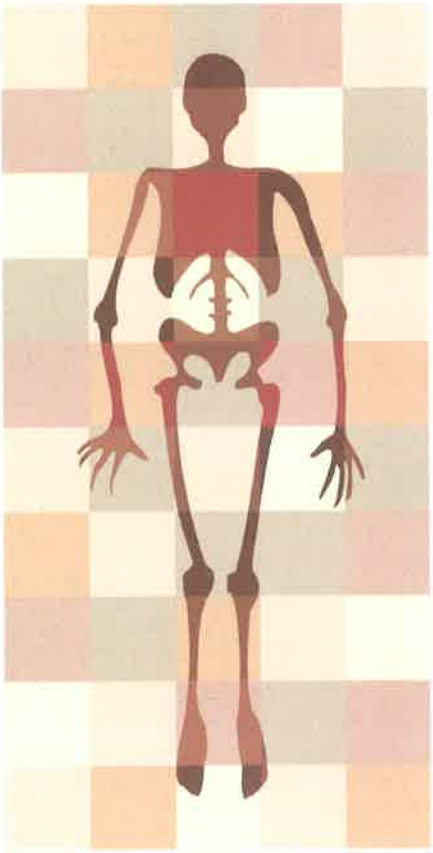
Unit Four:



Human Body Systems

Name _____ Date _____ Period _____

The Anatomy of a Big Mac

We all know that eating food is a necessary part of life. But why do you have to eat all those carbohydrates, protein, and fats? Let's dissect the Big Mac and find out the importance of these molecules.

Carbohydrates are present in many foods. The bun, cheese, special sauce, and tomato contain carbohydrates. These building blocks of all carbohydrates are simple sugars. One of these simple sugars is called glucose. Glucose is necessary for cellular respiration, which creates a usable form of energy called ATP. In other words, carbohydrates provide all your cells with energy to perform everything they have to do. Carbohydrates make up the largest part of your diet. Some of the carbohydrates we eat are called "complex carbohydrates." This means that they are long chains of simple sugars that need to be digested before being used by your cells.

The burger and the cheese contain protein. Proteins provide cells with the building material they need to grow and maintain their structure. Since you are composed of cells, you body is approximately 20% protein. Proteins are also required to build enzymes. Enzymes help digest food, perform cellular respiration, and build structures in the cell. The proteins we eat in our diet are digested into amino acids. These amino acids are then used by our cells to put together the proteins we need. There are 20 types of amino acids; however, our body can only produce 12 of them. The other 8 must be received through out diet.

Fats, also called lipids, are (believe it or not) a required part of our diet. The meat, cheese, and special sauce also contain fat. Fats are divided into two main groups: saturated and unsaturated fats. Unsaturated fat (vegetable oils) are generally considered healthier than saturated (animal) fat. In any case, all fat molecules are digested into glycerol and fatty acids. These molecules can then be used to build parts of the cell, especially the cell membrane. Lipids are also an excellent reserve source of energy. When your body cells do not have access to simple sugars, it will use (burn) stored fat for energy (to produce ATP). When you go on a diet, for example, your body uses your fat deposits for energy; therefore you lose weight.

There is another molecule you need to obtain in your diet. However, this molecule is not present on any nutrient label. These molecules are called nucleic acids. An example of a nucleic acid is DNA. When we eat nucleic acids (yes, we eat DNA at every meal), our digestive system breaks them down into basic units called nucleotides. Every time our body cells reproduce, the DNA in each cell must reproduce as well. Our cells make copies of DNA using the nucleotides.

So eat up and think about the reasons for your Mac Attack!!!

Pre-lab Questions

1. What are the building blocks of each of the following compounds: carbohydrates? proteins? lipids? nucleic acids?
2. What percentage of your body is protein?
3. If we can produce some amino acids, why must we eat them?
4. When will your body burn fat for energy?
5. Why are nucleic acids necessary in our diet?

Procedure + Data Collection

1) List the items you normally eat during a visit to McDonald's. You may choose breakfast, lunch, or dinner. Be sure to include sandwiches, sides, drinks, and desserts.

2) Use the Nutrition Facts packet to find these items and record the nutritional information in a table like the one below. Add up each column and record the totals. Create enough rows to accommodate the # of items you eat.

Food Item	Calories	Total fat (g)	Carbohydrates (g)	Protein (g)	Sodium (mg)

3) The calorie is a measure of the energy content of food. Different nutrients contain different amounts of calories: Calculate the number of calories of each of the following nutrients from your meal:

- 1 gram of carbohydrates = 4 calories
- 1 gram of protein = 4 calories
- 1 gram of fat = 9 calories

- Calories from carbohydrates: _____
- Calories from protein: _____
- Calories from fat: _____

4) Use the Estimated Calorie Requirements chart to find your calorie needs. Follow the activity footnotes to determine your level of activity. If there is a range of calories, choose the median value.

My calorie requirements: _____

How many calories do you have left after eating your meal at McDonald's? _____

Analysis Questions

1. The USDA recommends eating a total of 300g of carbohydrates and 60g of fat each day (based on a 2000 calorie diet). How many grams of carbohydrates should you eat the rest of the day after your trip to McDonald's? How about grams of fat?

2. We include mg of sodium in this activity. Fast food often contains high amounts of salt. The USDA recommends consuming less than 2,300mg of salt per day. What is the total amount of sodium in your meal from McDonald's? Why do you think consuming too much salt can cause health problems?

3. Most health experts recommend limiting your trips to fast food restaurants. However, if you are going to dine in places like McDonald's you can make better food choices. List 5 food items you can order that won't "pack on the pounds".

Food Item	Calories	Total fat (g)	Carbohydrates (g)	Protein (g)	Sodium (mg)

Me and My Innards: Model of the Digestive System

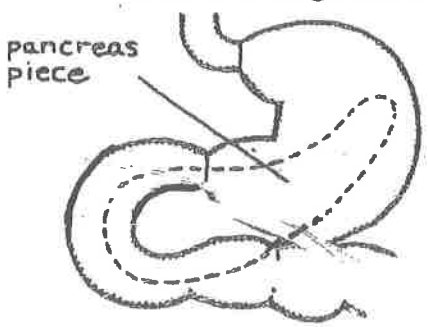
Introduction: This system is one long tube that contains many parts that are folded up inside your body. If you were to take your digestive system out of your body and lay it out flat, it would surprise you how long it is.

- In this lab, you will make a paper model of the human digestive system.

Procedure:

1. Create a Coloring Key for each organ of the digestive system.
   a. **Salivary glands, mouth, and liver** (same color) = _____
   b. **Stomach wall, villi, and pancreas** (same color) = _____
   c. **Esophagus** = _____
   d. **Stomach** = _____
   e. **Small Intestine** = _____
   f. **Large Intestine** = _____

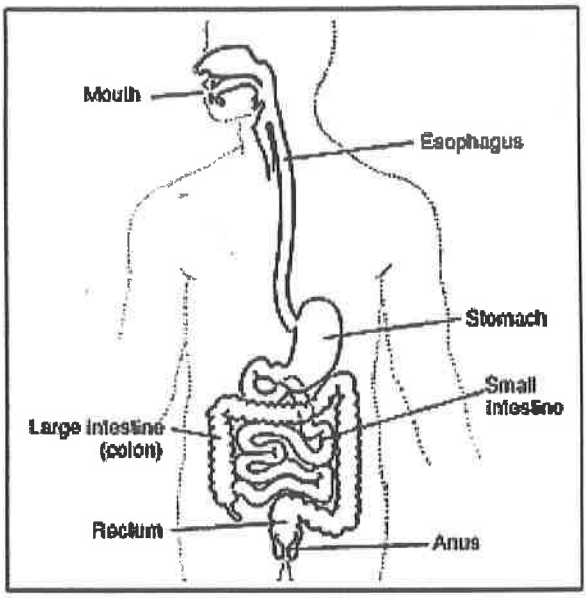
2. Cut out the outer face and the inner face. Tape/glue the outer face over the inner face
3. Cut out the esophagus (food tube) and tape/glue it in back of the inner face
4. Cut out the stomach and stomach wall. Cut along the solid line inside the stomach and fold the box on the dotted line to form a flap. Tape the stomach wall on the back of the stomach so that it can be seen when the flap is lifted.
5. Tape the lower tab of the esophagus behind #1 of the stomach
6. Cut out the small intestine and be sure to form a flap as you did with the stomach
7. Cut out the villi and tape it to the back of the small intestine so that it can be seen when the flap is open
8. Tape/glue the small intestine behind #2 on the stomach
9. Cut out the large intestine and tape/glue the small intestine behind #3 on the large intestine
10. Cut out the pancreas and paste its pointed end behind the stomach and its curved end behind the small intestine as shown below (make sure the pancreas can be viewed between the small and large intestine.



11. Cut out the liver and place its pointed end just over the top of the stomach and its curved, larger end in back of the small intestine.
12. Decorate the face to make your model look like you! Be creative. Write your name on the back of the head.

