to determine MER for dogs and cats at any stage of growth or activity level.

Materials:

Calculator

Procedure:

Complete the following problems using the chart below. Be sure to show all work!



RESTING ENERGY REQUIREMENTS (RER)		
Dog:	$2(30(\text{weight in kg}) + 70) = \text{RER}$	
Cat:	$1.5(30(\text{weight in kg}) + 70) = \text{RER}$	
<i>Remember 2.2lbs. = 1 kg</i>		
MAINTENANCE ENERGY REQUIREMENTS (MER)		
Canines		
Puppies	<4 months of age	3 x RER = Kcal/day
	>4 months of age	2 x RER = Kcal/day
Adult		1.6 x RER = Kcal/day
Senior		1.4 x RER = Kcal/day
Weight Gain Prevention		1.4 x RER = Kcal/day
Weight Loss		0.8 x RER = Kcal/day
Gestation (last 21 days)		3 x RER = Kcal/day
Lactation		4-8 x RER = Kcal/day
MAINTENANCE ENERGY REQUIREMENTS (MER)		
Felines		
Kittens		2.5 x RER = Kcal/day
Adult		1.2 x RER = Kcal/day
Weight Gain Prevention		1.0 x RER = Kcal/day
Weight Loss		0.8 x RER = Kcal/day

Problem 1:

Kali is an 8-year-old Springer Spaniel. She has mild arthritis and has become a couch potato in the last year. As a result, she now weighs 50 pounds! Help! Her owner needs to reduce her diet to help Kali lose weight. Determine how many Kcals per day Kali needs for a weight loss diet. **Show all work!**

Step 1:

Convert Kali's weight from lbs. to kg.

Step 2:

Determine Kali's RER (Resting Energy Requirement). Use RER formula from chart.

Step 3:

Now find the MER formula on the chart for canine weight loss. Plug the answer from step two into this formula. Be sure to label your answer as Kcal/day.

Problem 2:

Phil is a 5-year-old male neutered cat with an average activity level. He weighs 7lbs. Determine how many Kcals per day Phil needs. **Show all work!**

Step 1:

Convert Phil's weight from lbs. to kg.

Step 2:

Determine Phil's RER (Resting Energy Requirement). Use RER formula from chart.

Step 3:

Now find the MER formula on the chart for feline adult. Plug the answer from step two into this formula. Be sure to label your answer as Kcal/day.

Food For Thought:

Phil's food contains 600Kcals per cup. How much food should Phil be fed each day?

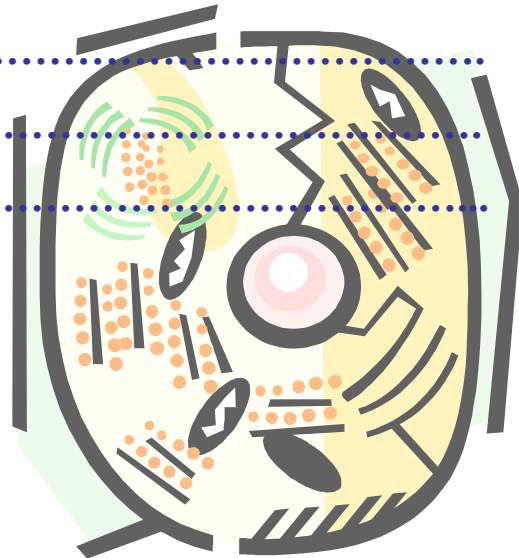
Principles of Disease

By Sue Brown

This unit looks at some of the fundamental principles behind the spread of disease by exploring three diseases that represent common categories of disease. Therapeutics and prevention are also examined.

Unit K Contents

Terms To Know.....	258
Handouts.....	259
Student Activities.....	265



Terms To Know

Alternative therapy – any of various health care practices that do not follow generally accepted medical methods

Benign tumor – an abnormal growth of cells that does not destroy surrounding tissue, but can lessen function by its presence

Cancer – an uncontrolled growth of cells on or in the body

Carcinogenic – capable of causing cancer

Congenital – existing at birth, but not hereditary

Contagious – transmissible by direct or indirect contact; communicable

Degenerative – adjective meaning a decline in a function from a former state

Epidemiology – the study of how diseases spread from one individual to another, and through populations

Hereditary – genetically transmitted

Infectious – capable of causing infection

Malignant tumor – an abnormal growth of cells that destroys surrounding tissue and can spread to new body sites

Metastasis – the spreading of a disease from an original site to one or more sites elsewhere in the body

Non-contagious – not capable of being transmitted by direct or indirect contact

Non-infectious – not capable of causing infection

Oncology – the study of cancer

Pathogenesis – the development of a diseased or morbid condition

Therapeutics – medical treatment of disease

Name _____

Health and Wellness

Directions: In the spaces below, write the signs of a healthy animal and list the factors that contribute to keeping an animal healthy.



Health Indicators

A healthy animal has:

- 
- 
- 
- 
- 
- 
- 

Contributors to Health

- 
- 
- 
- 
- 
- 
- 
- 

Name _____

Disease and Illness

Directions: In the spaces below, write the signs of a diseased animal and list the factors that contribute to causing disease.



Signs of Disease

- 
- 
- 
- 
- 
- 
- 

Factors Causing Disease

- 
- 
- 
- 
- 
- 
- 

Name _____

Pancreatitis

Directions: Use the spaces below to take notes on this disease.

The pancreas is an important organ located on the right side of the abdomen that produces hormones such as insulin, and enzymes which aid digestion. Under normal conditions pancreatic enzymes are activated in the small intestines, but with pancreatitis the enzymes are activated in the pancreas, which causes digestion of the pancreas. The severity of pancreatitis depends on the amount of enzymes activated. This disease is seen mostly in middle-aged or older dogs. There is no breed or sex predisposition, yet overweight dogs seem to be more prone.

Causes

Signs

Diagnosis

Complications

Name _____

Leptospirosis

Directions: Use the spaces below to take notes on this disease.

Leptospirosis is a zoonotic disease, occurring worldwide, caused by a group of spiral-shaped bacteria (spirochete), *Leptospira interrogans*. Leptospirosis can develop in any age, sex or breed of unvaccinated dog. Infection occurs in areas with alkaline soil and is often diagnosed in the summer and early fall.

Causes

Signs

Diagnosis

Public Health Risk

Name _____

Cancer**Directions:** Use the spaces below to take notes on this disease.

Oncology is the study of cancer. Cancer is defined as an uncontrolled growth of cells on or in the body. Cancer causes pain, inflammation, infection, damage to local tissue, and can hamper organ function. It is not a single disease, but a collection of many diseases that affects organ systems and tissue in all species and breeds.



Benign -

Malignant -

Metastasis -

Classification of Tumors

Tumor	Benign name	Malignant name
Bone	Osteoma	Osteosarcoma
Fiber tissue	Fibroma	Fibrosarcoma
Fat	Lipoma	Liposarcoma
Lymph nodes		Lymphoma
		Mast Cell Sarcoma
Skin		Squamous Cell Carcinoma


Carcinogenic Factors**Treatments**

Name _____


Therapeutics


Directions: Using the internet, look up the types of alternative therapies and write a short description of each.

1. **Vaccines** – used to prevent many diseases. Some vaccines are more successful at preventing disease than others depending on the make up of the vaccine and the tenacity of the disease.
2. **Drugs** – used to treat and/or prevent diseases. Drugs can be used as a stand alone treatment or in combination with another form of treatment.
3. **Surgery** – used in cases where drug treatment is not an option, for emergencies, or in combination with drug treatment. In some cases surgery may be a last resort due to the risks associated with it.
4. **Alternative Therapy** – a group of treatments originating from Eastern and other philosophies of the mind, body and soul. These forms of treatment were once rejected by Western medicine as primitive quack medicine. Today, they are becoming more widely used and accepted because they are showing proven results.

 Vitamin and mineral supplements -


 Massage therapy -


 Acupressure -

 Acupuncture -

 Magnetic therapy -

 Meditation -

 Herbal therapy -

 Hypnotherapy -

 Chiropractics –

Student Activity 1:

Simulated Disease Transmission

Name _____



Background:

A disease can be caused by a virus, or microorganisms such as bacteria, fungi, and parasites. The human body becomes “sick” when it is unable to fend off a disease-causing organism or a pathogen. A pathogen is an invader such as a virus or bacteria that resists internal defenses and begins to grow and harms the host.

Most diseases will eventually be eradicated from the body by the body's immune system. Some diseases are resistant to the immune system and are able to thrive in the body and cause harm including death to the host. Certain viruses, such as “Colds”, can be easily detected by symptoms such as a fever or a runny nose, but some viruses do not cause any symptoms till a later date. An example of this is HIV which causes AIDS. An HIV positive person can walk around for years transmitting it to others without knowing he/she has the virus.

In this simulation, you will be given an unknown “Simulated Bodily Fluid”. This fluid is clear, and can represent the aerosol droplets from a cough or sneeze, the bodily fluids exchanged in the transmission of HIV, or in any other disease. You will simulate the exchange of bodily fluid with three other students. After three exchanges have taken place, you will then test your sample for the disease. Once the testing is complete, you will find out which student's samples, in your entire class, turned out to be positive. Using this information, you will then trace the route of transmission by using a flow chart to find the original carrier.

Objective:

You will find that disease can be spread through the exchange of bodily fluids. In this investigation, you will simulate the transmission of disease, trace the route of transmission and identify the original disease carrier in the class population.

Materials: (Each student)

- 1 Plastic Tube (Filled with “*Unknown Bodily Fluid Solution*”)
- 1 Pipet
- 1 Microfuge Tube

Shared Materials:

“*Simulated Disease Indicator Solution*” (Indophenol)

Procedure:

1. Obtain a sample of “*Simulated Bodily Fluid*” from your teacher and pipet 1 mL of your sample into a microfuge tube. Set this tube aside for further evaluation.
2. You will exchange “fluids” with three classmates. Randomly choose 1 classmate with whom you will simulate the exchange of “bodily fluids”. One of you transfers 10 mL of the “bodily fluid” into the other student's tube. Then transfer 10 mL of fluid back into the original tube. You and your partner have now completed an exchange of “bodily fluid”.
3. Record the name of your classmate you exchanged fluids with in Round 1 on your worksheet.
4. For Round 2, wait for your teacher's signal and randomly find another classmate to exchange “*Simulated Bodily Fluids*” as in step 2. You may not exchange with the same person more than once. Again, record the name of your classmate on your work sheet.
5. Repeat again for Round 3, as in step 2.
6. Now that all three exchanges have taken place, you will test for the presence of a simulated disease.
7. Go to the testing area set up by your teacher and add 7 drops of “*Disease Indicator Solution*” to your 30 mL sample of “*Simulated Bodily Fluid*”.
8. Record the color of the fluid after the “*Disease Indicator Solution*” has been added. A clear or pink result will indicate the sample is positive for the disease. If your “*Simulated Bodily Fluid*” is negative for the disease, a blue color change will appear.
9. If you have tested positive for the disease, record your name and all of your contacts in the Class Data Table and also on the blackboard.
10. Record the names of all the infected people and their contacts in your class in the Class Data Table.
11. Once the entire class results are recorded, identify the original exchange in the class population, and trace the route of transmission. Using the example provided as a guide, create a flow chart from your Class Data Table which will show the route of transmission of the disease.

