BIOLOGY NOTEBOOK

NAME_____

SCI# _____

HOLT USERNAME _____

Bio Basics

(dissecting)scanning objective
low power
high power
field of view
micrometer
dependant variable
independent variable
fine adjustment knob
coarse adjustment knob
scanning electron microscope

Chap 1

Skepticism
Observation
Hypothesis
Experiment
control group
theory
SI
Biology
cell
homeostasis
universal laws
correlation data
bias
~~Homeostasis~~
Metabolism
Responsiveness
Heredity

Chap 3

Atom
Compound
Element
Ion
Molecule
valence electron
acid
adhesion
base
buffer
cohesion
pH
solution
amino acid
ATP
Carbohydrate
DNA
Lipid
nucleic acid
nucleotide
protein
RNA
activation energy
active site
energy
enzyme
product
reactant
substrate
Covalent

Ch 7

Cell membrane
~~Cytoplasm~~
Ribosome
Prokaryote
Eukaryote
Nucleus
Organelle
Vesicle
endoplasmic reticulum
Golgi apparatus
Vacuole
Chloroplast
Mitochondrion
Flagellum
Tissue
Organ
organ system
colonial organism

Ch 8

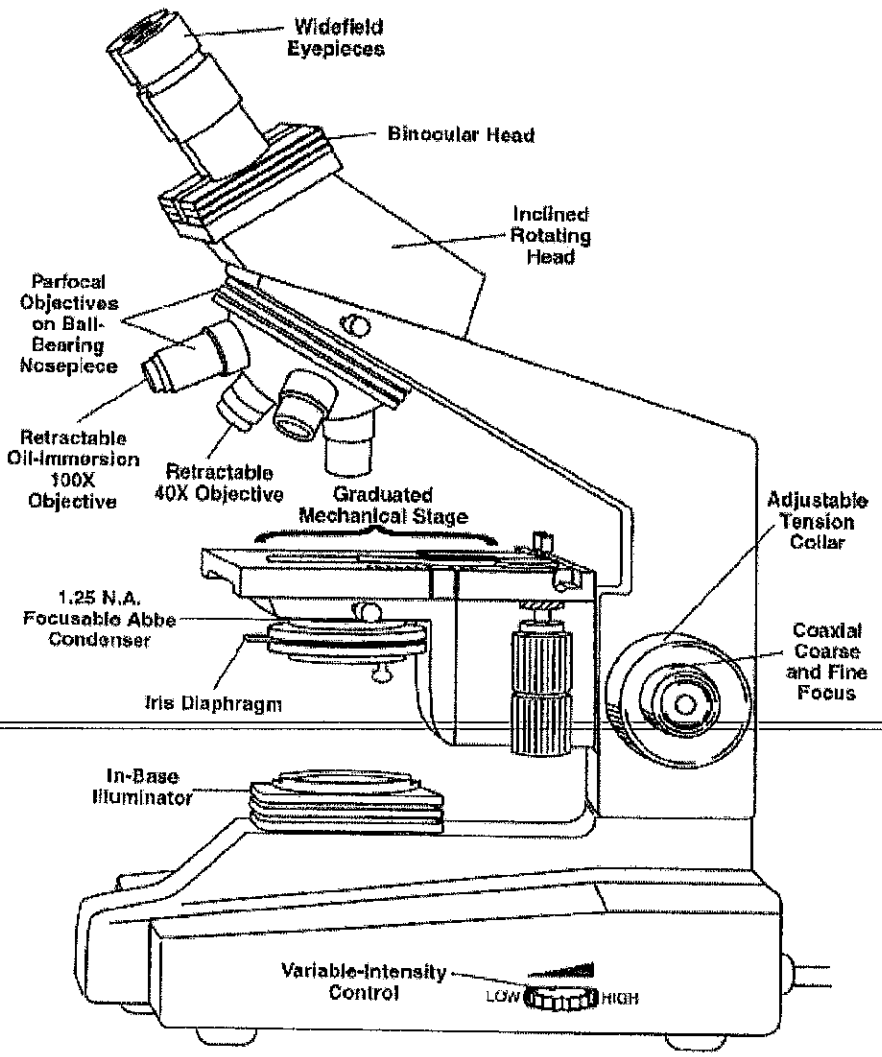
Phospholipid
lipid bilayer
equilibrium
concentration gradient
diffusion
carrier protein
osmosis
sodium-potassium pump
signal
receptor protein
second messenger
Hypertonic solution
Hypotonic solution
Isotonic solution
Concentration gradient