Accurate coloring = 3 points, Appropriate construction = 4 points, face/neat/effort = 3 points

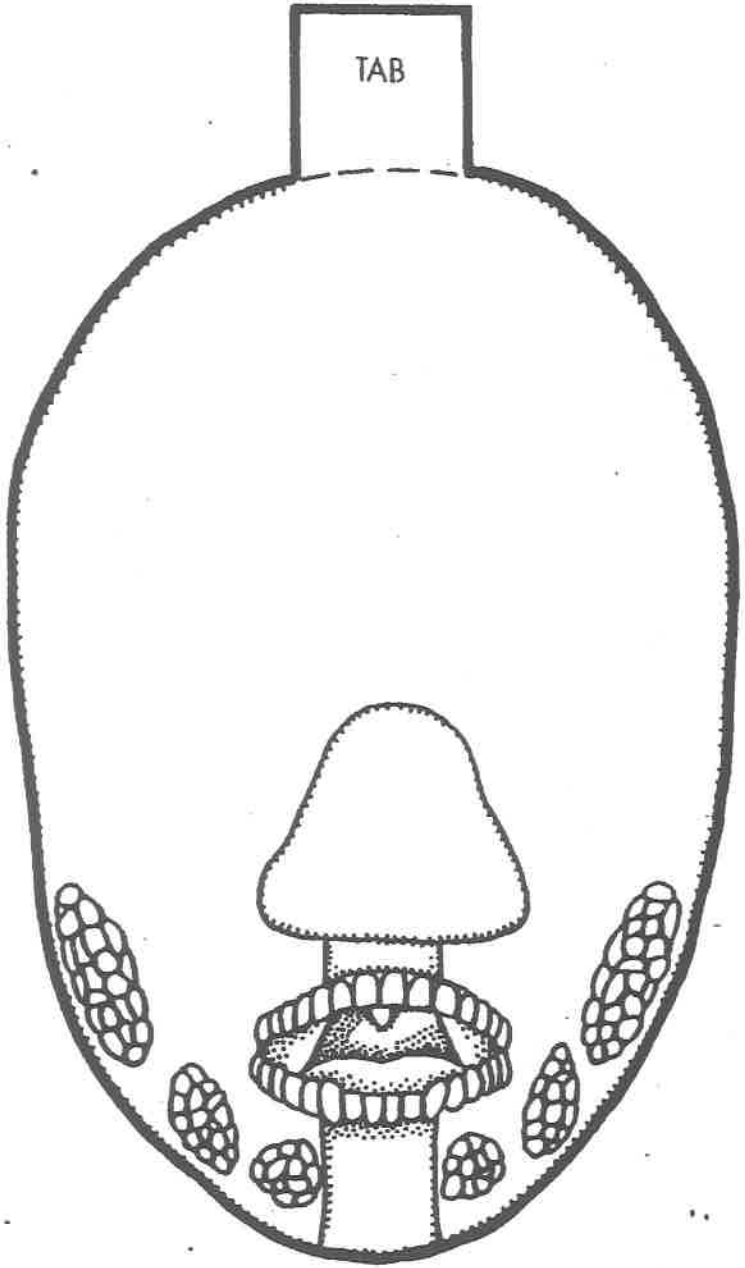
Post-Analysis:



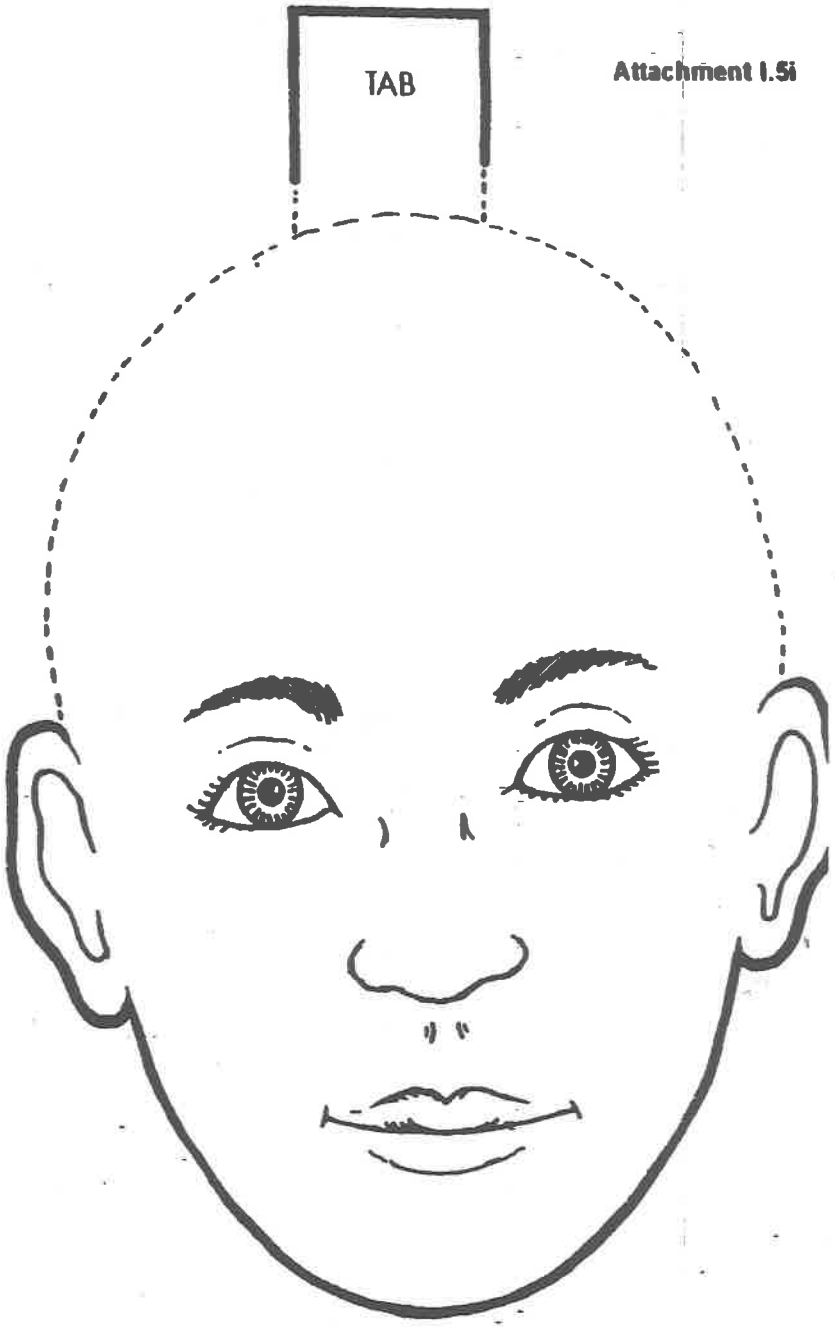
1. Why is digestion a necessary process for animals?
2. Digestion starts in the mouth. What two digestive processes occur there?
3. What is the main function of the stomach?
4. How does the stomach perform this function
5. Name the connecting organ between the mouth and the stomach. _____
6. Name the involuntary muscle movement that moves food through the digestive system.
7. Create a chart listing the enzymes produced by each of these organs and the nutrients digested by them:

ORGAN	ENZYME(S)	NUTRIENT DIGESTED
mouth		
stomach		
liver		
pancreas		

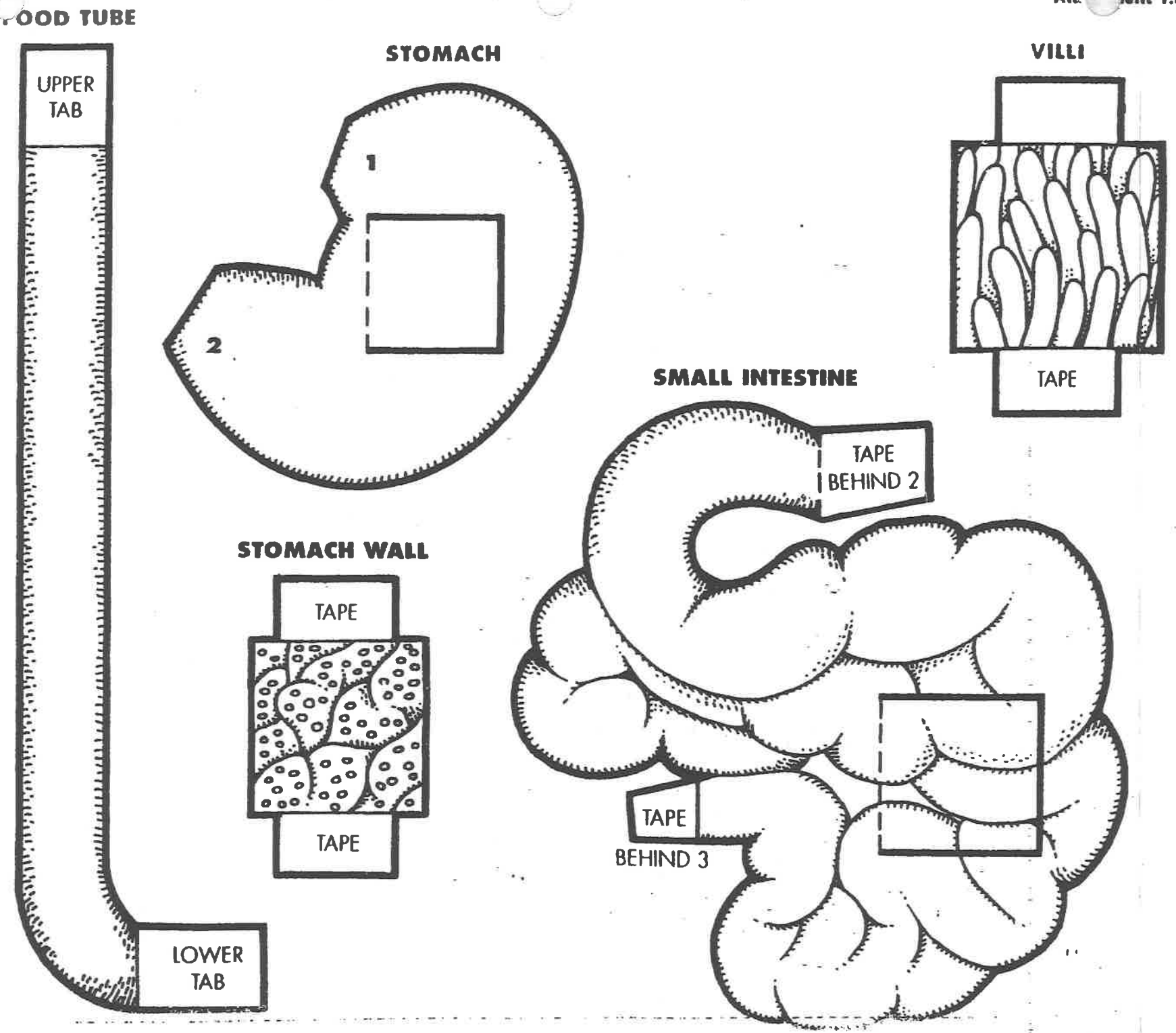
8. Why are the salivary glands, pancreas, liver, and gall bladder considered accessory glands of the digestives system?
9. Why can we live without our gall bladder? What is its main function?
10. Most digestion takes place in the small intestine. Open the flap of your small intestine and look inside.
    a. What is the small intestine lined with?
    b. What is their function?
    c. By what process does food move from the small intestines to the blood stream so it can be circulated to the rest of the body?
11. Most water absorption takes place in the _____.
    d. If very little water is absorbed, you may get sick with _____, but if too much water is absorbed, you may get _____.
12. What is the function of the bacteria that live in the large intestines?
13. Cellulose (plant material) is mostly indigestible, but it is still important for us to eat. What purpose does it serve?