Note: Because your class is a closed system, you can only trace the disease back to an original exchange (Round 1), but cannot determine which one of the two individuals involved in the original exchange had the disease. The only way that this can be accomplished is to test the two individuals involved in the original exchange, using the “Simulated Bodily Fluid” that was set aside.
12. The two infected individuals in your class who were determined to be involved in the original exchange will have to *submit their* microfuge tubes for further evaluation. Place a drop of “*Disease Indicator Solution*” into each microfuge. A change of color to blue will indicate negative for the “*Simulated Disease*”. A clear or pink color will indicate a positive result for the disease.

Worksheet

Your Name: _____

Persons Exchanged "Simulated Bodily Fluid" with

Round 1 _____

Round 2 _____

Round 3 _____

Color of your tube after test with "Disease Indicator Solution"

Blue _____ (Negative) Clear or Pink _____ (Positive)

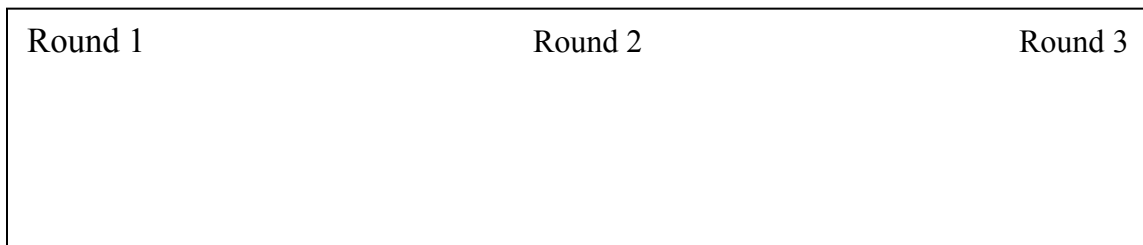
Class Results:

Fill in the names of infected people in your class as well as their contacts. Place an asterisk next to each name that is found to be positive for the simulated disease.

Class Data Table

Infected Persons	Contacts of Infected People		
	Round 1	Round 2	Round 3

Route of Transmission Flow chart



Original Carrier: _____

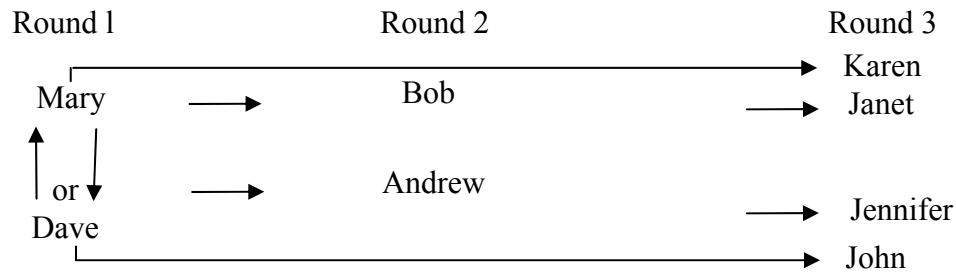
Example: Class Data Table

Infected Persons	Contacts of Infected People		
	Round 1	Round 2	Round 3
Bob*	Beth	Mary*	Janet*
Jennifer*	Wendy	John*	Andrew*
Karen*	Steve	Tim	Mary*
Dave*	Mary*	Andrew*	John*
Janet*	Ralph	Sheila	Bob*
John*	Mike	Karen*	Dave*
Andrew*	Kim	Dave*	Jennifer*
Mary*	Dave*	Bob*	Karen*

(*) Infected Person

1. An asterisk is placed next to each name in the Class Data Table who was found to be positive for the simulated disease. The Data Table above shows that Bob exchanged with Beth, Mary and Janet. This shows that in Round 1, Bob did not have the disease when he exchanged fluids with Beth, but received it in Round 2.
2. The Class Data Table is then used to devise a flow chart and to trace the route of transmission. In Round 1, Dave and Mary have tested positive for the disease. This indicates that these two people were involved in the original exchange.
3. In Round 2, Mary and Dave exchanged “*Simulated Bodily Fluids*” with Bob and Andrew. The flow chart now shows two rounds of exchanges and a total of four infected people.
4. For Round 3, the names of the individuals that exchanged with Bob, Andrew, Mary and Dave are filled in. They are Janet, Jennifer, Karen, and John, respectively. This completed flow chart shows that in Round 2, six people had the disease, but in Round 3, the number of infected people has increased to a total of eight people. Thus, the disease has passed from an original exchange of two people, to a total of eight people.

Example: Route of Transmission Flow chart



The chart above shows that in Round 1 Mary and Dave exchanged fluids. Since they are both positive in Round 1, they pass on the disease to Bob and Andrew in Round 2, and to Karen and Jennifer in Round 3. Then Bob and Andrew pass it on to Janet and John, respectively.

Since this is a closed system, the origin of the disease can only be traced back to an original exchange (Round 1). To determine the original carrier of the disease, the “Simulated Bodily Fluid” set aside of the two infected people involved in the original exchange must be tested.

The two individuals in your class who were determined to be involved in the original exchange (Round 1) will have to submit their microfuge tubes for further evaluation. A drop of the “Disease Indicator Solution” is placed into each microfuge. A change of color to blue indicates negative for the “Simulated Disease”, while a clear or pink color will indicate a positive result for the disease.

In an actual epidemic situation, one cannot trace a disease as easily as in this simulation. In an open system, it is almost impossible to trace a disease back to an original carrier. Because your class is a closed system, with a small number we can trace back an original exchange. If you had completed another round of “Simulated Bodily Fluid” exchange, then 16 people would be infected; with each round of transmission the number of infected people doubles.

Analysis/Conclusions:

1. How is a disease caused?
2. Were you surprised by the number of people who acquired the disease? Explain your answer.
3. Explain how one person can spread disease to many others?
4. How can disease transmission be traced to the original carrier?
5. In the example Data Table, explain why Ralph and Sheila tested negative in Round 1 and 2 exchanges, even though they exchanged "bodily fluids" with Janet who had tested positive.
6. How many people tested positive in your class? What was the percentage of positive to negative?

Student Activity 2: Leukemia Detection

Name _____

WARD'S

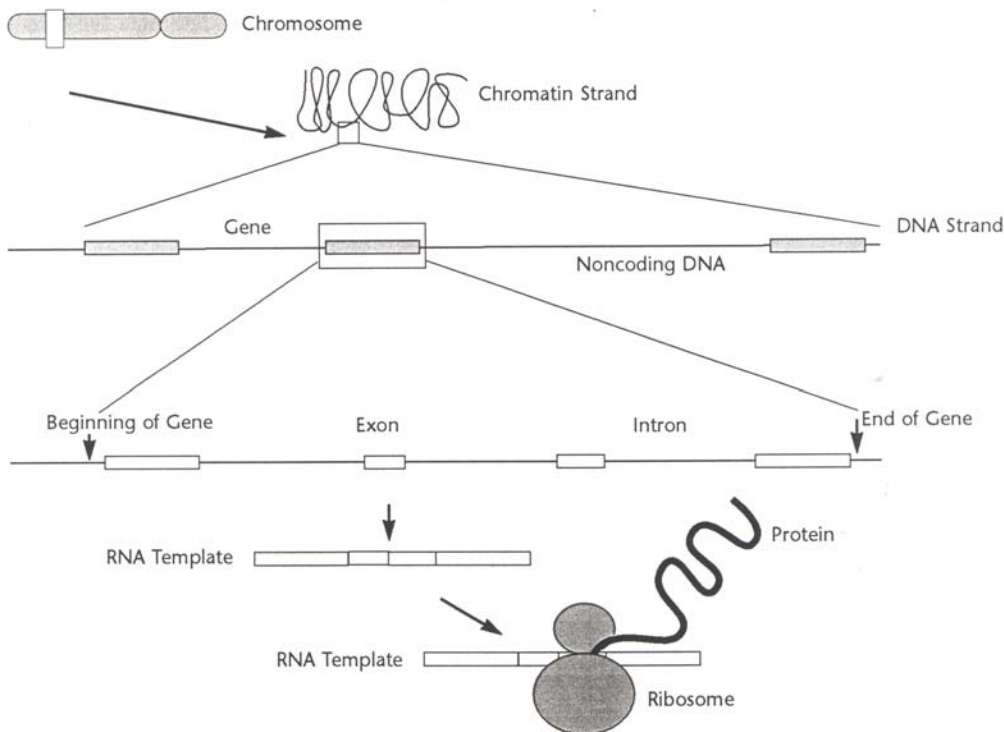
Introduction:

Chromosomes, Genes, and DNA

The genes which determine the functions of human cells are encoded in the 46 chromosomes in the nucleus of the cell. If all the chromosomes in a cell were uncoiled and laid end to end, they would be almost two meters in length and so thin that you would need an electron microscope to see them. Each chromosome is a long strand of chromatin, which consists of proteins entwined around a double helix of deoxyribonucleic acid, or DNA, containing the linear code of nucleotide molecules known as genes.

Genes are coded by the sequence of nucleotide base pairs which form a template for the ribosomes to make proteins out of amino acids (Figure 1). There are about three billion coding base pairs of nucleotides in the DNA; the total number of genes has been estimated to be from 70,000 to over 100,000. Genes, spaced like beads on a string, make up only about 10% of the total DNA; variable lengths of noncoding DNA fill the spaces between the genes.

Figure 1 Transcription and Translation



© 1998 WARD'S Natural Science Establishment, Inc. All Rights Reserved. 250-1449

DNA was first recognized as a cellular substance called nucleoprotein by Meischer in 1871. The term nucleic acid was coined in 1899. Although the chromosomal basis of heredity was recognized by Sutton in 1902, it was not until as late as 1944 that the importance of DNA as the substance actually containing the genetic coding was recognized. An intense period of investigation into and speculation about the structure of DNA was resolved in 1953, when Watson and Crick published their description of DNA as a double helix: two chains of nucleotides which are mirror images of each other.

The correct human diploid chromosome number (46) was recognized later, in 1956. This discovery led to advances in experimental techniques, technology, and theory, all advancing the field of genetics at a rapid rate, and all founded on the techniques of molecular biology.

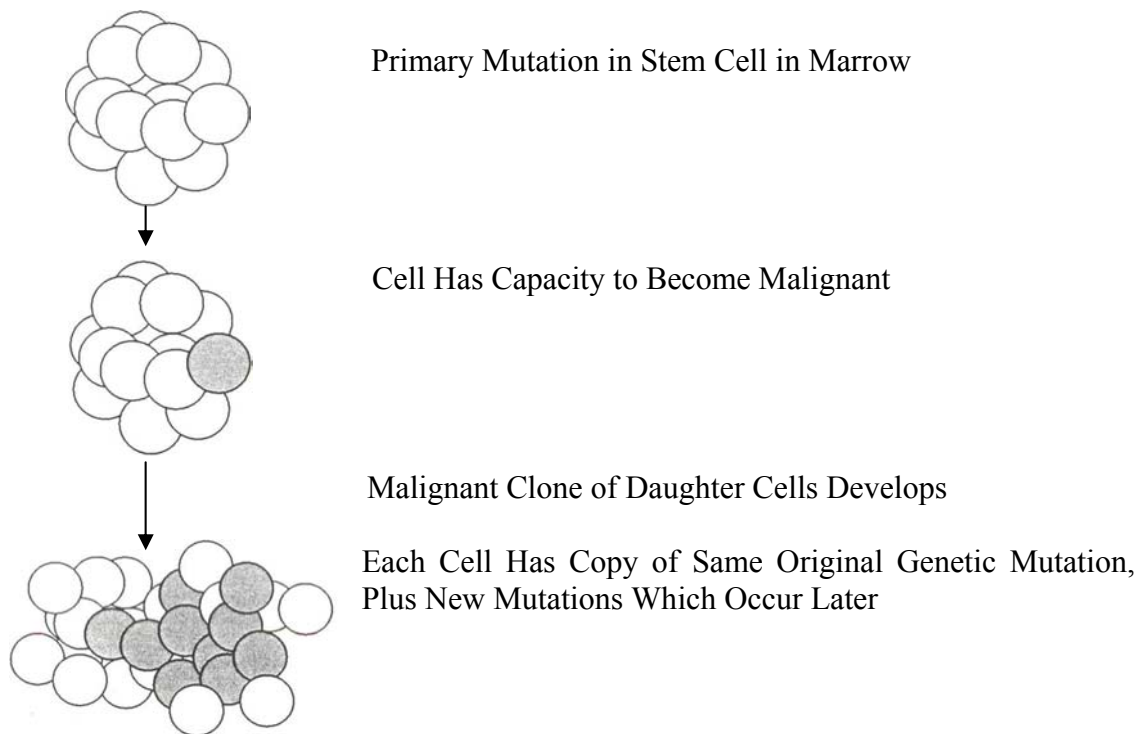
Applications of Molecular Biology

Molecular biology is used in the diagnosis and treatment of disease; identification of individuals through paternity testing, forensic science, populations studies, etc.; species identification and taxonomy (plants, animals, bacteria, viruses); evolutionary and archaeological studies (anthropology, zoology, biology); evaluation of biohazardous risks through mutation research, toxicology, etc.; as well as biotechnology itself, which involves genetic engineering of bacteria, plants, or animals for food or commercial products and gene therapy for human disease.