Chapter 0 BIO BASICS

1. Knowing the Microscope

1. Review the parts of the compound microscope
2. It is important that you have memorized the objectives
    a. Dissecting = 4X
    b. Low power= 10X
    c. High Power = 40X
    d. Oil (not generally used in this class)=100X
3. Know your microscope number, where it belongs, and know how to store it properly. If you do not put your microscope away properly at the end of class, you will receive a detention!

Advanced and Research Microscopes



2. Calculating Magnification

1. Look for the number marked with an X on the
    a. Eyepiece
    b. Low power objective
    c. High power objective
2. Multiply the number on the eyepiece by the number on the objective.

Ex- eyepiece is 10X and the objective is 40X. the total magnification is 400X

3.Using the Microscope

It is important that you become familiar with using the microscope. If you can not find and focus on an object, you will not be able to complete the labs in the allotted time.

1. Take the microscope that corresponds to your science number. If it is not put back correctly (not underdissecting power, not shut off, slide on the stage, cord not wrapped) tell me immediately.
2. Carry the microscope to your lab station with one hand under base and the other around the arm grasping the cord so you do not trip.
3. Place the microscope on the table and plug it in. Make sure the green light is lit on the outlet. If it isn't, hit the reset button with your finger-not an object.
4. Clean the eyepiece and objective with Kimwipes- DO NOT USE PAPER TOWELS- they scratch the lenses. If the microscope is very dirty, you may use alcohol on the Kimwipe. Use a small amount.
5. Make sure the diaphragm is open and turn on the microscope.
6. Place the slide (coverslip and/or label) facing UP. Make sure the object to be viewed (or the coverslip) is directly over the stage aperture. The light should shine directly through the object or coverslip.
7. The microscope should already be under dissecting lens (4X). You should now move the lens to low power (10X). Make sure you hear it click into place or you will see nothing. Without looking through the eyepiece, lower the low power objective til it is almost touching the coverslip.
8. Looking through the eyepiece, raise the objective using the rough adjustment knob. When the object comes into focus, stop and switch to fine adjustment. This will allow you to focus clearly. If you have difficulty observing the object, close the diaphragm slightly. This will allow you to see the object with a darker outline.
9. Using the stage adapters, move the slide until the object to be viewed is directly in the middle.
10. Switch to high power (40X) being careful to not crack the lens on the slide.
11. Look through the eyepiece and focus USING THE FINE ADJUSTMENT ONLY!! You will crack the slide and objective if you use the coarse adjustment!
12. When finished, return the microscope to dissecting objective (4X), remove the slide, clean anything you spilled on the stage or lenses, shut the power button, coil the cord and return to its parking spot.

4. Making a Wetmount

1. Add a drop of water to the center of a clean microscope slide.
2. Place the object to be viewed in the drop of water.
3. Pick up a coverslip by its edges. Do not touch the surface of the coverslip. Stand the coverslip on its edge next to the drop of water
4. Slowly lower the coverslip over the drop of water and the object to be viewed.