INSIDE THE FACE

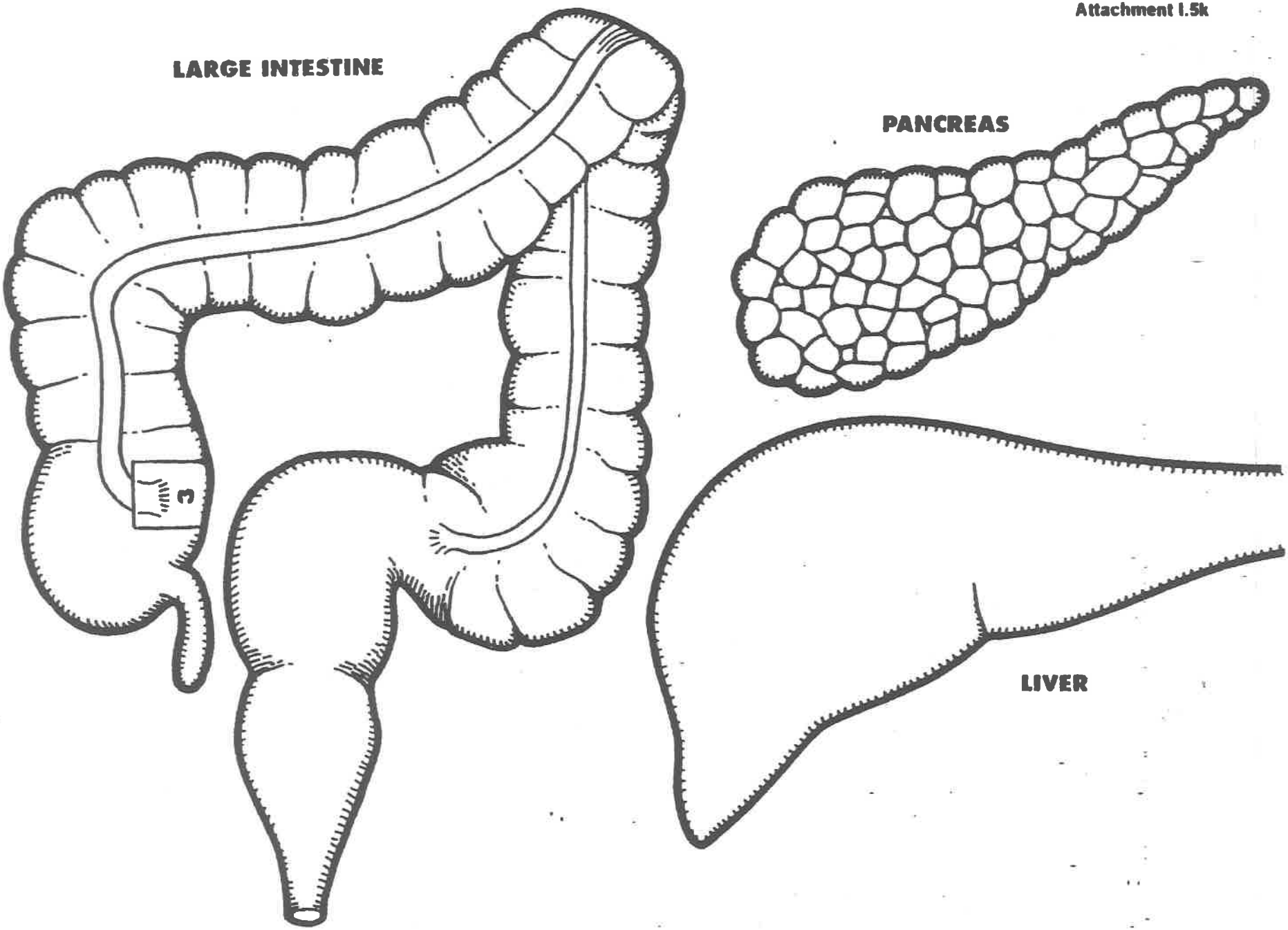


THE FACE


OOD TUBE
UPPER TAB
LOWER TAB
STOMACH
1
2
STOMACH WALL
TAPE
TAPE
VILLI
TAPE
SMALL INTESTINE
TAPE BEHIND 2
TAPE
BEHIND 3

15

Attachment I.5k



The Digestive System:
How long is YOUR digestive system?

Introduction:
This system is one long tube that contains many parts that are folded up inside your body. If you were to take your digestive system out of your body and lay it out flat, it would surprise you how long it is.

- In this lab you will make models of your own digestive system by measuring & cutting yarn to represent lengths of different parts of the system, and knotting (or taping) the pieces of yarn together to form one long string.

Procedure:

1) Digestion begins in the **mouth**, so measure and cut a piece of **white yarn** from the front to the back of the mouth. (You can do this by stretching the yarn from the front of your lips to the back of your jaw along your cheek).

2) Record this length of this "mouth" yarn in centimeters (cm) in the data table on the next page.

3) The **esophagus** is a tube that connects the mouth and stomach. Measure & cut a piece of **yellow yarn** the length of the esophagus. (Measure from the back of your jaw to just below your rib cage).

4) Record the length of this "esophagus" yarn in centimeters (cm) in the data table on the next page. Tie or tape the esophagus yarn to the mouth yarn.

5) In the **stomach**, gastric juices break down solid food into a liquid. Find the length of the stomach by spreading the fingers of your hand and measuring the span from the thumb to the little finger. Measure and cut a piece of **pink yarn** to match this length.

6) Record the length of this "stomach" yarn in centimeters (cm) in the data table on the next page. Tie the stomach yarn to the esophagus yarn.

7) The **small intestine** is the longest part of the digestive system. It is folded up inside of you so it fits. Food is further digested and absorbed here. Measure your height in inches and ***multiply it by four***. Use the **red yarn** to represent the length of the small intestine.

8) Record the length of this "small intestine" yarn in centimeters (cm) in the data table on the next page. Tie the small intestine yarn to the stomach yarn.

9) Last is the **large intestine**. It is much wider than the small intestine but much shorter. It is about as tall as you are. Undigested material from the small intestine moves to the large intestine before it leaves your body. Use **purple yarn** to represent the length of your large intestine.

10) Record the length of this "large intestine" yarn in centimeters (cm) in the data table on the next page. Then tie the large intestine yarn to the small intestine yarn.

11) Finally, add up each length to get the total length of your digestive tract in centimeters (cm).

DIGESTIVE ORGAN	LENGTH (CM)
Mouth	
Esophagus	
Stomach	
Small Intestine	
Large Intestine	
TOTAL	

12.) Convert this to meters using the formula: (total # of centimeters) multiplied by (0.01)

Length of your digestive tract in meters: _____

Post-Analysis Questions:

1. How does the length of your digestive system compare to your height (if you know your height in feet and inches, convert your height to inches knowing that there are 12 inches in a foot, then multiply it by 0.0254 meters/inch to get your height in meters)? How do you think your digestive system is able to fit inside your abdomen?

2. Why do you think your digestive system is so long? How do you think this helps digestion? What is the longest section of your digestive system? What important processes do you think happen to the food in this section?

3. How long do you think it takes (on average) to digest food?

Name _____ Class _____ Period _____

10–1 How Do Digestive System Lengths Compare?

You know that the diet of different animals may vary. You can buy cat food, dog food, and bird food in most supermarkets.

The length of the digestive system may also vary. Animals that eat plants usually have longer digestive systems than animals that eat meat.

EXPLORATION

OBJECTIVES

In this exercise, you will:

a. measure the length of the digestive system in three animals.
b. compare these lengths with the type of food eaten.

KEYWORDS

Define the following keywords:

caecum _____

carnivore _____

digestive system _____

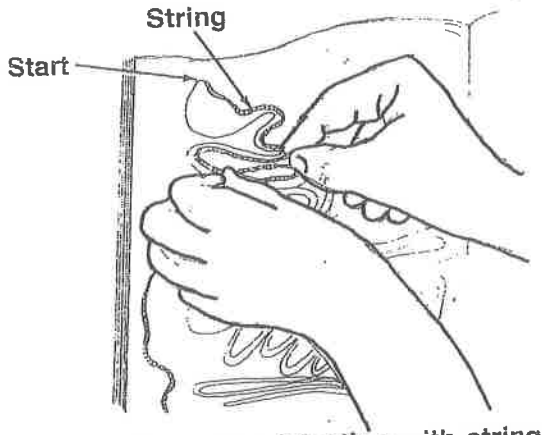
herbivore _____

MATERIALS

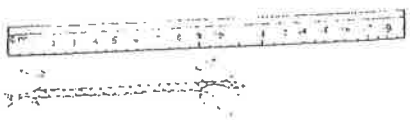
string metric ruler scissors tape

PROCEDURE

1. Place a piece of string down on the outline drawing of the rabbit digestive system in Figure 2 on the next page. Figure 1 shows you how.
2. Tape the end of the string in place at the label marked "start" on the stomach of the rabbit.
3. Position the string only over the entire length of the *unshaded* organs. It must match, exactly, the many twists and turns of the stomach, the small intestine and the large intestine (the unshaded organs).
4. When you reach the anus, cut the string, remove it from the drawing, and stretch it out its full length. **CAUTION:** *Use care with scissors.*
5. Measure the length of the string in centimeters and record this number in Table 1.