Molecular Diagnosis of Cancer

Cancers arise because genetic mutations lead to loss of control over the growth, differentiation, and death of the cells forming the tumor (Figure 2). The primary mutations starting the process are often specific to the type of tumor which eventually develops, and therefore can be used to identify and classify the type of tumor. This early identification allows the most appropriate type of treatment to be chosen, maximizing the chance of a cure.

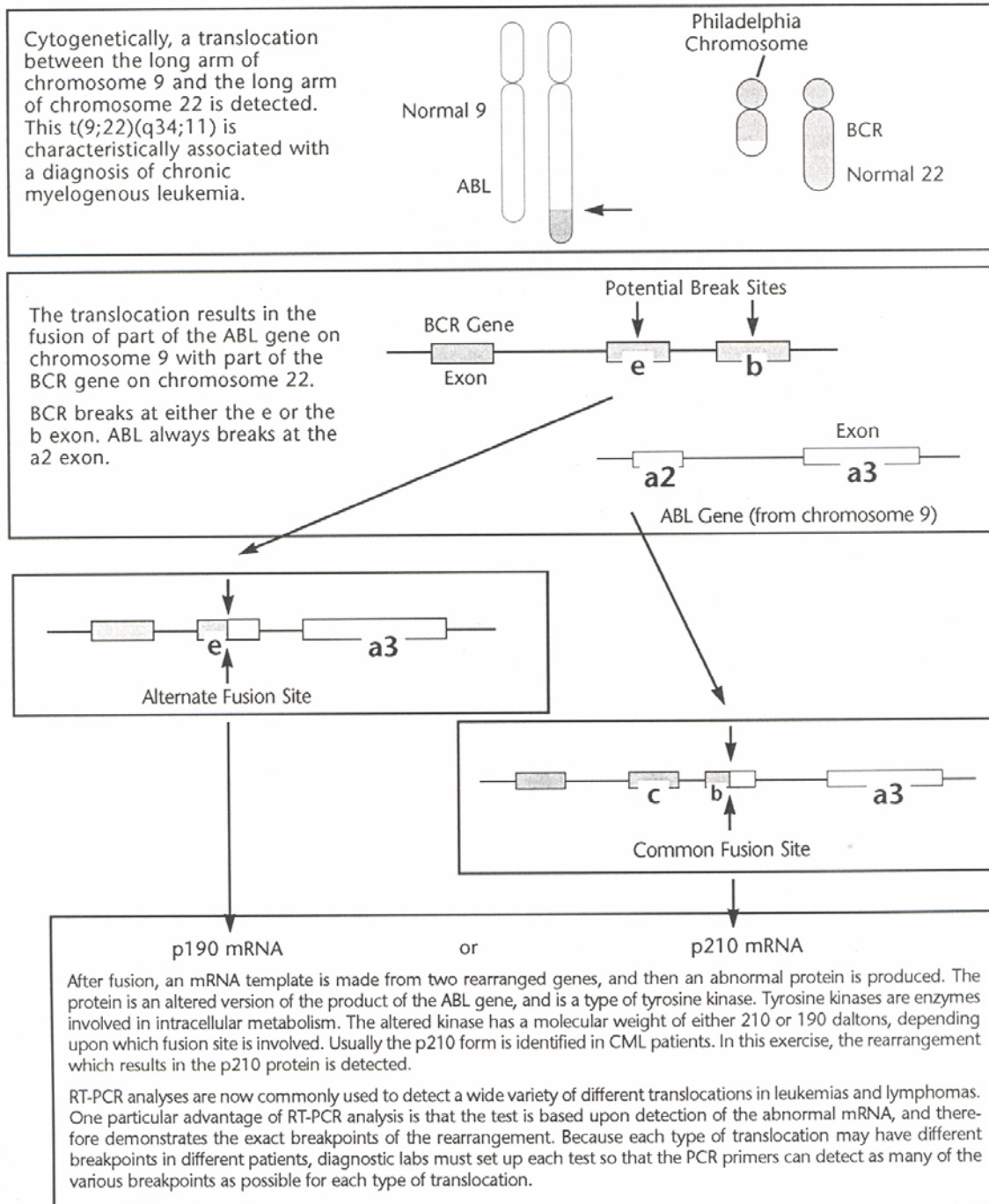
Figure 2
Primary Mutations Lead to a Clone of Malignant Cells



Philadelphia Translocation and Chronic Myelogenous Leukemia

Chronic myelogenous leukemia, or CML, is caused by the rearrangement of two genes, BCR and ABL. This mutation, named the Philadelphia translocation because it was recognized by Nowell and Hungerford in that city in 1960, was the first genetic mutation discovered to be associated with cancer (Figure 3). In the following decades, molecular techniques were used to identify BCR and ABL rearranged by chromosome translocation.

Figure 3
CML: Molecular Basis of the Philadelphia Translocation

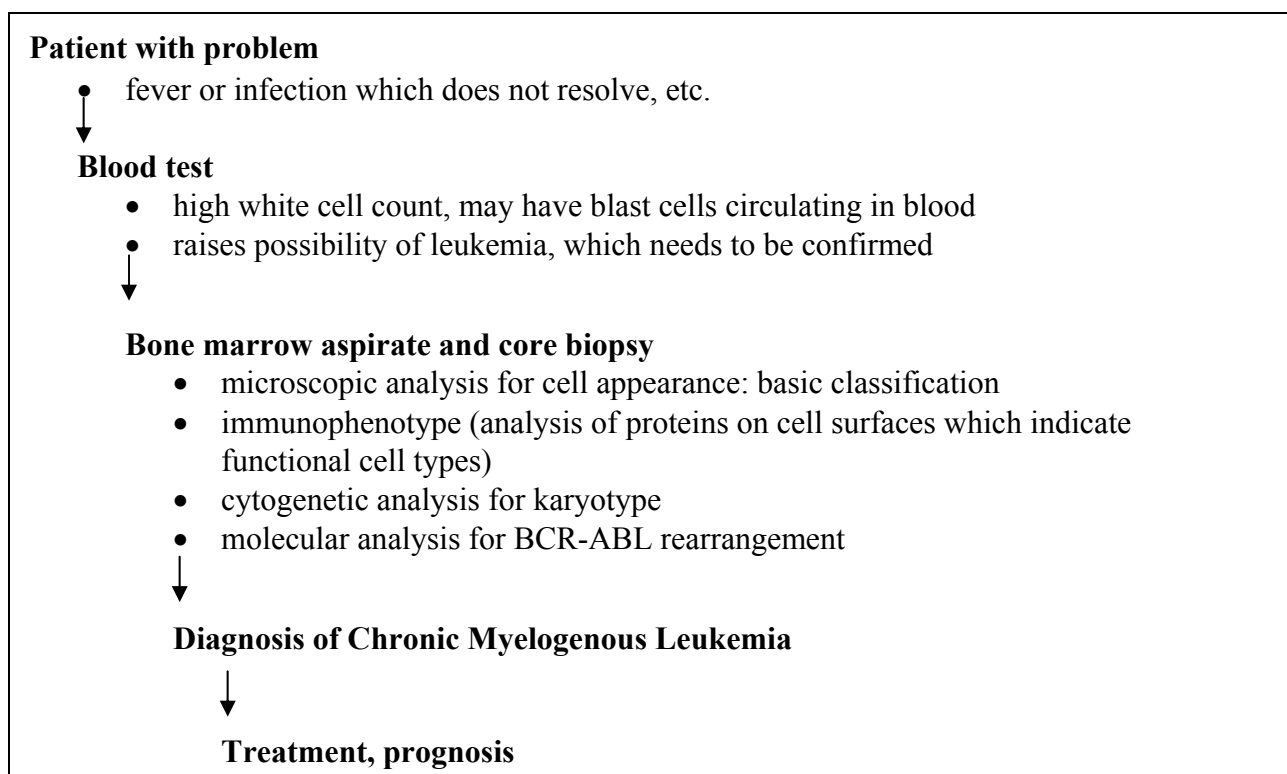


When this mutation occurs in a primitive blood-forming stem cell in the bone marrow, it leads to a clone of daughter cells which later form cancer. This rearrangement alone is enough to cause the development of cancer; the fusion of BCR and ABL results in production of an abnormal form of a tyrosine kinase enzyme, which alters cellular metabolism and interrupts the orderly maturation of white cells in the marrow.

Clinical History of CML

CML, affecting patients of any age but most commonly recognized in elderly people, follows a series of specific steps (Figure 4). Patients first feel unwell and often develop colds or fevers which do not go away. The result of a blood test shows a very high number of white cells. A specimen of the bone marrow is then examined, where the blood cells form before being released to the blood. In the marrow, many tumor cells are found, crowding out the remnants of normal developing blood cells. The diagnosis of chronic myelogenous leukemia is confirmed by a cell marker analysis (the proteins expressed by the cells), a cytogenetic analysis, and a molecular analysis of marrow or blood cells.

Figure 4
Plan of Diagnostic Assessment for Leukemia



The cytogenetic and molecular tests are used to detect the Philadelphia translocation. Once the diagnosis has been confirmed, treatments are begun which are designed to stabilize the patient, reduce the number of malignant cells, and prepare the patient for a bone marrow transplant, which offers the best long-term chance for a cure. It is very important to be absolutely certain of the diagnosis, because the treatment is specifically optimized for CML as opposed to other types of leukemia, is toxic, and very costly.

Molecular Diagnosis of CML by Detection of BCR-ABL Rearrangement

At a molecular level, CML is confirmed by demonstrating that the oncogene ABL has been translocated from its normal location at the end of chromosome 9 to the end of chromosome 22, where it is fused to part of the BCR gene. The rearrangement requires two breaks: one on chromosome 9, which interrupts ABL and lets part of it break away and move to chromosome 22, and one on chromosome 22, which interrupts BCR and lets the fragment of ABL join on. Because there are thousands of nucleotide base pairs which form the code for each of these genes, the exact sites of the breaks in the two genes vary from patient to patient.