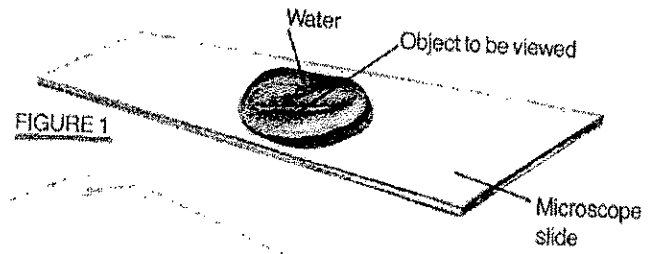


FIGURE 1

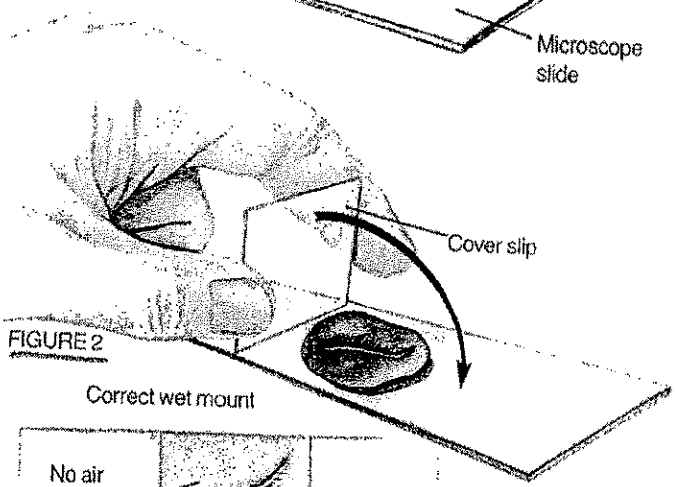


FIGURE 2

Correct wet mount

FIGURE 3

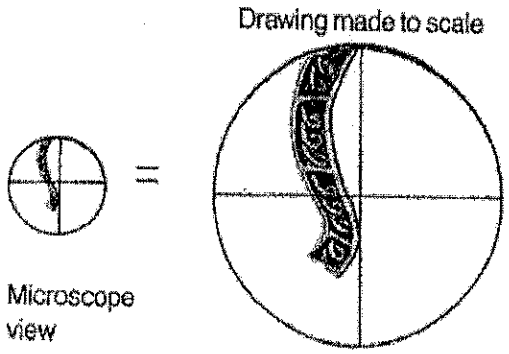
Troubleshooting

1. Not enough water: air bubbles will form. Air does not refract light in the same way as water- therefore you will not be able to see an object in or near an air bubble. Air bubbles will appear as dark black dots or lines
2. Too much water: water will come out from under coverslip and coverslip will be floating and moving. Take a paper towel and touch the edge of the paper towel to the edge of the coverslip. This is also how you pull stain across a specimen.

5.Making Scale Drawings

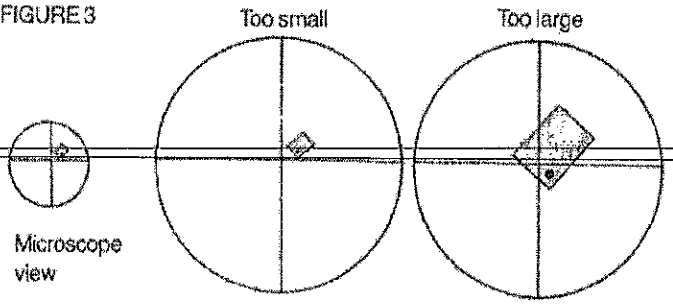
When you draw objects seen through the microscope, the size that you make your drawing is important. Your drawing should be in proportion to the size the object appears to be when viewed through the microscope. This is called drawing to scale. This allows you to compare the sizes of different objects.

1. Draw a circle on the paper
2. Imagine the circle divided into 4 equal sections
3. When looking through the eyepiece, imagine the same 4 equal sections
4. Note how much of the object takes up each quadrant. Draw each quarter exactly as it appears in the eyepiece.



Correct

FIGURE 3



Incorrect

Incorrect drawings to scale

6.Measuring Volume

Volume is measured in milliliters (ml) or liters (L). 1000ml = 1 L.