Measuring intestine with string



Measuring string with ruler

FIGURE 1. Measuring the digestive system

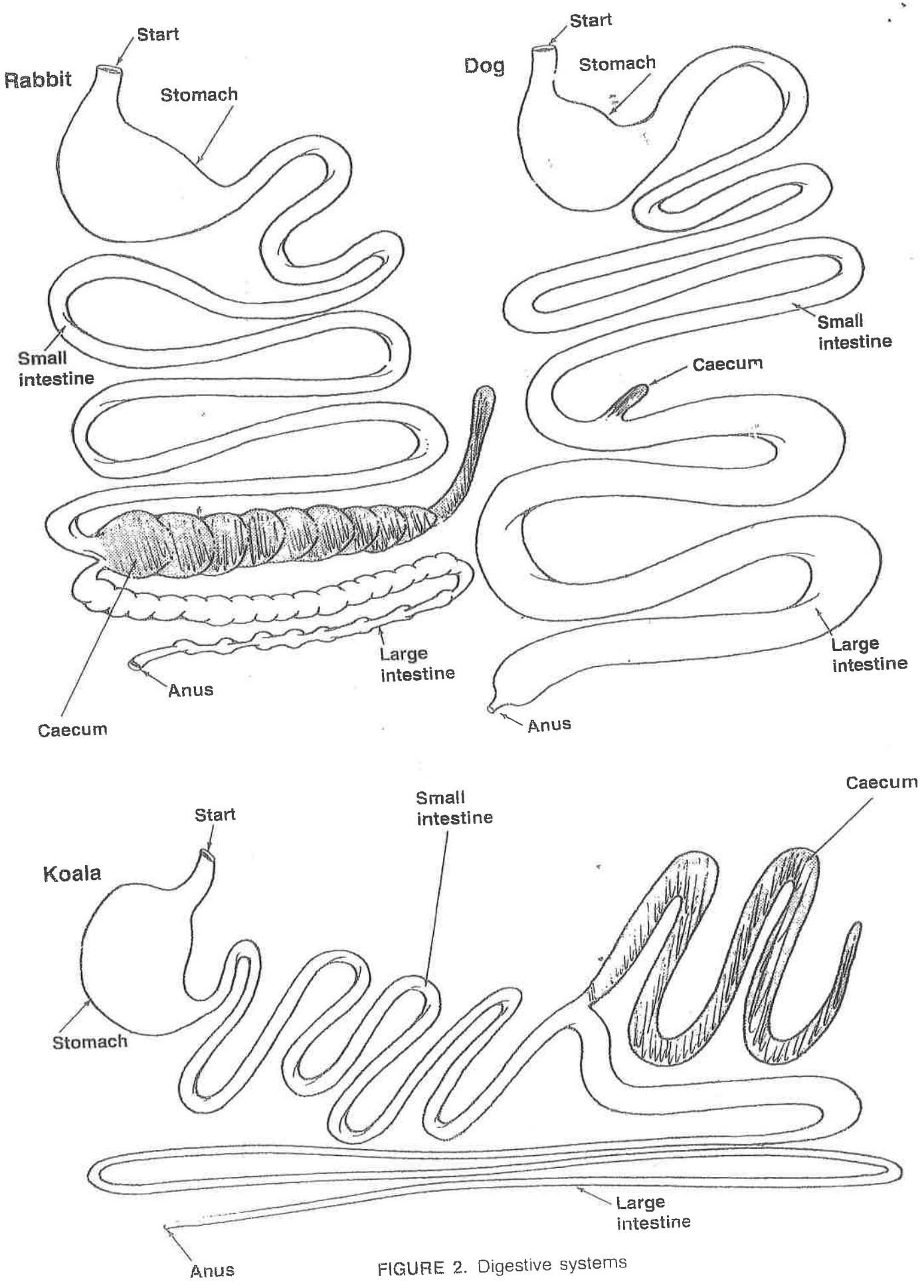


FIGURE 2. Digestive systems

Name _____ Class _____ Period _____

6. Position the string over the shaded portion of the rabbit digestive system and measure the length of the caecum. Record this measurement in centimeters in Table 1.
7. Add together the two numbers that you have now recorded in the table in order to get the total length of the digestive system. Record this number in Table 1.
8. The diagram of the rabbit digestive system is drawn ⅓ smaller than actual size. Multiply the total digestive system length by 3 to complete the first row of Table 1. This number is the actual length of the rabbit digestive system.
9. Repeat steps 1 through 8 for the digestive system of the koala and the dog.

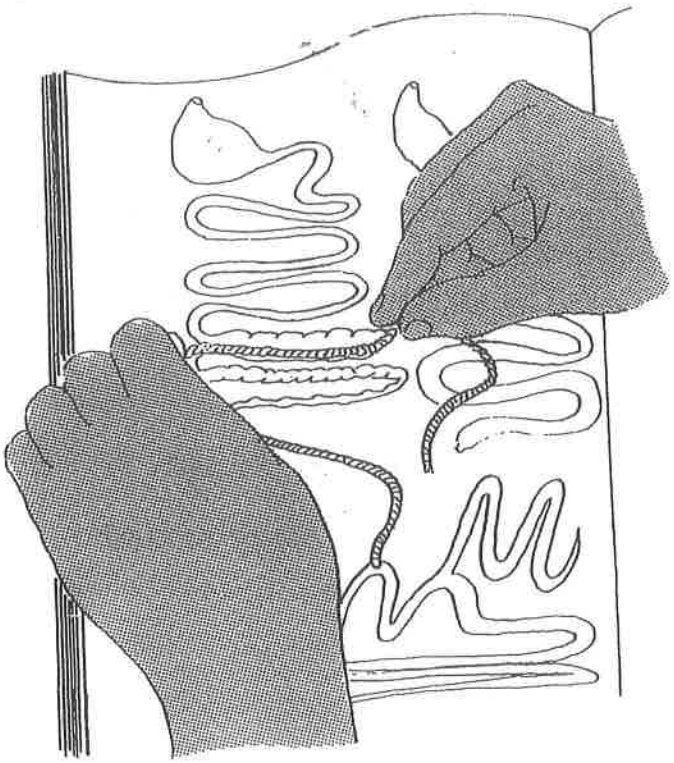


FIGURE 3. Measuring caeca of animals

Table 1. Digestive System Measurements

Animal	Length of stomach, small intestine, large intestine		Caecum length		Total digestive system length		Multiply by 3		Actual length of digestive system
Rabbit		+		=		×		=	
Koala		+		=		×		=	
Dog		+		=		×		=	

ANALYSIS

1. Which animal has the longest actual digestive system?

2. Which animal has the shortest actual digestive system?

3. Describe how the length of the digestive system in animals seems to be related to the type of food the animals eat.

4. Predict whether the following organisms would have a *long* or *short* digestive system.
Lion _____ Cat _____ Horse _____ Deer _____

5. Do you think our human ancestors had a longer or shorter digestive system than humans today? Why?

Name_____

Lab #_____Human Blood Microviewer Slides

Use the human blood booklet along with the microviewer slides to answer the following questions about human blood. Be sure to answer in complete sentences!

1. How does blood help the body maintain homeostasis?

→ View Slide #1.

2. What do the following represent? (note: corpuscles = cells)

Pt = Po = L =

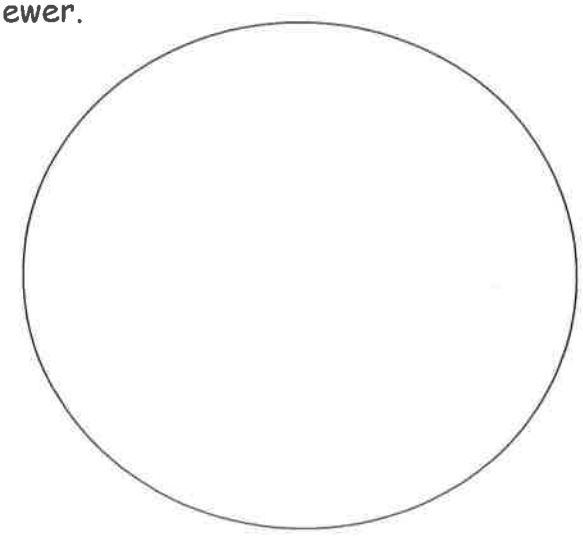
R= PL =

3. Why does blood taste salty?

4. How many types of white blood cells are represented here? _____

→ View Slide #2.

5. Draw a diagram of what you see under the microviewer. Label one of the red blood cells.



6. The red blood cells seem to be indented. What is this shape called?

7. Why is the shape of red blood cells important?

8. What is the importance of hemoglobin?

→View Slide #3 which shows different types of white blood cells.

9. What is another name for white blood cells (white corpuscles)?

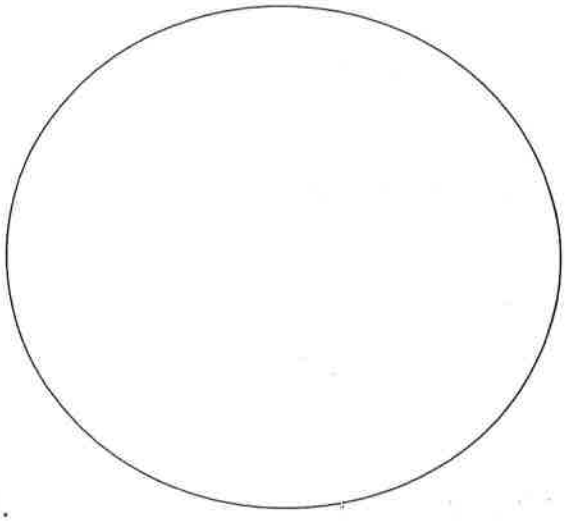
10. Each type of white blood cell plays a different role in protecting the body. Name and describe the general function of the 3 white blood cells shown in slide #3.

E)

B)

M)

11. Draw a diagram of what you see under the microviewer. Label each white blood cell.



→View Slide #6.

12. What does this picture represent?

13. Describe the steps in forming a blood clot.

→View Slide #7.