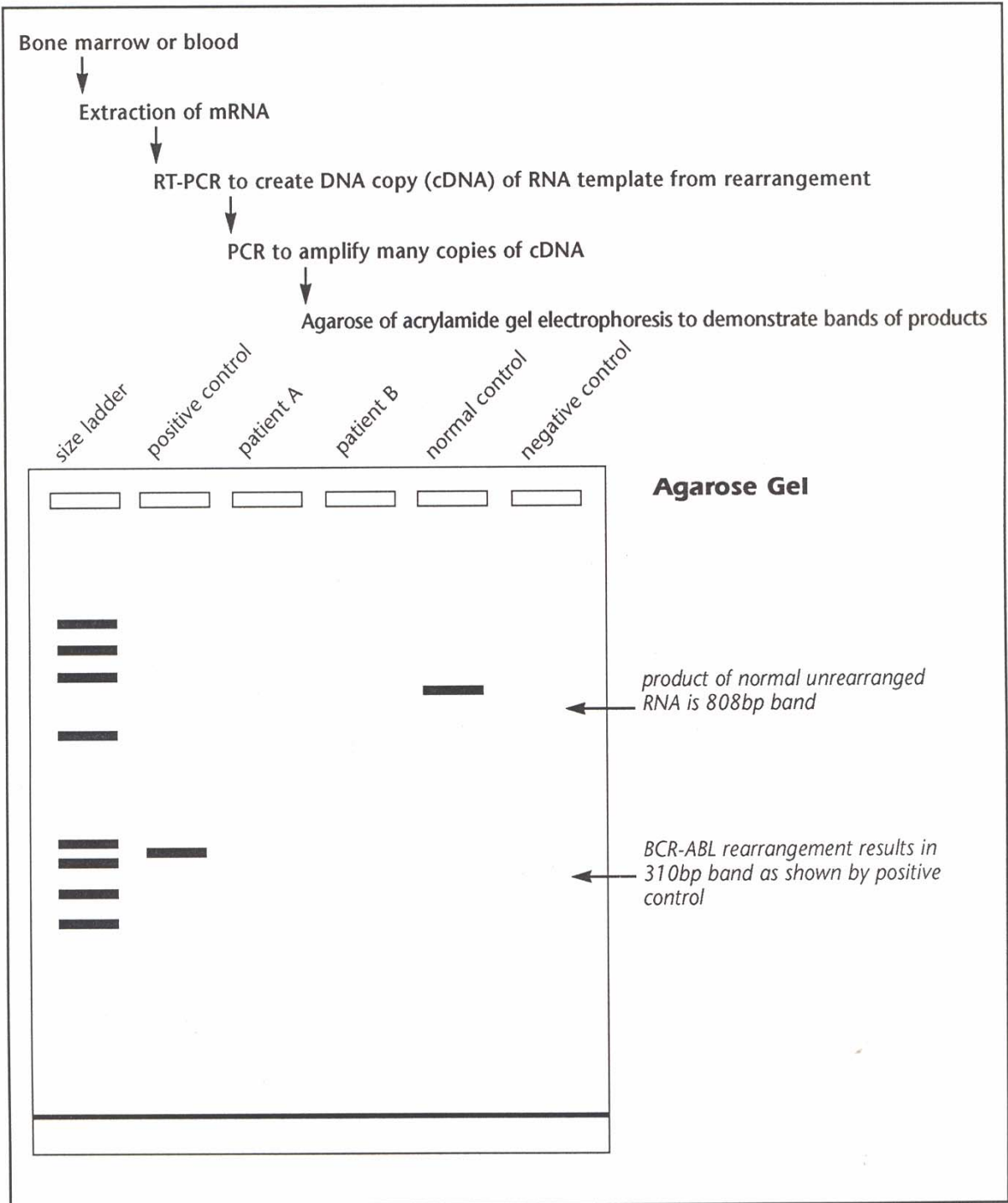
Each patient will actually have a mixture of normal and malignant cells in their bone marrow and blood, and only the malignant cells will have the mutation. Therefore, in order to reliably detect the translocation, a sensitive test is required which can detect a minority of cells producing an abnormal protein from a fusion gene allowing some variation in the exact sites of the breakpoints of the two genes involved.

This diagnostic test uses the technique of reverse transcription (RT) from RNA to create a DNA template which can be amplified by polymerase chain reaction (PCR) to very specifically indicate the exact nature of the genetic rearrangement (Figures 3 and 5). The RT-PCR technique is often used because it is very sensitive, detecting as few as one out of 10,000 positive cells; relatively fast, providing results in only one day; and very specific, with the size of the bands in the resulting gel indicating the actual breakpoints.

Technical Method for RT -PCR Analysis of BCR-ABL

The procedure for molecular diagnosis of CML, outlined in Figure 5, begins with the extraction of RNA from the patient's blood or bone marrow. The enzyme reverse transcriptase is then used to create copies of DNA from the RNA. The DNA copies are cDNA rather than genomic DNA; therefore, they reflect the actual sequence used to make the fusion protein which causes the tumor. The DNA copy is then amplified again by PCR, so that many more copies of the exact sequence are made. The products of this PCR reaction are then put into an agarose or polyacrylamide gel so that the sizes of the resulting bands illustrate whether a rearrangement has occurred.

Figure 5
Molecular Diagnosis of CML



The positive control is a cell line; all cells have the rearrangement, and therefore there is only one abnormal band. The B specimen has a mixture of normal cells and abnormal cells, and therefore there are two bands.

Objective:

To perform agarose gel electrophoresis with DNA specimens in a simulation of a molecular diagnostic test for chronic myelogenous leukemia.

Materials Needed per Team:

DNA Samples (10 μ l per well)

Positive Control

Normal Control

Negative Control

Patient A

Patient B

Size Markers

1 Cast Agarose Gel

TBE Running Buffer 1X (350 mL per electrophoresis chamber)

Dilute WARD'S QUIKView DNA Stain, 100 mL per gel

1 Gel Staining Tray

1 Set of Student Study and Analysis Sheets

Shared Materials

Electrophoresis Chamber Power Supply Micropipets with Tips

Notes on the Experiment:

Specimen DNA

DNA is extracted from blood by removing the plasma, lysing the cells, and processing the residual pellet of genetic material to purify the DNA for further study. Because RNA is very unstable prior to processing, the quality and quantity of RNA obtained is checked by a test gel electrophoresis and measurement of optical density. If it is suitable for analysis, it is then used to make DNA by RT-PCR.

To make DNA from RNA, the RNA is incubated in a special buffer solution containing nucleotides and reverse transcriptase; the products of this reverse transcription are DNA copies of the RNA templates.

To obtain millions of copies of the specific genetic rearrangement, the DNA products are then subjected to PCR using a combination of primers which permit copies of the fusion gene to be made. After about 35 cycles of the PCR, enough DNA is available to load onto a gel in order to determine the sizes of bands produced. Remember that copies of DNA are made only for the specific sequences desired. This is determined by the choice of the oligonucleotide primers used as starting points for the polymerase enzyme to construct the DNA copies.

The primers are carefully chosen to reliably serve as starting points for the polymerase in all patients, despite variations in the exact site of the breakpoints. One primer is used to start replication from the BCR end; the other primer is used to start replication from the ABL end. The PCR reaction produces millions of copies of the DNA sequence spanning the breakpoint. The DNA specimen in this kit simulates the product of RT-PCR which would be obtained in a diagnostic laboratory.

Note: *The typical specimen is 7 to 2mL of marrow aspirate or blood, but far smaller amounts will sometimes provide a conclusive result. RNA is stable only for 72 to 24 hours in blood and marrow specimens. Once extracted, however, both RNA and DNA can be stored at low temperature for years.*

Controls

PCR is very sensitive; therefore, it is important to use control specimens to show that products are genuine and not the result of laboratory contamination or error.

Included in this kit:

- Positive Control; produces simulation of result indicating that a person has CML
- Normal Control; produces simulation of result indicating that a person does not have CML (*lithe germline band*)
- Negative Control; most critical control that should always be loaded last, contains no DNA and should produce no band, indicating that the lanes were loaded properly and not contaminated by accidental transfer of PCR reagents
- DNA Samples; unknown specimens from Patient A and Patient B
- Size Markers; bands of various known sizes used to estimate the actual size of the fragment in the test and control lanes

Preparation Notes

Safety: *The power supply produces a high enough voltage to cause severe electrical shock if handled improperly. For safe operation, follow all directions and precautions. Examine all components of the electrophoresis apparatus prior to each use: all cords, plugs, jacks, the electrophoresis chamber itself and the power supply. Be sure you are well acquainted with the correct operation of the unit and know how to make proper electrical connections. Wear personal protective equipment: safety goggles and smocks or aprons while loading gels and during electrophoresis, and protective gloves when staining.*

Procedure:

Casting an Agarose Gel

Note: *Your instructor may have cast the gel ahead of time. If this is the case, begin with “Loading and Running a Gel”.*

1. Snap the end dams onto each end of the gel casting tray. The end dams seal the ends of the tray, eliminating the need to tape the ends.
2. Insert the gel comb, using either the 8-well or the 16-well side, into the slots near the end of the tray.
3. Pour approximately 25mL melted agarose into the tray, until it reaches a depth of about 3mm.
4. Allow the gel to solidify for approximately 20 minutes. Do not disturb the gel tray or comb. When the agarose has solidified, it will turn opaque.
5. After the gel has solidified, carefully remove the comb from the gel. Remove the end dams from the tray by carefully sliding them out.

Loading and Running a Gel

1. Load 10µl from each sample tube onto a corresponding gel lane with a micropipet. Do not pierce the bottom of the wells with the micropipet tip. Do not overload wells.

Lane #1: Size Marker

Lane #2: Positive Control

Lane #3: Patient A

Lane #4: Patient B

Lane #5: Normal Control

Lane #6: Negative Control

Note: *The amount of DNA in the reaction tubes are extremely small. Your instructor will demonstrate the correct procedures needed to transfer samples from these reaction tubes to the wells on the gel.*

2. Place the loaded gel on the gel tray, in the center of the chamber. Position the well-side of the gel near the black (negative) electrode.
3. Add approximately 350mL of 1 X TBE running buffer to the chamber: Carefully pour buffer from a beaker into one compartment of the cell. When the level of the buffer in the compartment reaches the gel, pour running buffer into the other compartments until the level of buffer in each compartment reaches the gel. Add more running buffer to the compartment nearest the red (positive) terminal until the buffer level is approximately 2mm above the top of the gel.

Note: *Do not overfill the compartments. Wipe off any spills.*

4. Making sure the cover is dry, slide it onto the electrophoresis chamber. Wipe off any spills on the apparatus before proceeding to the next step.
5. Making sure that the patch cords attached to the cover, as well as the female plugs and the banana jacks on the chamber are completely dry, connect the red patch cord to the red electrode terminal on the power supply. Connect the black patch cord to the black electrode terminal on the power supply.

Note: *Be sure your instructor checks the connections before proceeding to the next step.*

6. Plug in the power supply and set it to either 75V or 125V.
7. Turn on the power supply. The red power light will illuminate and bubbles will form along the platinum electrodes.
8. Observe the migration of the sample down the gel toward the red electrode. Turn off the power when the loading dye has neared the end of the gel. Unplug the power supply.
9. Wait approximately 10 seconds, then disconnect the patch cords first from the power supply and then from the chamber.
10. Put a notch in one side of the gel to ensure the lanes can be identified after the gel is removed from the unit.
11. Lift the gel tray with the gel from the chamber and gently place the gel in the staining tray.
12. Wearing protective gloves, pour approximately 100mL of warmed dilute stain into the staining tray so the stain just covers the gel.
13. Cover and let gel stain for approximately 30 minutes.
14. When the gel has completed staining, carefully decant the used stain. Make sure the gel remains flat and does not move up against the corner. Decant the stain directly to a sink drain and flush with water.