Volume= length X height X width

1. Locate the units on the graduated cylinder. Not all graduated cylinders are 1 ml/ graduation
2. Place the cylinder on a flat surface. Do not hold it up!
3. Read the volume at eye level
4. The surface of the liquid will form a curve. This is the meniscus. Read the volume at the lowest part of the curve.

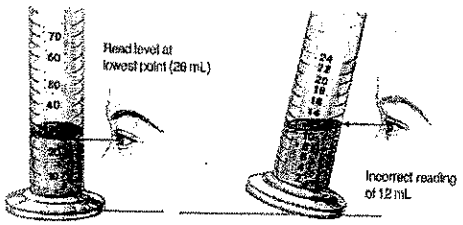


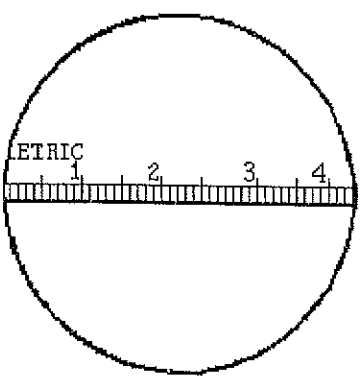
FIGURE 1 FIGURE 2

7. Measuring Field of View

The unit of length that is commonly used for microscopic objects is the **micrometer**. The prefix ***micro-*** is given the symbol of the Greek letter mμ (μ). A micrometer (μm) is equal to one-millionth of a meter. More appropriately, for microscopic objects a micrometer is equal to one-thousandth of a millimeter (0.001 mm.), or 1000 μm = 1 mm.

Procedure:

1. With the lowest power objective (4X) in position, place the millimeter ruler on the center of the stage so that the scale is visible through the microscope.
2. Line up the 0 mm. vertical line with the left side of the circular field of view. (A total magnification of 40X will give you a view similar to **Figure 2.**)
3. Count the number of millimeters included from one side of the field to the opposite side. If the right side of the field of view does not coincide with one of the lines, you will have to estimate to a fraction of a millimeter. (Be particularly careful that the **edge** of the ruler is across the **middle** of the field of view.)



40X field of view _____ mm. _____ μm

100X field of view _____ mm. _____ μm

400X field of view _____ mm. _____ μm

4. Turn the 10X objective into place and fine adjust. Estimate this new field of view of 100X.

8. Writing a Hypothesis

A hypothesis is a possible or tentative explanation for a question or problem. A properly written hypothesis has a dependent and independent variable.

Dependent Variable- this is what may happen because of the independent variable. In other words it depends on the independent variable.

Independent Variable- this is what is having an effect on the dependent variable

Here are some Examples to help clear this up!

Problem: Does the amount of air in a basket ball determine how high it will bounce?

Hypothesis:

The amount of air in a basketball affects how high it will bounce.
(I.V.) (D.V.)

Problem: Does the temperature affect how active the lizard is?

Hypothesis:

Warmer temperatures increase the activity level of a lizard.
(I.V.) (D.V.)

Problem: IS the speed that a boy walks affected by how baggy his pants are?

Hypothesis:

The speed that boy walks is affected by how baggy his pants are

(D.V.) (I.V.)

Listed below are some already written hypotheses. Underline the independent variable and **circle** the dependent variable in each one. Basically, the dependent variable is something that can be measured like speed, height, odor, etc. and the independent variable is something that is causing different amounts of the thing being measured.