14. What does S represent in the picture?

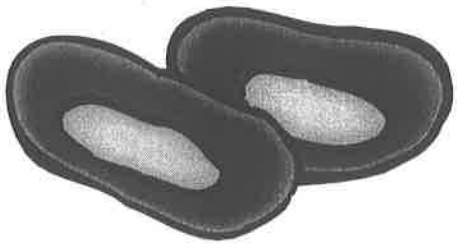
15. How can someone be diagnosed as having Sickle Cell Anemia?

Name:

FREQUENCY OF HUMAN BLOOD TYPES

INTRODUCTION

Every human has one of four blood types: A, B, AB or O. Blood type is determined by the presence or absence of proteins A and B on the red blood cell. Up until now, we have assumed that there are only two alleles for each trait. For example, Mendel's pea plants were either tall or short, and the pods were either green or yellow. However, there are cases where there are more than two alleles for each trait. There are called **multiple alleles.** Human blood types are an example of multiple alleles for a single trait, because there are three possibilities, the alleles for A, B or B. While with multiple alleles there are more than two alleles for each trait, each individual has only two of them because there are only two chromosomes in each homologous pair, each of which can have one allele on it.



PROCEDURE

1. Place all the cards in the container and mix them up
2. Each student must pick one "allele" and record it's symbol in the space below.
3. Return the first "allele" to the container and mix it up.
4. Pick a second "allele" and record its symbol in the space below.
5. Return the card to the container.
6. Record the following information in your lab notebook:
   a. **FIRST ALLELE:** _____
   b. **SECOND ALLELE:** _____
   c. **YOUR BLOOD TYPE:** _____
7. Complete the data table below by copying the information collected by the class for the master data table on the board.
8. Calculate the percentage of each phenotype (blood type) in the class. Record this information in the appropriate row in the data table. To calculate the percent, divide the total number of students with a specific blood type by the total number of students in the class.

DATA

GENOTYPE	IAIA or IAi	IBIB or IBi	IAIB	ii
BLOOD TYPE (Phenotype)	A	B	AB	O
Number of Students with this Blood Type				
Percentage of Students with this Blood Type				

ANALYSIS QUESTIONS:

1. The four blood types are found in the following percentages in the American population:

A= 37% B= 13% AB= 6% O=44%

Does this information conform to the class information? Justify your answer

2. What is your fictional blood type?

3. What two alleles do you possess to give you this fictional blood type?

4. Use the information in the first two lines of the data table to help you answer the following questions:
   a. Is the gene for blood type A dominant or recessive to the gene for blood type O?
   b. Is the gene for blood type B dominant or recessive to the gene for blood type O?

5. What type of blood is produced when a person inherits the gene for blood type A from one parent and the gene for blood type B from the other parent?
   a. Is one of these alleles dominant over the other?

6. In which blood type(s) (A,B,AB, O) can the genotype be determine without any knowledge of the parent's blood type? Justify your answer.

7. How many different alleles for blood type are there in the human population?

8. Explain why each person only has two alleles for blood type.

9. How many main blood groups are there in the human population?

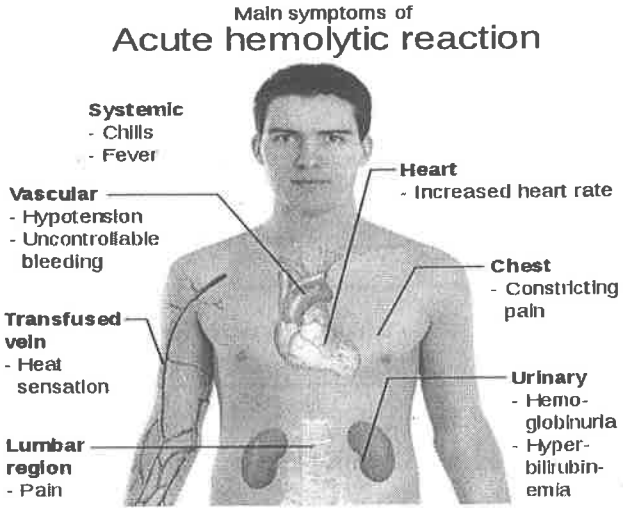
Name:  # Transfusion Lab  Lab#

OBJECTIVE: To demonstrate the concepts involved in blood transfusions and to form conclusions about blood donors and receivers.

BACKGROUND:

A blood type (also called a blood group) is a classification of blood based on the presence or absence of inherited antigenic substances on the surface of red blood cells (RBCs). These antigens may be proteins, carbohydrates, glycoproteins, or glycolipids, depending on the blood group system, and some of these antigens are also present on the surface of other types of cells of various tissues.

	Group A	Group B	Group AB	Group O
Red blood cell type	A	B	AB	O
Antibodies present	Anti-B	Anti-A	None	Anti-A and Anti-B
Antigens present	A antigen	B antigen	A and B antigens	None



PRE-LAB QUESTIONS:

Record the data table below in your notebook and complete:

Blood Type A	Blood Type B	Blood Type AB	Blood Type O
Antibodies present in blood serum			
Antigens present on surface			
Can receive from…			
Can donate to…			

☆ If one blood type is mistakenly given to an individual whose blood type is not compatible, the person may experience **agglutination** of the blood (red blood cells clumping due to an immune response). The picture to the left depicts symptoms of this reaction.

MATERIALS:

* 1 spot plate
* 4 medicine droppers
* clear water – type O
* 4 small beakers
* yellow food coloring – type B
* blue food coloring – type A
* green food coloring – type AB

PROCEDURE AND OBSERVATIONS:

1. Label the four beakers A, B, AB, and O.
2. Obtain samples of each blood type from your instructor
3. Using the following figure as a guide, fill the first 5 columns of your spot plate with **10 drops total** of the appropriate "blood".

Donor	Recipient A	Recipient B	Recipient AB	Recipient O
A (Blue)	Blue	Yellow	Green	clear
B (Yellow)	Blue	Yellow	Green	clear
AB (Blue +Yellow)	Blue	Yellow	Green	clear
O (Clear Water)	Blue	Yellow	Green	clear

4. Cleaning the dropper each time it is used, **combine 10 drops from the beaker of blood with the 10 drops in the spot for Recipient A, Recipient B, Recipient AB, and Recipient O.**

5. If a combination produces a color change, the transfusion would not be safe. If there isn't a color change, that indicates a safe transfusion. **Record your observations in the data table** by recording the final color, as well as whether the combination would be safe/unsafe for the recipient.

6. Using Donor Type B, AB, and O, **repeat the same procedure** in the Recipient spots.

DATA TABLE (record in your lab notebook)

Donor	Recipient A	Recipient B	Recipient AB	Recipient O
A (Blue)	Color Safe/Unsafe	Color Safe/Unsafe	Color Safe/Unsafe	Color Safe/Unsafe
B (Yellow)	Color Safe/Unsafe	Color Safe/Unsafe	Color Safe/Unsafe	Color Safe/Unsafe
AB (Green)	Color Safe/Unsafe	Color Safe/Unsafe	Color Safe/Unsafe	Color Safe/Unsafe
O (Clear Water)	Color Safe/Unsafe	Color Safe/Unsafe	Color Safe/Unsafe	Color Safe/Unsafe

ANALYSIS AND CONDLUSIONS

1. Which blood type might be considered a "universal donor"? Describe what this means, using vocabulary from the background of this lab.
2. Which blood type might be considered a "universal receiver"? Explain.
3. Explain why some blood types cannot be donated to people with a different blood type. Use the terms *blood cells, antigens, antibodies, agglutination foreign,* and *reaction* in your response.
4. Many pregnant women carry a fetus with a different blood type from their own, and the mother can form antibodies against fetal RBCs. Sometimes these maternal antibodies are IgG, a small immunoglobulin, which can cross the placenta and cause hemolysis of fetal RBCs. Why do you think this occurs and what would you expect the results of this would be?

12–1 How Can Blood Diseases Be Identified?

Blood is a tissue. It has many different cells with many different jobs. If you look at blood under the microscope, you will find three different cell types—red cells, white cells, and platelets. In a normal person the numbers of types of blood cells are fairly constant. Sometimes, however, the number of cells will change due to a certain disease. Noticing this change in number can help a physician in the diagnosis of a person's disease.

INTERPRETATION

OBJECTIVES

In this exercise, you will:

a. learn how to recognize three blood cell types.
b. examine diagrams of blood samples from six hospital patients.
c. match the blood samples with certain diseases.

PROCEDURE

Part A. Normal Blood Cells

1. Examine Figure 1, which shows human blood cells magnified 1000 times.
2. Count each cell type present.
   HINT: To help avoid counting cells twice place a checkmark on each cell as you count.
   a. red blood cells—round, very numerous, no nucleus.
   b. white blood cells—round, few in number, larger than red blood cells, nucleus present.
   c. platelets—dotlike, many but less than red cells, very small.

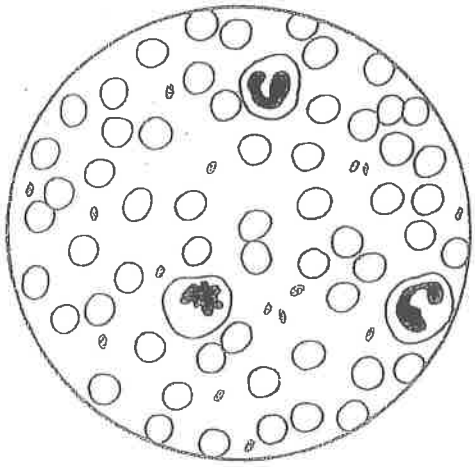


FIGURE 1. Normal blood sample

3. Record the number of each cell type for Figure 1 in Table 1. These numbers are for normal blood. Enter these numbers in the column marked #.
4. Using the numbers 1, 2, or 3, rank the cells in order from the most common (1) to the least common (3). Enter these rankings in the next column in Table 1 marked *Rank*.