Note: *The dilute DNA stain may be saved and reused several times. For best results, reheat the stain before reusing.*

15. Add warm distilled or tap water (50° to 55°C) to the staining tray. To accelerate destaining, gently rock the tray. Destain until bands are distinct, with little background color. This will take between 20 and 30 minutes, depending on the amount of agitation. Change the water several times or destain the gel in water overnight. Destaining overnight will produce dark blue DNA bands and a colorless background.
16. View the gel against a light background, such as white paper, or on a light table. Gels can be stored in self-sealing plastic bags. For long-term storage, add several drops of dilute stain to the bag to prevent the DNA bands from fading. If fading does occur, the gel can be restained using the above procedure.

Note: *Wash hands thoroughly before leaving the lab.*

Analysis/Conclusions:

Standard Curve Plot

The length of DNA is frequently given in nucleotide base pairs (bp) for smaller fragments and kilobase (kb) for larger ones. Under a given set of electrophoretic conditions (pH, voltage, time, gel type and concentration, etc.) the electrophoretic mobility of a DNA fragment molecule is standard. Thus the length of a given DNA fragment can be determined by comparing its electrophoretic mobility on an agarose gel with that of a DNA marker sample of known lengths. The smaller the DNA fragment, the faster it will move down the gel during electrophoresis. Under identical electrophoretic conditions, each fragment has a "relative mobility" value (R_f). R_f can be expressed as:

$$R_f = \frac{\text{distance the DNA fragment has migrated from the origin (gel well)}}{\text{distance from the origin to the reference point (tracking dye)}}$$

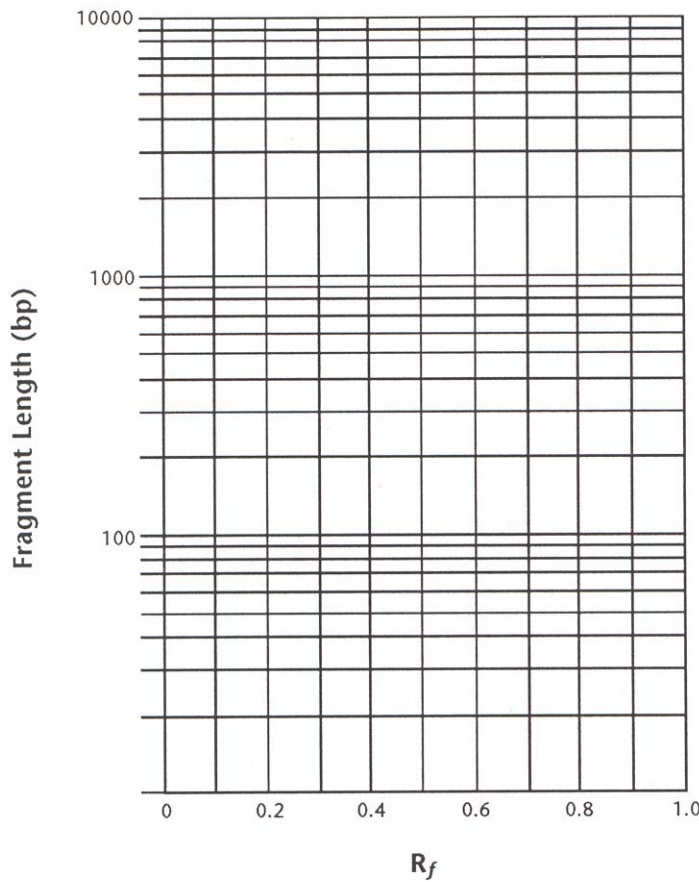
A standard curve is constructed by plotting the R_f value of each standard DNA fragment versus its molecular size in base pairs.

1. Measure the distance in mm from the sample well to each fragment. Record each in the table, in order, beginning with the band closest to the sample well.
2. Measure the distance from a sample well to the end of the gel.
3. Calculate the R_f of each fragment; record data in Table 1.

Table 1
DNA Marker Standard

Sample (DNA Marker)	Fragment Length in Base Pairs	Distance Migrated (mm)*	R_f
Fragment 1		1353	
Fragment 2		1078	
Fragment 3		872	
Fragment 4		603	
Fragment 5		310	
Fragment 6		281	
Fragment 7		234	
Fragment 8		194	
Tracking Dye		-	

4. On the graph below, draw a standard curve for this marker. Plot R_f against its molecular size in base pairs.



5. Using your standard curve, determine the base pair size of the fragments of the positive control, the normal control, Patient A, and Patient B.

Sample	Distance Migrated (mm)	R_f	Fragment Length in Base Pairs
Lane 2 (Positive Control) Fragment 1			
Lane 3 (Patient A) Fragment 1			
Lane 4 (Patient B) Fragment 1 Fragment 2			
Lane 5 (Normal Control) Fragment 1			
Lane 6 (Negative Control)		No Bands	

Student Activity 3:

Alternative Therapy Report

Name _____

Purpose:

Alternative therapy is a group of treatments originating from Eastern and other philosophies of the mind, body and soul. These forms of treatment were once rejected by Western medicine as primitive quack medicine. Today, they are becoming more widely used and accepted as they are showing proven results. Understanding the uses and pitfalls of these therapies will allow you to make informed decisions regarding your pet.

Objectives:

The students will research one of the many types of alternative therapy being practiced today.

Materials:

Internet

Encyclopedia

Medical publications

Local resources (veterinarians or others practicing alternative therapy)

Procedure:

1. Choose an alternative therapy from the list on handout 6 or other source.
2. Research this therapy using the Internet, medical publications, and local people who use or practice that therapy.
3. Answer the following questions and produce an informational brochure that can be shared with your class.
 - a. What medical theory or spiritual belief is the foundation of this therapy? Explain.
 - b. What results are supposed to be gained by using this therapy?
 - c. Explain the treatment process this therapy uses.
 - d. Are you required to hold a medical degree or other license to practice this therapy? If yes, explain.
 - e. How common is this therapy?
 - f. What concerns do doctors of traditional medicine hold about this therapy?
 - g. Would you ever use this therapy for yourself or your pet? Why or why not?

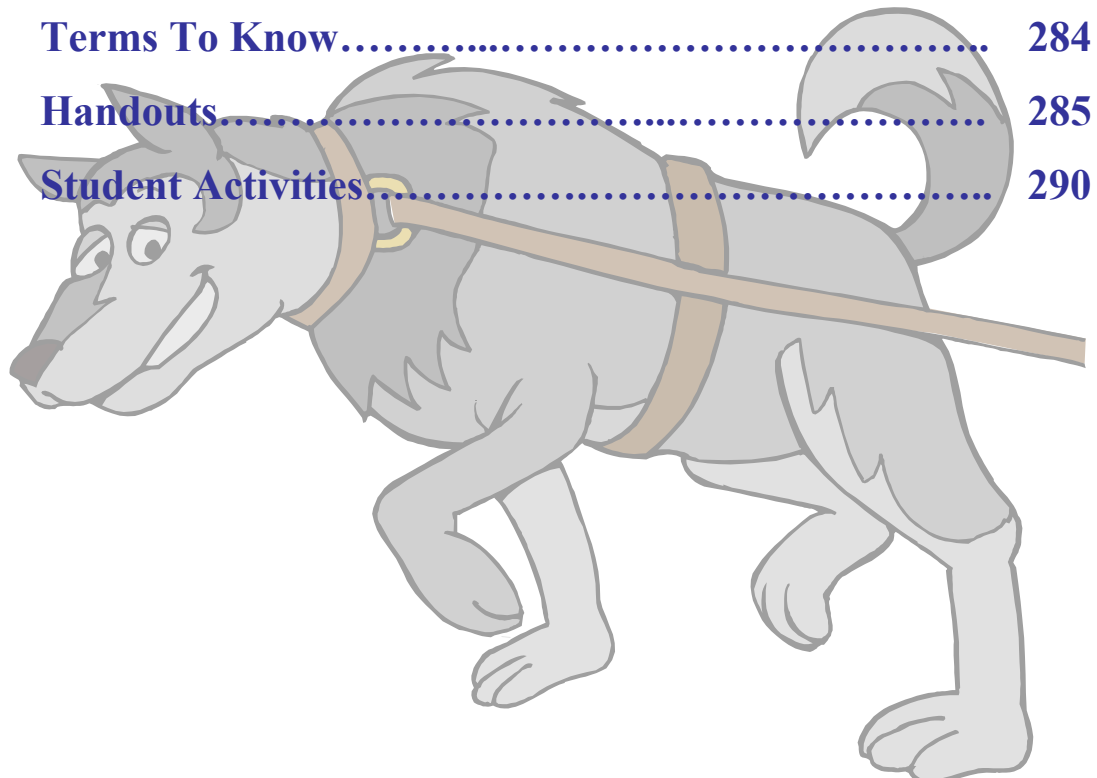
Animals in Society

By Elisabeth A. Martinec

This unit covers the human and animal bond, uses of animals, the rights vs. welfare issue and other animal issues including: overpopulation, abuse, endangered species, and euthanasia.

Unit L Contents

Terms To Know	284
Handouts	285
Student Activities	290

A cartoon illustration of a grey dog with a brown collar and a yellow bell. A wooden stick is positioned horizontally through the dog's back, passing between its shoulder blades and hindquarters. The dog is shown in profile, facing left, with a friendly expression.

Terms To Know

Animal activist – a person who takes political or physical action to protect and preserve animals and their environment

Animal rights – the position that using animals for human purposes is ethically and morally wrong

Animal welfare – the belief that animals should be treated in a humane manner

Bond – a uniting force or tie

Euthanasia – the act of painlessly ending a life

Ethic – a principle of right or good conduct

Name _____

Animal Roles

Directions: In the spaces provided, write down as many specific examples of animals that fill these various roles.

Food & Clothing

Leather, meat, fur, hair

Sports & Recreation

Hunting, racing, showing, riding

Service & Protection

Therapy, search and rescue, drug/bomb detection, attack, guard, guide and aide, seizure detection, herding, water rescue

Name _____

What Animal Rights Means to Me

Directions: In the space provided, write a short paragraph explaining what you think is the difference between animal rights and animal welfare. Then, at the bottom of the page write the definitions of animal rights and animal welfare given to you by your teacher.

Animal Rights –

Animal Welfare –

Name _____

Welfare Timeline

Directions: Work in groups of three or more, research the following events and write a short description for each date.

1641 – “The Body of Liberties” legal code passed by the Massachusetts Bay Colony

1828 – First anti-cruelty law passed by New York legislature

1866 – American Society for the Prevention of Cruelty to Animals (ASPCA) was formed

1867 – Henry Bergh drafted “An Act for More Effectual Prevention of Cruelty to Animals

1906 – The Animal Transportation Act was passed

1958 – The Humane Slaughter Act was passed

1964 – Ruth Harrison wrote “Animal Machines: The New Factory Farming Industry”

1966 – Laboratory Animal Welfare Act (AWA) passed

1970 – AWA was amended

1970 – The Horse Protection Act passed

early 1970’s – modern animal rights movement began

Handout-3 cont.

1972 – Marine Mammal Protection Act was passed

1973 – Endangered Species Act” was passed

1975 – Peter Singer writes “Animal Liberation”

1976 – Horse Protection Act was amended

1985 – Improved Standards for Laboratory Animals Act was passed

1986 – Animal Liberation Front (ALF) destroys labs at Oregon State University

1989 – The Farm Animal and Research Facilities Protection Act was introduced

1990 – Food, Agriculture, Conservation and Trade Act was passed

1990 – “March for the Animals” in Washington D.C.