1. The amount of sunlight a plant gets affects how tall the plant will grow.

2. Female elks with higher level of hormones will migrate faster

3. A teacher's attitude is affected by the number of students in her class

4. The amount of sleep a students gets before a test affects the score he or she earns on a the test

5. A person's sex determines how fast they can learn.

6. The amount of hairspray a girl uses affects the number of boys who ask her out.

7. Eating broccoli increases the number of correct answers on a math test

8. Applying fertilizer affects the number of weeds growing in a yard

9. The amount of rainfall affects how many flowers a cactus produces

10. A rougher road increases the number of times you fall when rollerblading.

11. Telling your mother that she is a good cook increases the hour of your curfew.

12. Washing the dishes for your mother increases the amount of money she gives you on the weekend.

13. Coaches with more years of experience will have a higher percentage of wins.

14. The amount of food that a bird eats is affected by the temperature.

15. Eating chocolate affects the number of zits you get.

Now you are given the problem and you have to write a hypothesis. Underline the independent variable and **circle** the dependent variable for each hypothesis you create.

1. Does the number of holes in your pants affect the number of detentions you get?

2. Does the color of a person's hair affect the scores they get on tests?

3. Does the color of a T-shirt you wear affect the number of people who smile at you?

4. Does the type of music you listen to affect your grades?

5. What affect does the temperature have on the length of an animal's hair?

6. Does the amount of salt in water affect how fast it will boil?

7. Does the way a boy's hair is cut affect how many girl's like him?

8. Does music have an affect on the number of eggs a chicken will lay?

9. What effect does the price of a pair of jeans have on how good they fit?

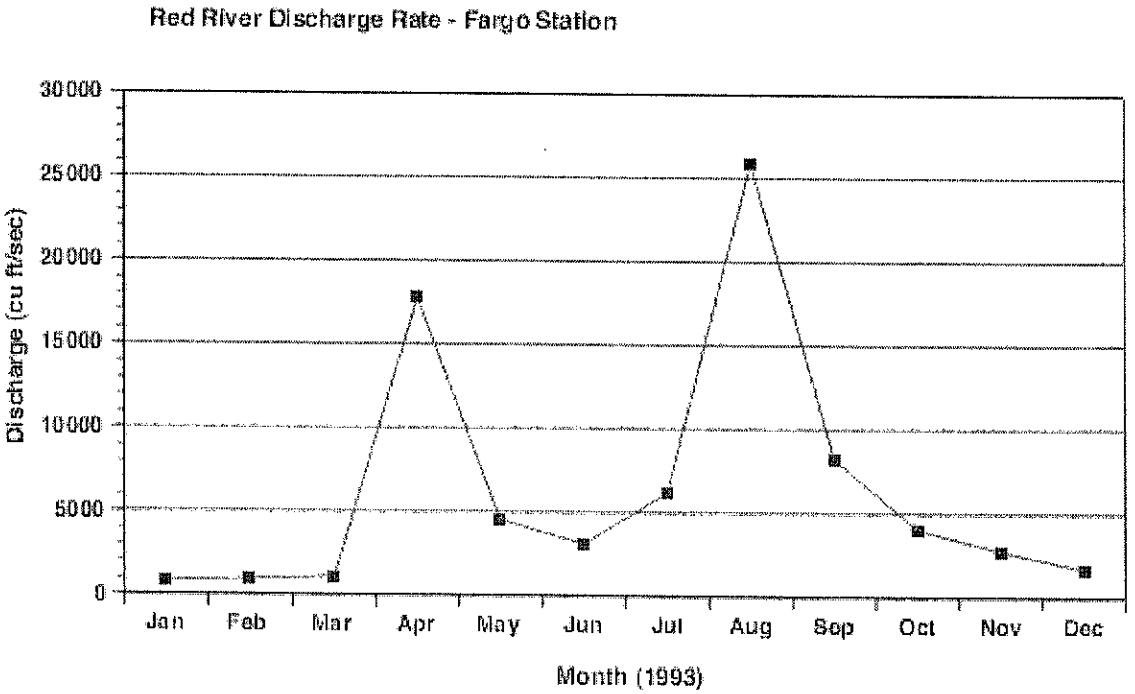
10. What affect does cockroach poison have on the number of cockroaches in a house?