Table 1. Blood Cell Counts

Cell type	Fig. 1		Fig. 2		Fig. 3		Fig. 4		Fig. 5		Fig. 6	
	#	Rank	#	Rank	#	Rank	#	Rank	#	Rank	#	Rank
Red												
White												
Platelet												
Disease diagnosis	Normal blood											

Analysis Questions:

1. Explain why a person with AIDS may also have pneumonia (keep in mind the main job of white blood cells).
2. If the rank of the blood cells in a typical blood sample is the same as one with sickle-cell anemia, how could you conclude that a person has sickle cell anemia?
3. Identify the blood disease characterized by...
   a. Too many white blood cells b. too few platelets c. too few white blood cells
4. Why would a person with thrombocytopenia purpurea bruise easily?
5. Which of these diseases do you think are genetic? Which are not?

Part B. Examining Abnormal Blood Cells

1. Examine Figures 2 to 6. These represent human blood samples from people with certain diseases.
2. Count each cell type and record the number for each sample in Table 1 under the right column.
3. Complete the rank columns using the numbers 1 to 3 as with the normal blood sample.

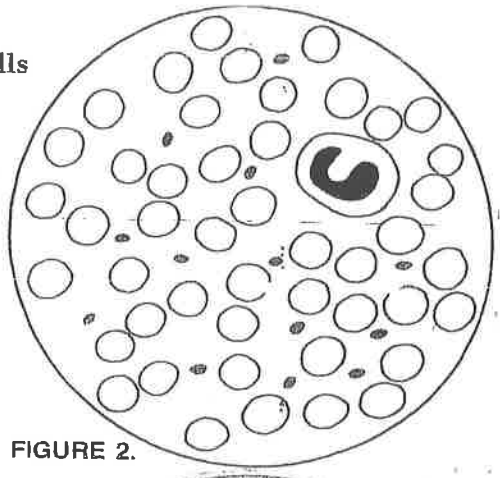


FIGURE 2.

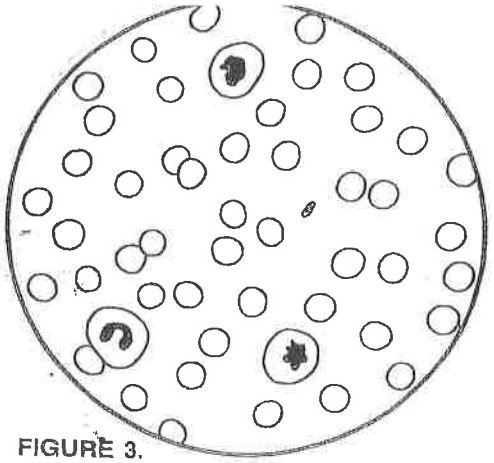


FIGURE 3.

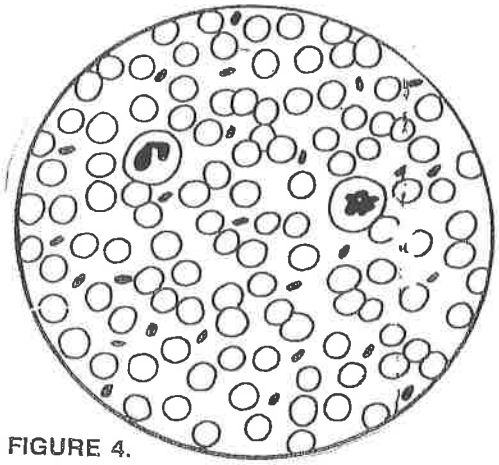


FIGURE 4.

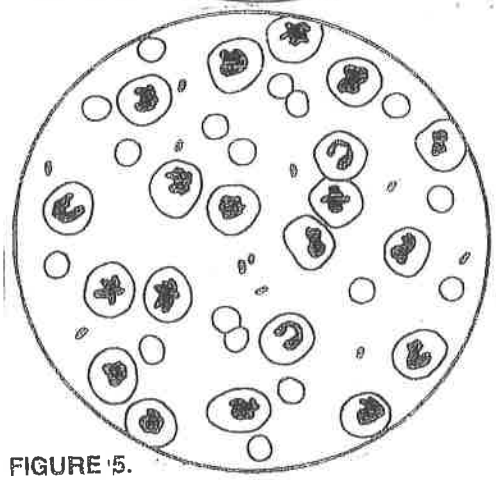


FIGURE 5.

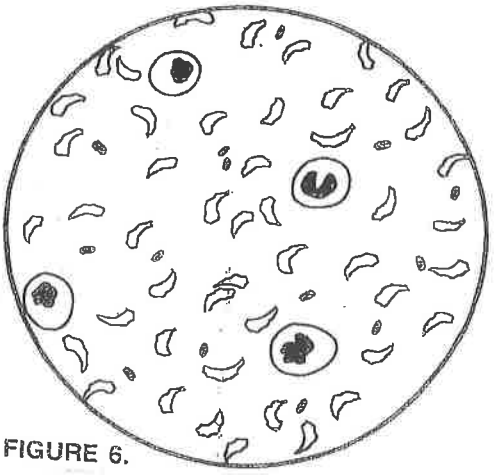


FIGURE 6.

Part C. Diagnosing Blood Diseases

1. Read over the following case histories for five hospital patients.
2. Match each case history with the appropriate blood sample.
3. Record the name of the disease below each sample in Table 1 in the space provided for disease diagnosis.

Case History:	Male, white, age 28; has admitted to injecting drugs for the past 6 years, has pneumonia and skin cancer
Blood analysis:	Few white cells present
Disease Diagnosis:	AIDS (acquired immunodeficiency syndrome)
Case History:	Male, black, age 15; is always tired and short of breath
Blood Analysis:	Red cells—shaped like crescent moons
Disease Diagnosis:	Sickle-cell anemia
Case History:	Female, oriental, age 14; has a fever, sore throat, and frequent nosebleeds
Blood Analysis:	Red cells—low in number; White cells—high in number Blood cell rank—white = 1, red = 2, platelets = 3
Disease Diagnosis:	Leukemia (leuk = white, emia = blood)
Case History:	Male, white, age 68; has frequent headaches, nosebleeds, shows high blood pressure, a very red complexion
Blood Analysis:	Red cells—a very high number
Disease Diagnosis:	Polycythemia (poly = many, cyth = cell, emia = blood)
Case History:	Female, white, age 22; has sudden appearances of purple marks under the skin, bruises easily, blood does not clot easily after a cut
Blood Analysis:	Platelets—very few in number Blood cell rank—red = 1, white = 2, platelets = 3
Disease Diagnosis:	Thrombocytopenia purpurea (thrombo = platelet, cyto = cell, penia = shortage, purpurea = purple)

Name:_____ Period___

Lab #

Blood Diseases

Problem: To observe prepared slides of various blood diseases, and compare them to the slide containing normal human blood.

Materials: Prepared slides of the following:

Normal Human blood- Wright's stain
Acute Monocytic Leukemia
Sickle Cell Anemia
Iron Deficiency Anemia

Compound Light Microscope

Method: 1. Observe the slide containing normal human blood under first low, then high power.

Make sure to identify; red blood cells
white blood cells
platelets

2. Observe the remaining three slides, containing the blood diseases under first low, then high power. (Keep in mind the observable characteristics of each disease when comparing them to the slide of normal human blood.)

Observations:

1. Make a drawing of the slide containing normal human blood, when viewed under high power. Remember to label the red blood cells, white blood cells and platelets.
2. Make drawings of each of the slides containing the blood diseases, when viewed under high power. Remember to label the observable characteristics which cause the blood to be diseased.

Conclusions: **IN COMPLETE SENTENCES**, Answer the following questions in your lab notebook.

1. What are the functions of red blood cells, white blood cells, and platelets?
2. What is another name for leukemia, and what is the disease characterized by?
3. What is sickle cell anemia, and how does a person get it?
4. What is iron deficiency anemia?
    a. Why were the red blood cells that you saw so pale in color when compared to with normal red blood cells?
    b. If you were a doctor treating a patient with iron deficiency anemia, what would you advise your patient to do, to help cure their anemia?

Name:

DISEASE TRANSMISSION LAB

INTRODUCTION:

The following lab is a demonstration, which involves you in a simulation of disease transmission. Whether it is winter cold, flu season, an outbreak of the measles or an STD, it is important that you realize the ease at which viruses like these can be carried. Very often as you will see the infected individual will have no apparent symptoms. They will however be a carrier of the infectious disease. Our job today will be to find the mysterious disease carriers in our class.

PROCEDURE:

Part 1: How are Diseases Transmitted?

1. You will receive a small cup with liquid in it. (DO NOT DRINK IT!!!)
2. Exchange your liquid with the liquid of a partner. To do this, pour your liquid into his/her cup, then have him/her pour the liquid back into your cup, and then even out the amount of liquid between the two of you.
3. Record the name of your partner in the data table under exchange #1.
4. Repeat steps 2 and 3 with three different partners.
5. Return to your seat and wait to see who is infected with the disease. The teacher will test each liquid, checking for a reaction. Then, we will analyze the data (who was infected) as a class and trace the infection back to the original source.

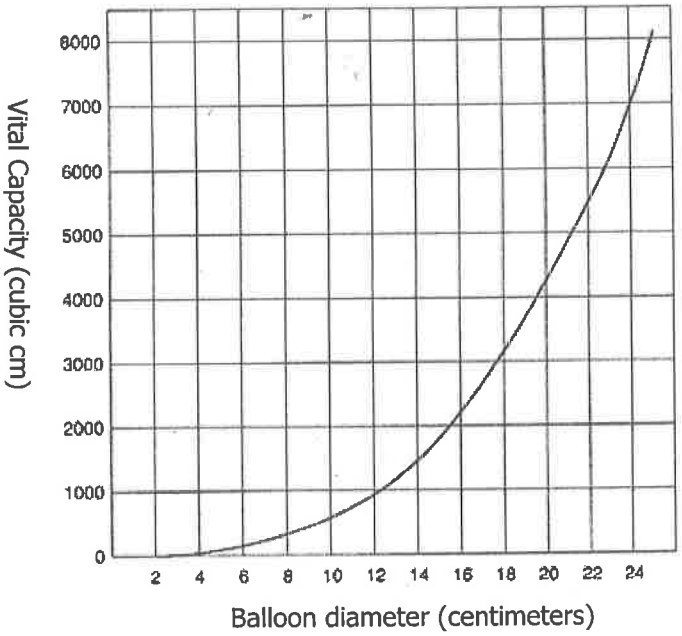
Exchange #	Name Of Partner
1	
2	
3	
4	

INTRODUCTION:

1. I was (circle one) infected not infected
2. The original source of "disease" in the classroom was:_____.
3. How many people in the class ended up with the "disease" that started with just one person?
4. Can someone have a disease and still appear healthy? Explain the possible negative effects of this.
5. What are some ways that diseases can be prevented? (How can you keep yourself healthy?)
6. List three steps that can be taken to prevent infections from spreading?
7. What types of cells are responsible for fighting infections in humans?
8. Name two types of these cells and state how they fight infection?
9. What are some possible sources of errors in this investigation?