1992 – The Animal Enterprise Protection Act was passed

1999 – Federal Law Enforcement Animal Protection Act was passed

2002 – AWA amended

2002 – Animal Fighting Enforcement Act introduced

2002 – Captive Wildlife Safety Act introduced

Name _____

Animal Issues

Directions: Use the following issues as a basis for a class discussion. What is your opinion on these issues?

- **Abuse and neglect** – Millions of abused animals are rescued every year. These animals have not received adequate food, water, shelter, or medical attention. Most big cities now have animal control officers who have the power to seize abused animals and arrest their owners.
- **Illegal capture and trade** – Many animals are captured, traded illegally and even killed. Exotic species such as apes, elephants, tigers, and birds are prized for meat, ivory, fur, or sale as pets. Animal poaching has led to the endangerment of many species.
- **Overpopulation** – Irresponsible breeding and failure to have dogs and cats spayed or neutered has led to a serious overpopulation problem and severely overcrowded shelters.
- **Euthanasia** – Euthanasia is the act of painlessly ending the life of a sick animal. Issues arise however when owners want their animal euthanized when there is nothing wrong with it, or when healthy animals are euthanized to make space in an overcrowded shelter.
- **Exotic species** – Exotic animals have always been prized as pets and for carnival and zoo exhibits, but because of their unique environmental and nutritional requirements are difficult to maintain in captivity.
- **Production agriculture** – There has always been heated debate over the methods used in production agriculture. Problems with overcrowding, transport, slaughter, and disease were at the forefront of the animal rights movement and continue to be a main issue.
- **Hunting (legal and illegal)** – At one time hunting was a necessity of life, now however, hunting is mainly a sport. Legal hunting helps to maintain the population levels of certain animals. Illegal hunting, often of exotic species, reduces already endangered species.
- **Education and research** – Animals used for education and research have gotten a lot of media attention in the last twenty years. Many schools no longer dissect animals in class and many companies that once tested on animals have discontinued the practice.
- **Endangered species** – Many species of animals are now endangered due to pollution, deforestation, urban sprawl, poaching, etc. There are programs and organizations that focus on the rehabilitation of specific species and because of them, many animal populations have been brought back to stable numbers.

Student Activity 1:

Research a Role

Name _____

Purpose:

Animals are used by humans in many different ways and it is important to understand how they are used so that issues surrounding their use can be looked at in an objective manner.

Objectives:

Students will research one of the ways animals are used by society today and give a class report.

Materials:

Breed magazines
Library
Internet
Personal interviews

Procedure:

1. Choose an animal role to research either from the list on Handout-1, or from some other source.
2. Research the role you have chosen by using breed magazines, the library, Internet, and/or personal interviews.
3. Prepare a presentation using a poster or PowerPoint.
4. Include the answers to the following questions in your presentation.
 - a. Why are you interested in this particular animal role?
 - b. What is the history of animal use in this role?
 - c. How has the use of the animal in this role changed over the past 100 years?
 - d. What breeds are best suited to this role?
 - e. Are there any recent advances being made and what are they?
 - f. Are there any controversies over animals used in this role and if so, what are they?

Student Activity 2: Rights/Welfare Debate

Name _____

Purpose:

The rights/welfare debate has been raging for a long time. Its intricacies should be thoroughly understood so that an objective opinion can be formed and information can be filtered through an objective lens.

Objectives:

The students will develop the skills needed to participate in a debate of issues.

Materials:

Library
Journals
Internet

Procedure:

1. Using standard debating practices, research and debate the animal rights/welfare issue.
2. Form a debating team and toss a coin to determine which side your team will debate.
3. Research and organize your side of the issue using note cards.
4. Participate in a debate.

Student Activity 3:

Fundraiser

Name _____

Purpose:

There are many groups doing work to protect and preserve animals. Most of these groups often work on a non-profit basis and need donations to run their programs.

Objectives:

Students will choose a group that has a mission which they support and run a fundraiser to give a donation to the group.

Procedure:

You should now be familiar with numerous animal rights/welfare organizations and their causes.

1. As a class, choose an organization that you want to support with a fundraiser.
2. Decide on what type of activity you will run as a fundraiser. It should be animal related.
3. Hold the fundraiser and donate the proceeds.
4. Some ideas for fundraisers are listed below.
 - Owner and dog walk – owners could pay a fee or get sponsors for the walk.
 - Dog wash
 - Food/donation drive
 - Sponsor a pet at the ASPCA for money or supplies
 - Make and sell dog/horse/cat treats

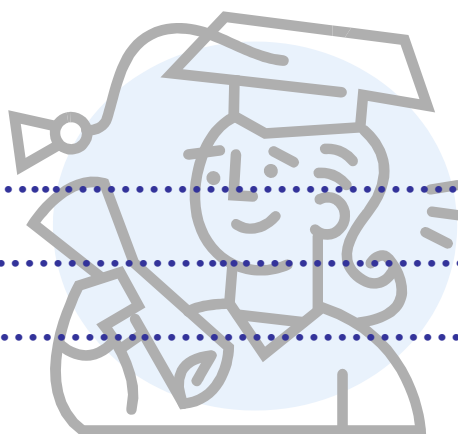
Career Exploration

By Elisabeth A. Martinec

The focus of this unit is exploring careers in veterinary science. Topics covered include: choosing a career, getting an education, the job search, developing good work habits and professional ethics.

Unit M Contents

Terms To Know.....	294
Handouts.....	295
Student Activities.....	302



Terms To Know

Career – a chosen pursuit; profession or occupation

Career planning – the steps one goes through to find, obtain, and maintain a career

Career Profile – an outline of a career including: job description, salary, education, skills needed, benefits, etc

Communication – the exchange of thoughts, messages, or information

Cover Letter – a letter accompanying and introducing a resume

Ethics – a system of moral principles or values

Follow up letter – a letter written after an interview to thank the hiring business for their time and recap your skills and desire to work for them

Job – a regular activity performed for payment

Non-verbal communication – the unspoken elements of communication such as facial expression, posture, spatial cues, and tone of voice

Occupation – another word for career

Reference – a person who is in a position to recommend another, as for a job

Resume – a brief account of one's professional or work experience and qualifications, often submitted with a job application

Transferable skills – skills learned through school, work, or experience that can be put to use in many situations

Verbal communication – the use of words to express ideas and feelings to others

Name _____

Careers in the Veterinary Field

Directions: The following is a list of careers in the veterinary field – if we missed any, add them at the bottom.

Small Animal Veterinarian	Veterinary Technician
Kennel Worker	Equine Veterinarian
Zoo Keeper	Veterinary Assistant
Feed Store Owner	Large Animal Veterinarian
Pharmaceutical Sales	Military Veterinarian
Nutritionist	Farrier (Blacksmith)
Animal Behaviorist	Animal Trainer
Animal Breeder	Research Scientist
Groomer	Lab Animal Technician
Wildlife Rehabilitator	Animal Control Officer
Pet Boarding Owner	Mounted Police Officer
Pet Store Owner	Racetrack Official
Hospital Manager	Dentist
ASPCA	Marine Biologist
Wildlife Conservationist	
Artificial Insemination Technician	
Alternative Therapist (massage, acupuncture, hydrotherapy)	
Government Veterinarian (NASA, FDA, EPA)	

Name _____

Veterinary Colleges

Auburn University (1906)
University of California-Davis (1948)
Colorado State University (1907)
Cornell University (1894)
University of Florida (1965)
University of Georgia (1946)
University of Illinois (1944)
Iowa State University (1879)
Kansas State University (1905)
Louisiana State University (1967)
Michigan State University (1910)
University of Minnesota (1947)
Mississippi State University (1974)
University of Missouri (1946)
North Carolina State University (1975)
The Ohio State University (1885)
Oklahoma State University (1947)
Oregon State University (1975)
University of Pennsylvania (1883)
Purdue University (1957)
University of Tennessee (1974)
Texas A&M University (1916)
Tufts University (1978)
Tuskegee University (1945)
VA-MD Regional (1974)
Washington State University (1899)
University of Wisconsin (1979)

Name _____

Resume and Cover Letter Mistakes to Avoid

1. Addressing letters, "Dear Sir:" or "Dear Sirs:" Many readers today are women, so if gender is unclear, the salutation should be something like "Dear Hiring Manager," or "Dear Human Resources Manager."
2. Addressing letters, "To whom it may concern." Find out who will receive the letter and address it personally.
3. No signature. Even if you type your name at the end of correspondence, you should sign the page in your own handwriting to give it a personal touch.
4. Spelling and grammar errors.
5. Handwriting letters.
6. Using the word "I" too much. Some letters are filled with 20 or 30 I's. Make sure yours aren't.
7. Forgetting to include your phone number.
8. Cluttered design. Avoid using various type sizes and fonts. Business letters should look conservative. If you want to be creative, do so in your choice of words.
9. Not saying enough. A letter is an opportunity to sell. So say something about yourself.
10. Ending with "Thank you for your consideration." EVERYONE ends their letters this way, so try something different, like "I'm excited about talking further," or "I know I could do a good job for you." The same goes for "Sincerely," and "Sincerely yours." EVERYONE uses them. Find something different like "With best regards" or "With great enthusiasm".
11. WRITING IN ALL CAPS. IT'S HARD TO READ. DON'T DO IT.
12. Abbreviating Cir., Ave., Dec., and all other words. Take time to spell out words.
13. Forgetting the date and/or salutation.

Name _____

Sample Cover Letter

Abigail S. Rose
303 Central Avenue
Phoenix, Arizona 00000
(555) 555-1488

November 28, 2002

Ms. Janet Campbell
Veterinary Marketing Corporation
P. O. Box 555
Orchard Park, New York 00000

Dear Ms. Campbell,

Subject: Stanford Alumni Employment Bulletin - Advertisement for President

Enclosed is my resume in response to your advertisement. I found the wording of your advertisement with emphasis on leadership, innovation and change quite intriguing. It is in response to such challenges that I have excelled during my career.

Most recently, I was President of PetCo which I turned around and led to the best performance in its history. Previous to that, I worked successfully in a variety of unusual situations, including the startup of a significant division of Merck and the turnaround of Purina Mills. In each of these situations, the problems (or opportunities) differed widely. They had in common, though, a requirement of an ability to size up the situation, assess the reasonable alternatives and execute a plan of action. My track record shows that I am able to do this.

With regard to the requirement for agricultural experience, I have worked 14 years in veterinary and zoo operations, where I obtained an in-depth exposure to problems facing those industries. Additionally, of course, I was President of PetCo with full responsibility for all operations and financial activities.

I am free to travel and open to relocation. I would welcome the opportunity to meet you and to further discuss your requirements.

Best regards,

Abigail S. Rose

arose@email.com

Name _____

Sample Resume

524 My Street, Anywhere, USA 00000 Phone, Fax, E-mail

Susan Smith**Objective**

To work successfully as an agricultural news reporter.