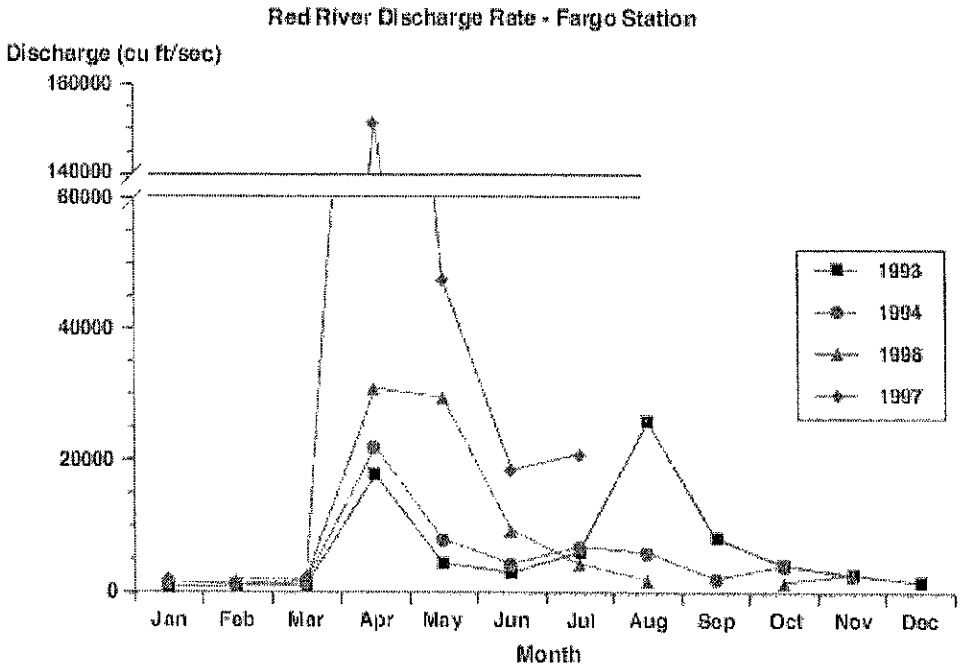
10.Graphing

It is extremely important for both this class and the EOCT test to be familiar with the units of measurement for the x and y axes. You must also be able to place the correct variable on the correct axis to create a graph. The independent variable always goes on the x-axis. The y-axis is for the dependant (what you are changing/doing/looking at) Because time heeds no one, time is almost always independent and therefore will be on the horizontal x-axis. Below are some of the more common types of graphs.

Line Graphs

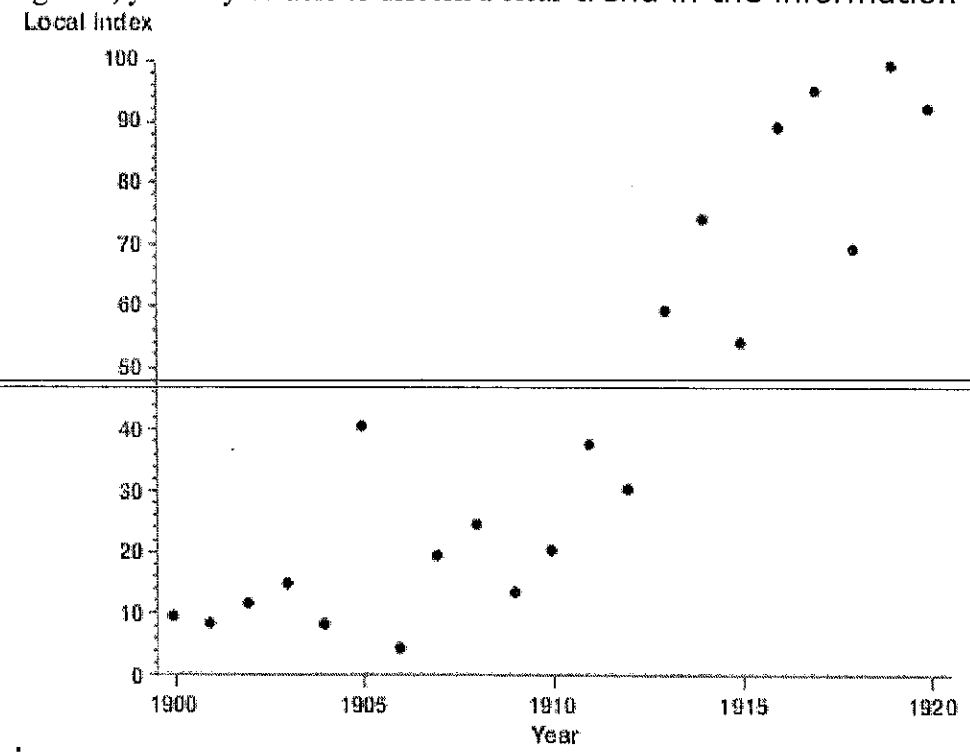
Line graphs are very useful to plot a value over time. Line graphs are useful when both variables are quantitative (numerical). The line can be studied to find the slope, which can be useful for studying certain properties. The slope is a tool used to mathematically express a trend in the data.