Determining Vital Capacity

Vital Capacity Conversion Graph



Background:

The human body obtains energy through *cellular respiration*, a process which uses oxygen and produces waste products, such as carbon dioxide. This process is supported by a series of events called *respiration.* Respiration has 4 phases: breathing, the exchange of carbon dioxide and oxygen in the lungs; the transport of these gases to or from body cells; the exchange of gases between blood and cells.

In this lab, you will study the capacity of the lungs (the volume of air the lungs can inhale and exhale), as well as physical factors that may affect it.

Objectives:

1) Approximate a measurement of the capacity of your lungs.
2) Observe the differences in capacity among females and males, athletes/non-athletes.

Hypothesis:

Develop and hypothesis stating the effect of gender/physical activity on lung capacity

Procedure:

1. Stretch a round balloon several times to stretch it out.

2. Take a few deep breaths. The exhale deeply once into the balloon. Fill the balloon as much as you can, but only with air from one exhalation!

3. Pinch the end of the balloon and measure its diameter in centimeters as shown in the figure at the right. Record the balloon's diameter in centimeters on the table below.

4. Repeat step #3 two more times so that you have 3 trials total. Take the average of all three trials and record in a table like table 2 below.

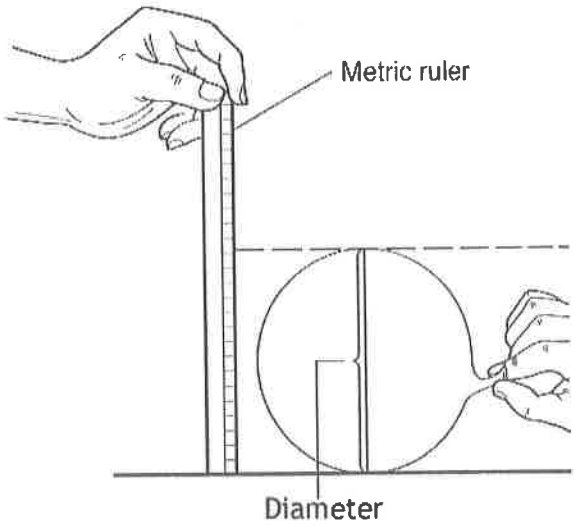


Table 2

Trial	Balloon Diameter (cm)	Vital Capacity (cm^3)
1		
2		
3		
Average		

5. Convert the balloon diameter measurements for each of the 3 trials to a measurement of lung volume (vital capacity) using the graph provided. Record this data as your vital capacity.

6. Decide whether you are an athlete or non-athlete. Write your average vital capacity in the appropriate column in the chart which your teacher constructed. Calculate and record the total class averages for vital capacity in a chart in your notebook as demonstrated below.

Average Vital Capacities (cm^3)

MALE		FEMALE	
Nonathlete	Athlete	Nonathlete	Athlete

ANALYSIS and APPLICATION QUESTIONS:

1. Why is it important to measure vital capacity three times and then get an average?

2. Compare your data to other members of the class. How can you account for differences?

3. Examine the data table of a person who entered into a training program. This person's vital capacity was measured over a 60 day period. Use the data to construct a graph.

4. Describe the relationship between number of days of training and vital capacity.

5. How might vital capacity be important to a musician?

Day of Training	Vital Capacity
0	4800
10	4840
20	4890
30	4930
40	4980
50	5180
60	5260

Name:

MEDICAL SCHOOL URINALYSIS

A Study of Kidney Function and Homeostasis

INTRODUCTION

Animals must rid their bodies of waste products created by metabolism. These waste products are called metabolic wastes. In humans, the nephrons of the kidneys are responsible for removing metabolic wastes from the blood stream and produce urine. Urine normally contains water, salts and organic wastes. The amount of each of these chemicals depends on the person's health, diet and activity.

From urine tests, doctors learn much about the general health of an individual. Kidney malfunctions, urinary tract infections, liver diseases and diabetes are just some of the problems that can be diagnosed with urinalysis. Urinalysis involves physical and chemical examination. Color, volume, cloudiness, odor, pH, protein content, sugar content, presence of blood cells, and sediments are some of the characteristics that can be tested in medical laboratories.

Congratulations! You have graduated medical school, completed your residency and landed a job at Winthrop University Hospital! Today is your first day on the job and nothing could possibly ruin this for you - not even the fact you are working the over-night shift in the geriatrics department.

Half-way through your shift three patients are admitted- Edna, Morty and Gertrude. Each patient is complaining of various different discomforts and you immediately think ... "Urinalysis!" Since you are a newbie and working the overnight shift, the laboratory tests available to you will be limited.

Your lab has the capacity to test for:

The presence of sugar
The pH
Transparency, odor and color.

MATERIALS

a. Four Urine Samples - They have been already collected for you!
   Control (normal), Patient 1, Patient 2 and Patient 3
b. Test Tube Rack
c. 4 Small Test Tubes and Tweezers
d. pH papers and Glucose test strips

PROCEDURE

For each test you will record your findings in your lab notebook in the data table.

Transparency

One factor to observe in the urine is its general appearance. Normal urine is transparent. Old samples of urine may be cloudy due to the bacteria growing in the sample after it was collected. Fresh urine samples that are cloudy may be due to urinary tract infections. This could be due to the presence of white blood cells or pus.

Evaluate the transparency of the samples and record in the patients chart

Color

The color of the urine is another factor a physician like yourself can observe. The color of urine depends in part on its concentration. Pale, dilute urine maybe the result of drinking large volumes of fluid but it may also indicate diabetes. Diabetes is associated with an abnormal thirst and frequent urination which can also cause pale, dilute urine. Dark, concentration urine on the other hand can indicate severe dehydration sometimes associated with high fevers. A smoky, reddish brown indicates the presence of red blood cells which can be caused by injury or a severe urinary tract infection. Vegetables, fruits and vitamins may also color urine.

Evaluate the color of the samples and record in the patients chart

Odor

The normal odor of urine can be altered by several factors. A foul, rotten odor in fresh urine may indicate the presence of bacteria, the result of a urinary tract infection. A fruity odor indicates the presence of ketones caused by diabetes or starvation.

Evaluate the odor of the samples and record in the patients chart

Sugar Content

Sugar can be present in the urine after eating a meal rich in carbohydrates or simple sugars or during periods of stress. However, a consistent finding of sugar in the urine may indicate diabetes. Urine with sugar present often has bacteria present as well since bacteria can thrive in the bladder if urine is sweet. Diabetes has been detected in the urine of dogs because ants swarmed around the urine of the diabetic dog.

Using the glucose strips, measure the glucose concentration in the urine.
Record this value as either being low, medium or high in the patients chart

Acidity

Usually urine is slightly acidic with a pH of around 6. The normal range, however, may vary from as low as 5 to as high as 8. Several factors may influence the acidity of the urine such as food, dieting, stress, dugs, breathing rate and liquid intake.

Evaluate the acidity of the samples and record in the patients chart

ANALYSIS QUESTIONS:

1. Why is it important to test each sample against a control urine a sample?
2. Diagnose each patient and provide evidence to justify your diagnosis.

CONCLUSION QUESTIONS:

1. How could urine reflect a disruption in someone's homeostasis?
2. Give two examples of diseases caused by disruption of homeostasis which can be seen by studying urine.
3. What are two indicators of a Urinary Tract Infection?
4. What would be your diagnosis if an otherwise healthy patient came into your office for a check up on March 18th and produce a specimen of urine that was bright green?
5. Why might a urine sample taken early in the morning differ from a urine sample taken soon after dinner?
6. How would you test for protein in the urine using an indicator you are already familiar with? (Proteinuria is serious disease that is detected by a protein test)

PATIENT CHARTS

Characteristics	Control	Patient 1 "Edna"	Patient 2 "Morty"	Patient 3 "Gertrude"
				
Transparency				
Color				
Odor				
Sugar Content				
pH Level				

Name: _____ Lab #_____

Human Reflexes and Reaction Time

PURPOSE: to observe and measure your own reflexes and reaction time with and without distractions

BACKGROUND INFORMATION:

You have probably touched a hot stove or sharp object and pulled your hand away before realizing what happened. This fast and automatic reaction to a stimulus is called a reflex action. Some reflexes prevent injury to the body. For example, the withdrawal reflex that allows you to remove your hand from a hot stove helps to prevent a severe burn. Reflexes also control automatic activities in the body, such as the beating of the heart, breathing, gagging, and stomach movements.

In the reflex arc, or pathway, of the reflex described above, a sensory neuron carries the impulse from the skin to the spinal cord where it synapses with an interneuron. The interneuron synapses with a motor neuron. Impulses carried by the motor neuron stimulate the appropriate muscles to withdraw the affected body part. All of this happens in a fraction of a second. Some impulses are sent to the brain to signal information, but these impulses are not part of the reflex arc.

In non-reflex responses, impulses must travel to the brain, where they are interpreted and a proper response is initiated. The time required for the brain to receive and interpret the impulses, and initiate a response is much longer than the time required for a reflex action, which involves only the spinal cord, not the brain.

A person's reaction time is a measure of how quickly he or she can perceive a stimulus and react to it. Reaction time is important in operating vehicles and machinery, in sports, and in many everyday activities. Fatigue, drugs, and distraction may increase reaction time.