Skills

- Excellent people skills
- Proficient in layout programming
- Excellent writing skills

Experience

1995–2002 USDA Somewhere, USA

Editor

- Managed the production of the Agricultural Research magazine
- Increased distribution by 25%
- Managed 20 writers

1990–1995 The Gazette Somewhere, USA

Senior Reporter/ Associate Editor

- Wrote a weekly editorial column
- Managed 10 junior reporters
- Implemented new technology for layout and design

1988–1990 The Gazette Somewhere, USA

Junior Reporter

- Covered and reported on local events
- Developed a column on local agricultural issues
- Worked as part of a team to update newspaper layout and design

Education

1986–1990 Carlisle University Somewhere, USA

- B.A., Communications and journalism
- Graduated Summa Cum Laude

Interests

Running, gardening, carpentry, computers

Name _____

Work Habits / Communication

Work Habits:

- Comes to work on time
 - Responsible
 - Good attitude
 - Hard working
- Dresses appropriately
 - Respects others
- Handles criticism well
- Gets along with co-workers
 - Self-motivated
 - Follows directions

Communications Tips:

- Be a good listener
- Don't talk negatively about other co-workers
 - Make eye contact
- Think about what you say *before* you say it
 - Ask questions
- Give advice only when it's asked for
 - Be cheerful and attentive
 - Respect others' ideas
- Stop working when someone talks to you and give them your full attention

Name _____

Vet Tech / Vet Assistant Duties**Responsibilities of *licensed veterinary technicians* include:**

- Physical exam and patient history
- Client education
- Care for hospitalized animals
- Administration of vaccines and medications
- Laboratory procedures
- Dental prophylaxis
- Radiology
- Anesthesiology
- Surgical assistance
- Hospital management
- Research

***Veterinary assistants* are unlicensed individuals whose duties include:**

- Care for basic animal needs under the direction of the veterinarian or technician
- Administer and monitor the use of common physical restraints
- Assist the technician during surgery
- Assist the technician with radiographs
- Collect samples for diagnostic laboratory work
- Perform common laboratory tests under the supervision of the technician
- Perform basic bookkeeping functions
- Prepare labels for medication
- Book appointments
- Perform receptionist duties

Student Activity 1:

Personality/Career Testing

Name _____



Purpose:

To determine your personality type and what careers will best suit you based on your personality.

Materials:

www.nycareerzone.org

www.davideck.com

www.colorwize.com

Procedure:

Visit one of the websites above or search for other online tests and then complete a personality and career test and answer the questions below.

1. List six words or phrases that you feel describe your personality.
 - a.
 - b.
 - c.
 - d.
 - e.
 - f.

2. List the main words or phrases used to describe your personality based on the results of the test you took.
 - a.
 - b.
 - c.
 - d.
 - e.
 - f.
3. Do you feel that the test was mostly accurate or inaccurate? Explain why.
4. Did you learn something about yourself and your personality that you didn't know before? What was it?
5. List the top five careers that the test said would match your personality.
6. Pick three of the five careers that you are most interested in and explain why they interest you.

Student Activity 2: Career Profile Poster

Name _____

Purpose:

Gather in-depth information on one career and present that information to the class in a poster.

Materials:

www.nycareerzone.org

<http://www.bls.gov/oco>

Procedure:

1. Choose a career in the veterinary field that most interests you and construct a career profile poster using the worksheet on the next page.
2. Use the websites listed above to gather information, or conduct a personal interview of someone who works in that career.
3. Find pictures that illustrate the career using the web or any veterinary or animal related magazines to decorate your poster.
4. Write a brief statement on your poster explaining why this career interests you.
5. Compile the information into a poster that can be presented to the class.
6. Present the poster to the class.

Career Profile Worksheet

Directions: Choose a career in the veterinary field that most interests you and use this worksheet to construct a profile of that career.

1. What is the job title?
2. Describe the tasks and responsibilities associated with this job.
3. What is the salary range for this type of career?
4. What education is required for this career?
5. What are the benefits of this career?
6. What kinds of skills do you need to be successful in this career?
7. What types of hours are you expected to work in this career?
8. What are the working conditions for a job of this nature?
9. What are the possibilities for advancement?
10. What are the disadvantages to this career?
11. If interviewing a presenter, what is their background? What path did they take to end up where they are today?
12. After finding the above information, explain how this career fits with your personality and career goals. Are you still interested in this career? Why or why not?

Student Activity 3:

The College Search

Name _____

Purpose:

Searching for a college that meets your needs is important. How far from home do you want to go? Would you prefer a big college or small? What kind of financial aid is available? How rigorous are the academics? All these important questions and more should be answered during the college search.

Objectives:

Students will go through the process of choosing colleges that interest them, contacting those colleges for information, and then synthesizing that information to make informed decisions.

Materials:

College brochures
Websites
Guidance office

Procedure:

1. Make a list of **fifteen** questions that you want to answer when choosing a college that is right for you. For example: What courses will I take? What are the housing and meal arrangements? What is the cost?
2. Identify a career or career area that interests you and find **three** colleges that offer a degree in that career or career area using the Internet or the guidance office.
3. Contact those colleges through e-mail or write them a letter requesting information on their college and specific information on the courses in which you are interested.
4. Once you obtain the information, compile a chart with your questions down the side and the college names across the top. Answer the questions for each college.
5. Choose a college. Then write a ½ page essay on how the answers on your chart affected your decision.

Student Activity 4:

The Job Hunt

Name _____

Purpose:

There are many places to search for jobs besides the newspaper classifieds. The internet is now one of the best methods of job hunting. It gives businesses and job hunters many more options when posting jobs or looking for jobs. College and local business job boards are also good places to search for job postings.

Objectives:


The students will be able to use several job hunting methods when searching for a job.

Materials:


Professional journals (Vet Tech Magazine)
Classifieds
Internet


Procedure:

1. Use at least two of the sources listed above to find job advertisements for positions within the veterinary field.
2. After you have looked at several advertisements and the samples provided, answer the questions that follow the samples.

 Seeking self-motivated, dependable & detail oriented vet. tech. or assistant to join our unique in-pt, out-pt & refill prescription hospital pharmacy. Knowledge of veterinary drugs, prescription terminology & drug calculations preferred, but willing to train the right person. P/T to F/T positions from \$8-\$11/hr., based upon amount of experience/education. Available immediately. Numerous F/T benefits.

 Full-time position for a Certified Veterinary Technician. New clinic opened in Katy. Experience preferred.

 Emergency veterinarian needed for new clinic in Parker, CO. Experience small town charm with the nearby conveniences of a large metropolitan area. We strive to provide our veterinarians with the support staff, equipment, and supplies that are required to practice progressive emergency medicine and critical care. Applicant should have at least two years of clinical experience in critical care medicine and surgery. We need someone who is searching for a busy, team-oriented practice with high standards of medicine, patient care, and client/referring veterinarian relations. The position is for the overnight (5:30 p.m. - 8:30 a.m.) shift with a current rotation of four nights on and four nights off. We offer a guaranteed base salary (\$65,000) along with an attractive benefits package.

 Work for leading Animal Health manufacturer selling products to veterinarians. Qualifications include pharmaceutical sales or pet food sales experience, excellent communications skills, ability to travel. Good leadership skills a must.

1. What types of jobs are advertised?
2. What salaries or salary ranges are listed for each type of job?
3. What types of skills are employers looking for?
4. Does the location (city, rural, state) of the job seem to influence the salary range or type of job available? Explain.
5. What makes an advertisement good or bad from a job seekers point of view?
6. Find an example of a good advertisement and a bad advertisement and copy them here.

Student Activity 5:

Cover Letter and Resume

Name _____

Purpose:

Writing a cover letter and resume is the first step in getting a job. Good cover letters and resumes make an impression that could be the difference between getting an interview or not.

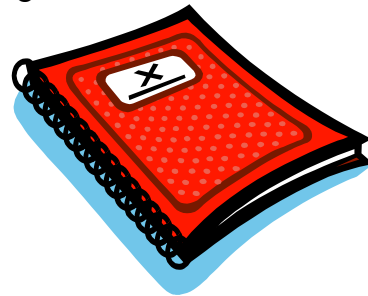
Objectives:

Students will gain the skills needed to develop and write a good cover letter and resume.

Materials:

Handouts 3-5

Internet



Procedure:

1. Choose a job that interests you, either from the list of jobs in handout 1, or from the advertisements you looked at in Activity 4. Write a cover letter and resume as if you were applying for that job. See handout 3 for mistakes to avoid when writing cover letters and resumes.
2. Use the sample cover letter and resume from handouts 4 and 5 as a reference for this activity, or find a template on the internet or in Microsoft Word.
3. Remember to list employment and education starting with the most recent and working back. List skills in order of importance as they relate to the job for which you are applying.

Student Activity 6:

Mock Interviews

Name _____

Purpose:

Having good interview skills is vital since the interview provides the job seeker with an opportunity to make a lasting impression on a potential employer.

Objectives:

Students will gain interview experience by participating in mock interviews.

Procedure:

You will be interviewing for a position as a veterinary assistant at a veterinary hospital in your home town.

Your interview will be on _____ at _____ a.m./p.m.
(insert class day and time when you will be interviewing)

Your interview will be with Mr./Mrs./Ms. _____
(insert name of person giving the interview)

Think of three or four questions to ask the interviewer. They will ask if you have any questions at the end of the interview and it is always good to have a few prepared.

Remember these tips when interviewing:

- Be early
- Dress appropriately
- Make eye contact
- Smile
- Sit up straight
- Speak clearly
- Be positive
- Talk about your strengths
- Ask questions
- Be knowledgeable of the business to which you are applying

Activity 6: Mock Interviews

1. Are you currently employed? If so, what type of work are you performing?
2. Give me a brief background of your education and future educational goals.
3. Why are you interested in this job?
4. Do you have any pets? What kind?
5. What kind of people do you like to work with the most?
6. What skills do you have that would be valuable in a veterinary hospital?
7. If you had a problem with another employee or customer, how would you handle it?
8. Describe your idea of the perfect job for you.
9. What are your interests and hobbies?
10. Do you have any questions for me?

INTERVIEW EVALUATION

Activity 6: Mock Interviews

Person Interviewed: _____

	Excellent	Satisfactory	Needs Improvement	Comments
Dress				
Eye contact				
Speaks clearly				
Posture				
Able to answer questions				
Asked questions				

Overall Suggestions / Comments:

Student Activity 7:

Work habits / Communication Skits

Name _____

Purpose:

Work habits and communication skills are important to success in any job, but are especially important in a veterinary hospital where you work as a member of a team and interact with the public on a daily basis.

Objectives:

Students will develop and act out two skits: one illustrating poor work habits and communication skills and one illustrating good work habits and communication skills.

Materials:

Handout 6
Props

Procedure:

In groups of two or three, develop and act out two skits; one illustrating poor work habits and communication skills and one showing good work habits and communications skills.

Use Handout 6: Work Habits/Communication as a guide. Choose two or three factors to illustrate in each skit.

Prepare your skits carefully, because as you are acting them out the rest of the class will be trying to guess which factors you are illustrating in the skit. You don't want to make it too easy for them!