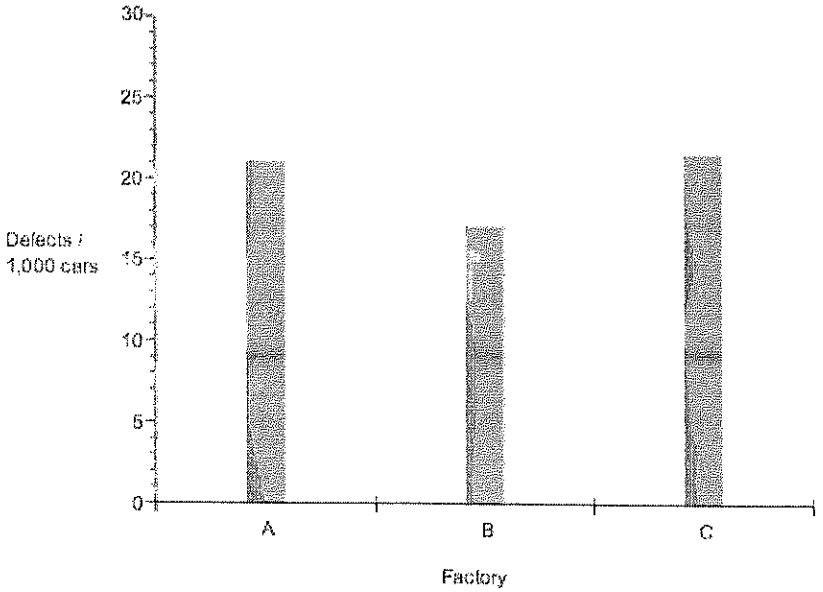


Scatter Plot

With a scatter plot a mark, usually a dot or small circle, represents a single data point. With one mark (point) for every data point a visual distribution of the data can be seen. Depending on how tightly the Points cluster together, you may be able to discern a clear trend in the information



Bar graphs are a coomon type of graph that are best suited for qualitative information, such as name or group. there is no unbiform distance between the bars- due to qualitative nature- and a slope can NOT be derived from the information presented.



http://nces.ed.gov/nceskids/help/user_guide/graph/index.asp

Common SI units				
Prefix	none	*kilo-*	*centi-*	*milli-*
Factor	1 (base unit)	1,000	0.01	0.001
Units used to describe volume	1 liter (L)	1 kiloliter (kL) = 1,000 L	1 centiliter (cL)= 0.01L	1 milliliter (mL) = 0.001 L
Units used to describe length	1 meter (m)	1 kilometer (km) = 1,000 m	1 centimeter (cm) = 0.01 m	1 millimeter (mm) = 0.001 m
Units used to describe mass	1 gram (g)	1 kilogram (kg) = 1,000 g	1 centigram (cg) = 0.01 g	1 milligram (mg) = 0.001 g

Lab ____: Following Procedures in the Lab

Purpose: In this activity you will learn determine your skill in following written directions. This will be graded as a quiz. Please be sure to complete all questions on the lab.