HYPOTHESIS: Make a prediction stating the effect of distraction on your own reaction time

MATERIALS: Meter stick, Calculator, Pen or Pencil, Clock

SAFETY: Be careful using the meter sticks. Do not swing them or raise them above chest level.

PROCEDURE and DATA COLLECTION: Work in pairs, alternating turns as test subject and experimenter.

Part I – Reflexes

A) Patellar Reflex - The subject should sit on a chair with one leg crossed over the other so that the top leg is free to swing. With the side of the hand, the experimenter should gently tap the subject's knee on the tendon just below the kneecap. Record a description of your observations.

B) Repeat step A, but this time the top leg of the test subject should be held out straight instead of being free to swing. Record a description of your results in the observations.

C) Switch roles and repeat steps A and B

D) Iris-Pupil Reflex - The subject should close and cover his or her eyes for at least one minute. At the end of one minute, the experimenter should watch the subject's pupils (black dot in the center of the eye) as the eyes open. Record the response of the iris (colored part of the eye) and pupil.

E) Switch roles and repeat step D.

Part II – Reaction Time

1) One student will rest his or her arm on the side of the desk, with the arm extending over the edge. This person must be completely focused on catching the meter stick without distraction.

2) The subject's partner will hold a meter stick with the 0 centimeter line between the subject's index finger and thumb.

3) Without telling the test subject, the partner holding the stick will release it and the subject should catch it as quickly as possible. Note the measurement in centimeters on the meter stick where it was caught, indicating the distance that the meter stick fell.

4) Repeat for 5 trials for each partner. Construct and complete a data table like the one below.

5) After collecting data for both students, calculate the average distance the meter stick fell without distraction, for each lab partner.

6) Repeat steps 1-5 only now the test subject must recite the alphabet backwards while waiting for the meter stick to drop. This will serve as a distraction, your independent variable being tested.

7) Use the information from your data table to graph your results. Construct a **BAR GRAPH** to show a visual representation of your averages with and without distraction. Remember to label both the x-axis and y-axis and give your graph an appropriate title.

No Distraction		With Distraction	
Trial #	Distance Meter stick Fell (cm)	Trial #	Distance Meter stick Fell (cm)
1		1	
2		2	
3		3	
4		4	
5		5	
Average		Average	

ANALYSIS QUESTIONS: Be sure to answer in complete sentences.

1. How is the iris-pupil response to light a protective reflex?

2. What is the relationship between distraction and reaction time? Why have certain counties in New York State passed laws prohibiting the use of cell phones while driving?

3. Based on your experimental data from the ruler drop, how successful would this activity be with 15 cm rulers instead of meter sticks? Refer to your specific data.

4. Describe what is meant by a "reflex arc." Be sure to include the function of a reflex arc as well as its components from stimulus to response.

LAB#_____ REGULATION

Problem: Do lengths of reaction time vary among individuals?

Science Process Skills

observing, recording data, hypothesizing

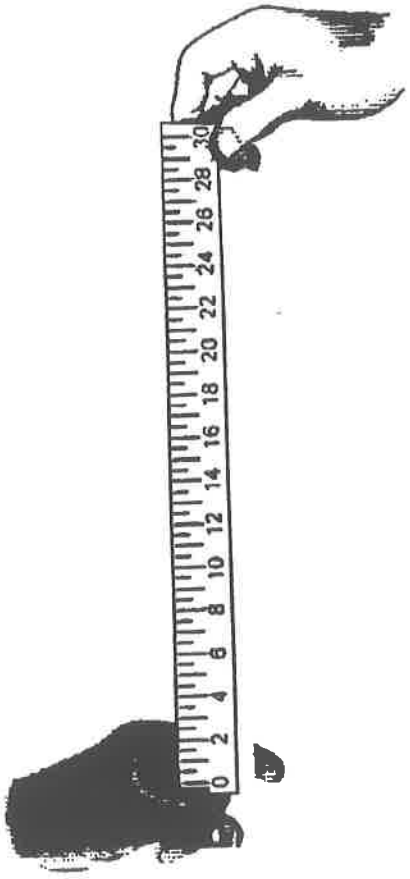
Background Information

Your nervous system enables you to respond to changes in your environment. For example, if you are walking down the street and you see a bicyclist coming toward you, you get out of the way. The length of time that passes between seeing a change and reacting to the change is the reaction time.

Materials

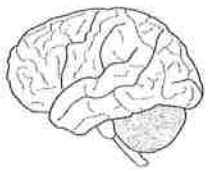
metric ruler

Procedure



1. Work with a partner. Hold the metric ruler at the 30 cm mark as shown in the diagram. Have your partner position his or her thumb and forefinger around, but not touching, the zero end of the ruler as shown.
2. Drop the stick at any moment you choose. Your partner must catch the stick as it falls by closing the thumb and forefinger. Your partner's hand must not move.
3. On a separate sheet of paper, develop a data table to record the distance in mm from zero that the ruler falls until it is caught.
4. **HYPOTHESIZE** Do you think that your reaction time is the same as your partner's? Why or why not? In the space provided, write your hypothesis. Your hypothesis should answer the questions. To test your hypothesis, continue the activity.
   Hypothesis:_____
   _____
5. Repeat steps 1-4 four more times, then average the five trials. To find an average, add the five trials together, then divide the total by 5. Average: _____
6. Repeat the activity with you and your partner's roles reversed.
7. **ORGANIZE** On a separate sheet of paper, develop a data table to record the average distance for each student in your class.

Stroop Effect and Brain Sidedness



Purpose:

1) Conduct an experiment to determine how the brain is conditioned to accomplish tasks (The Stroop Effect)
2) Determine which side of your brain is dominant

Background:

Many times we take our brain functions for granted. Can you imagine if you could not move your hands, read a book, or recognize your best friend? What if you could not laugh, cry, or feel happy? Our brains are complex structures that allow us to accomplish many tasks, still little is known about how it actually does this! The Stroop Effect was named after psychologist Ridley Stroop, who investigated this phenomenon in the 1930s. He uncovered that the act of reading words sends a message to the brain that is difficult to suppress. When a word's meaning is combined with a conflicting message, such as the word's color, it interferes with processing, causing delays and errors in the response

Pre-lab questions:

- Name and describe the functions of 4 parts of the human brain

Procedure:

1) Obtain a Stroop Test from you teacher.
2) Using a stopwatch (or clock), record how long it takes your partner to **read through the words on the card three times without stopping.**
3) Record your times in a data like the one below.
4) Using a stopwatch (or clock), record how long it takes your partner to **name the colors of the words on the card three times without stopping.**
5) Record your times in the table.
6) Have your partner test you as well! Be sure to conduct 2 trials per person.

	Read through time (Self)	Read through time (Partner)	Color name time (Self)	Color name time (Partner)
Trial 1				
Trial 2				
Average	____ seconds	____ seconds	____ seconds	____ seconds

Analysis:

With the Stroop Effect, the words themselves have a strong influence over your ability to say the color. The interference between the different information (words vs. color) your brain receives causes a problem. There are two theories that may explain the Stroop Effect:

1) Speed of Processing Theory: the interference occurs because words are read faster than colors are named.
2) Selective Attention Theory: the interference occurs because naming colors requires more attention than reading words

Analysis Questions:

1) Referring to the present theories on The Stroop Effect, which one do you agree with and why? (Use examples from your experience in this lab)
2) Try to alter the way you look at the card (blur your eyes or turn it upside down) in order to decrease (speed up) your time for naming colors. Offer an explanation for why this works.
3) Do you think it would be easier for a child or adult to name the colors? Offer an explanation.
4) Which part of your brain do you think you used to complete the Stroop Test? Explain.

Which Brain Side is Dominant?

Strengths of Right Brain Thinkers	Strengths of Left Brain Thinkers
• Recognizing faces • Expressing emotions • Music • Reading emotions • Color • Images • Intuition • Creativity	• Language • Logic • Critical thinking • Numbers • Reasoning

According to the left-brain, right-brain dominance theory, the right side of the brain is best at expressive and creative tasks, while the left-side of the brain is considered to be adept at tasks that involve logic, language and analytical thinking. Some of the abilities that are popularly associated with the left. Since your left brain controls the physical activities of your right body, and vice versa, analyzing your physical preferences may also provide clues as to which brain side is dominant.

Objective: Determine which side of your brain is the most dominant.

Procedure: Construct the following chart in your lab notebook, filling it in as you complete each task.

Procedure	Test	Left	Right
1	Writing Hand		
1	Waving Hand		
2	Dog faces *away* from this side in drawing		
3	Batting		
4	Starting down stairs		
4	Skipping		
5	Folding Hands (thumb on top?)		
6	Dominant eye		
7	Resting weight on leg		
8	Drawing circles		

1) Record in the table which hand you prefer to write and wave with.
2) Create a simple drawing of a dog in your lab notebook. Which side does it face *away* from?
3) If your right arm is behind you when swinging a bat, check right, otherwise check left.
4) Stand on your chair and step down. Which foot touches the floor first? Now stand with your feet together. Begin skipping. Check whichever foot moves forward first.
5) Record which thumb is on top when your hands are folded.
6) Hold your hands in front of your face, palms out. Form a triangle bringing together your index fingers and thumbs. Locate a distant object (ex. The school clock) and position it in the triangle. While keeping your left eye open, close your right eye, and then open it. Does the object jump out of the triangle? If so, your right eye is dominant (check right). If the opposite is true, your left eye is dominant (check left).
7) Record which leg your weight is on when you are at rest standing.
8) Draw a circle with your right hand. Note the direction it was drawn (clockwise/counterclockwise). Draw a circle with your left hand. Note the direction again. Both were clockwise = check right, both were counterclockwise = check left, drawing direction differed = check both columns.

Analysis:

1) Which is your dominant body side? Which is your dominant brain side? (opposite)
2) Discuss the accuracy of your findings. Do you agree with your results you obtained pertaining to your personal "brain side"? Be sure to refer to specific examples from brain strengths chart above right.