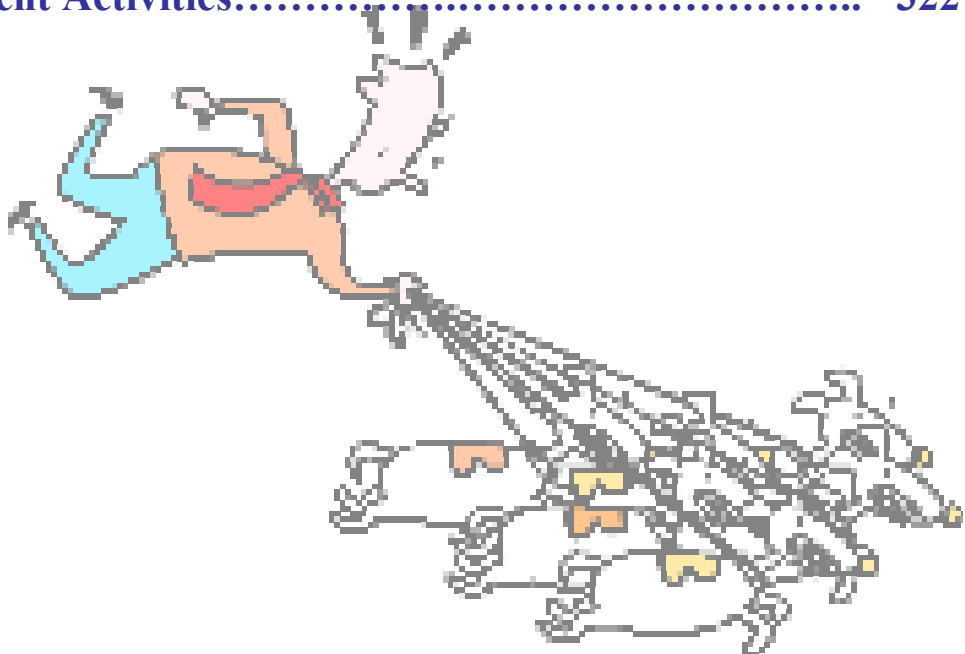
Animal Management

By Sandy Hawkins

This unit covers basic breed identification, behavior and communication, and basic training theories.

Unit N Contents

Terms To Know.....	316
Handouts.....	317
Student Activities.....	322



Terms To Know

Behavior – the actions or reactions of an animal under a given set of circumstances

Conditioning – training to cause a response in a specific manner to a specific stimulus

Ethology – the study of animal behavior in a natural environment or habitat

Husbandry – the careful management and care of an animal or group of animals

Temperament – the manner in which a particular animal behaves and reacts to various stimuli

Name _____

Types of Communication

Directions: Use the spaces provided to take notes on the types of communication seen in groups of animals.

Auditory

Olfactory

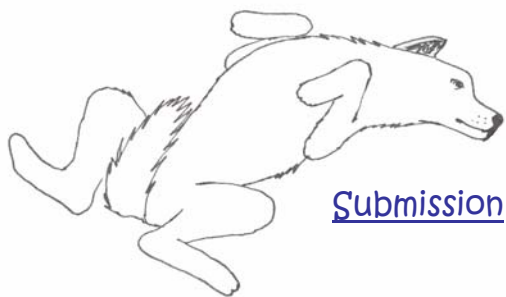
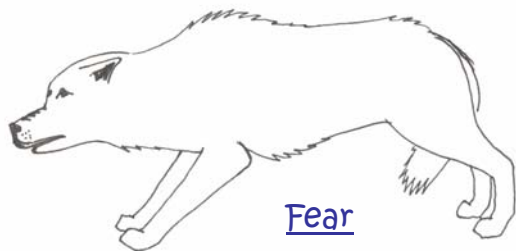
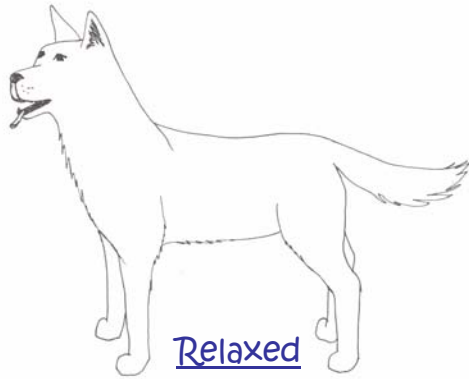
Tactile

Visual

Name _____

Visual Communication

Directions: Use the spaces provided to take notes on the types of visual communication exhibited in dogs.



Name _____

Behavior Factors

Directions: Use the spaces provided to take notes on the factors that influence behavior.

Environmental

Health

Experience

Genetic

Name _____

Patterns of Behavior

Directions: Use the spaces provided to define each type of behavior pattern and then give a species specific example.

Ingestive – patterns and methods of obtaining, eating and drinking food.

Example: Crows feed off of dead animals that were killed by another animal or hit by a car.

Eliminative

Sexual

Mother-young

Agonistic

Gregarious

Social

Shelter-seeking

Investigative

Sleep and rest

Name _____

Basic Training Theories

Directions: Give two examples for each type of training method using other species of animals besides the dog.

Positive reinforcement – correct behavior is rewarded with a pleasant stimulus. Example – dog is told to sit, it sits, dog receives treat within 3 to 5 seconds.

Owner can also reinforce unwanted behavior with positive reinforcement.

1. Allowing dog to come inside when barking - encourages barking!
2. Begging, stealing, and jumping on people.
3. Showing excitement or even mild punishment can be a reward if dog is getting attention.

- 1.
- 2.

Negative reinforcement - *NOT PUNISHMENT* animal escapes or avoids an unpleasant stimulus by performing a behavior. Example – using a choke collar to make dog sit, dog avoids tightening collar by sitting. Fear-biting is negatively reinforced. Person approaches (negative stimulus), dog bites, person backs away removing the negative stimulus and rewarding the dog.

- 1.
- 2.

Punishment – the presentation of a negative stimulus immediately following a behavior that serves to decrease the probability that the behavior will be repeated. This is the most over-used and abused behavior modification technique. *Punishment after-the-fact is not effective!*

- 1.
- 2.

Extinction – removal of positive reinforcement. Example – ignoring a barking dog. The behavior may increase for a while, but eventually the barking will stop. The trick is that you must outlast the dog. This is one of the most effective techniques, but is difficult to implement correctly.

- 1.
- 2.

Student Activity 1:

Breed Identification Poster

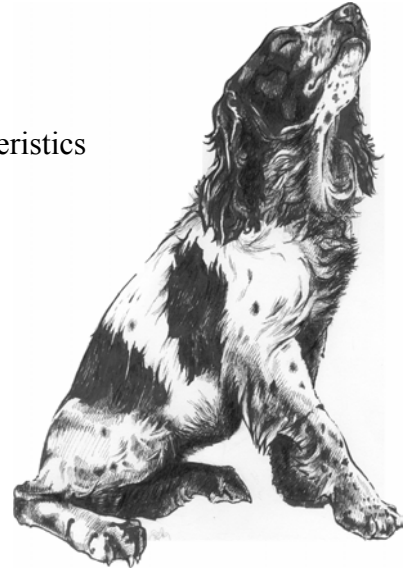
Name _____

Purpose:

To research a specific breed and learn the history and characteristics that makes it unique.

Materials:

Internet
Breed magazines
Encyclopedia
Breed books



Procedure:

1. Choose one breed of animal from any of the following species: horse, dog, cat, cattle, sheep, goats, rabbits, pocket pets or swine.

2. Research the breed, finding answers to the following items.
 - a. History of breed
 - b. Original purpose it was bred for
 - c. Physical characteristics
 - d. Unique or unusual facts
 - e. Colors
 - f. Basic temperament
 - g. Housing and exercise needs
 - h. Social interaction needs

3. Make a decorative informational poster that includes all the information from the list above and pictures of the breed.

Student Activity 2: Observing Animal Behavior

Name _____

Purpose:

Studying animal behavior can provide information that can be used to develop better ways of training, handling, and housing animals. Knowing an individual animal's normal behavior will enable an owner or handler to tell when an animal is sick.

Objectives:

The students will observe patterns of behavior in a group of animals.

Materials:

Groups of animals in a natural setting
Watch with a second hand

Procedure:

1. Observe a group of animals. Choose one animal from the group and watch that animal for 30 minutes. Do not interfere or interact with the animals and maintain a safe distance.
2. Use the general observation sheet to record what your animal does for 30 minutes. Record the amount of time spent eating, standing, lying down, sleeping, and drinking. Also record grooming, mating and courting, mother-young behaviors and vocalizations.
3. Use the quadrant sheet to record the path the animal traveled through its enclosure.
4. Use the tabulation sheet to compile all the data you have gathered.
5. Compare the results for your animal with the results of your classmates and answer the conclusion/analysis questions as a class.

General Observations Sheet

Name: _____

Animal observed: _____

Start Time: _____

End Time: _____

Total Time: _____

Time (minutes)	General Observations
0 – 2 min	
2 – 4 min	
4 – 6 min	
6 – 8 min	
8 – 10 min	
10 – 12 min	
12 – 14 min	
14 – 16 min	
16 – 18 min	
18 – 20 min	
20 – 22 min	
22 – 24 min	
24 – 26 min	
26 – 28 min	
28 – 30 min	

Quadrant Sheet

Divide the animal's enclosure into four sections and sketch the path the animal travels through it.

Keep track of how much time your animal spends in each quadrant by recording the time it enters each quadrant in the corresponding quadrant box below.

A	B
C	D

Tabulation Sheet

1. Compile and tabulate the behaviors you recorded on the general observations sheet.
2. Group each behavior into one of the behavior patterns listed below.
3. Calculate the total minutes spent on each pattern of behavior and the percentage of total time the animal spent on that behavior.
 - a. $\text{Percent} = (\text{total time of behavior} \div 30 \text{ minutes}) \times 100$

Behavior Pattern	Observed Behaviors	Time in Minutes	Percentage of Total Time
Ingestive			
Eliminative			
Sexual			
Mother-Young			
Agonistic			
Gregarious			
Social			
Shelter-Seeking			
Investigative			
Sleep and Rest			
Other			

Analysis/Conclusions:

1. Calculate the time your animal spent in each quadrant and compare it to the amount of time that your classmates' animals spent in each quadrant. Was there one quadrant that all the animals spent more time in? Was there a behavioral or physical reason for the animals to spend more time in one quadrant? Explain.

Student Activity 3:

Behavior Case Studies

Name _____

Purpose:

Accurately identifying behavior problems is the first step in treating them. Many behavior problems are the result of improper training by well-intentioned owners.

Objectives:

Students will be able to examine and discuss case studies of animals with behavior problems and make educated analyses of what the behavior issues are, their cause and a method of removing the unwanted behavior.

Materials:

none

Procedure:

As a class, read the following case studies and then discuss a probable cause for each case. Then brainstorm ways to fix the problems.

Case 1: Emmy

- Emmy is a six-month-old cocker spaniel. She gets excited and urinates when strangers pet her. Her owners are embarrassed to have people come to the house and are not pleased that she keeps staining the carpet. Discuss Emmy's problem and the ways they could handle it using your knowledge of behavior and training.

Case 2: Kali

- Kali, a springer spaniel, had been abused by a former owner when a new owner brought her home at nine months old. She is afraid of men and will try to avoid them, and then when they turn away from her she will run up and bite them. Her owners have tried yelling at her and scolding her, but the behavior has not stopped. In fact, it has gotten worse. She now attacks anyone who comes up the driveway. Her owners are afraid that someone will sue if they get bit and are thinking of getting rid of her. What have they been doing wrong so far, and how can they fix the problem?

Case 3: Stevie

- Stevie is a three year old lab. He barks a lot when he is outside during the day while his owners are at work. During the past two years, the neighborhood has grown and Stevie's owners are getting complaints about the barking. They have been keeping him inside whenever he barks, but would rather keep him outside during the day to keep him off the furniture. How can they fix this problem?

Case 4: Rocky

- Rocky, a pitbull, is generally a good dog. His one problem is that he will go into the owner's room and take things like a slipper or stuffed animal. He then brings the item back near the owner and proceeds to destroy them. The owner scolds Rocky and takes the item away. However, he has noticed that Rocky thinks this is a game. He never destroys anything while the owner is gone and only behaves this way when the owner is present, but not paying attention to him. He also seems to exhibit this behavior when he doesn't get his way. Why is Rocky exhibiting this behavior, and how can it be discouraged?