Materials:

red, blue, and yellow water test tube stand 6 test tubes

3 small beakers or cups small graduated cylinder

Procedure:

1. Label each test tube A, B, C, D, E, or F using tape
2. Pour about 25 mL of each color of water into three small beakers or cups. One should be blue, one yellow, and one red.
3. Into test tube A, measure 9.5 mL of red water
4. Into test tube C, measure 9 mL of yellow water
5. Into test tube E, measure 9 mL of blue water
6. From test tube C, measure 2 mL, and pour the 2 mL into test tube D
7. From test tube E, measure 3.5 mL and add it to test tube D and mix
8. Into test tube F, measure 2 mL of blue water and 3.5 mL of red water and mix
9. From test tube A, measure 4 mL of water and pour it into test tube B
10. From test tube C, measure 1.5 mL of water and pour it into test tube B and mix
11. Once your observations are complete, empty all the test tubes into the sink, remove the tape and rinse well. Put all test tubes upside down on the test tube rack. Show me the cleaned lab table and I will stamp this lab.

Observations and Data:

Carefully measure the total amount of water in each test tube. Complete the table below by recording the final color and total amount of water in each test tube.

Test Tube	Color of Water	Total Volume of Water (mL)
A		
B		
C		
D		
E		
F		

Questions:

1. What lab table were you working?

   _____

2. Who was your lab partner?

   _____

3. What was the biggest difficulty in completing this lab?

   _____

   _____

   _____

4. Other than practicing following procedures, what other purpose did this lab have?

   _____

   _____

   _____

1. What is the dependant variable?_____

2. What is the independent variable?_____

Which is the dependant and independent variable in each of the following? Underline the independent, circle the dependant.

3. The number of holes in a student's jeans affects the number of detentions the student gets.

4. The amount of rain during the spring season determines the number of mosquitoes

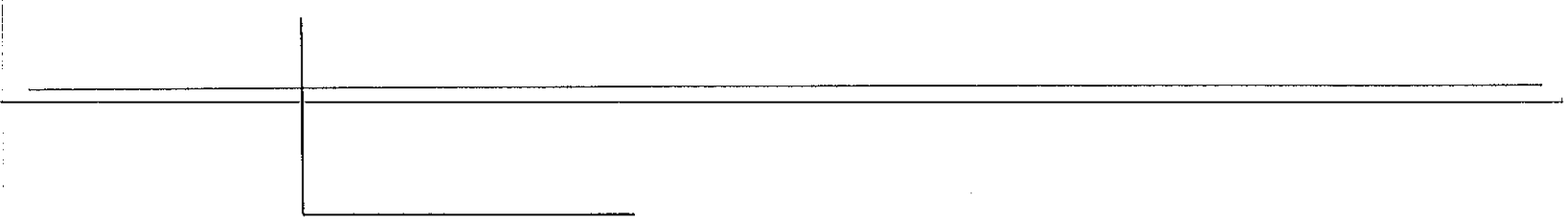
5. A teacher's attitude is affected by the number of students in the class

6. The number of flowers on a cactus plant is related to the amount of rainfall.

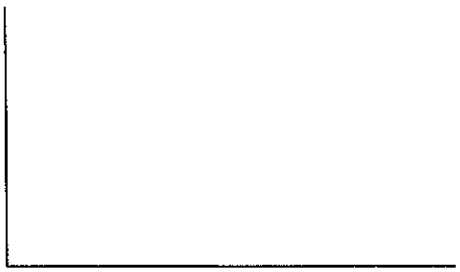
Determine the variable that goes on each axis

7. The amount of fabric softener used in the laundry affects the grades that the student gets.

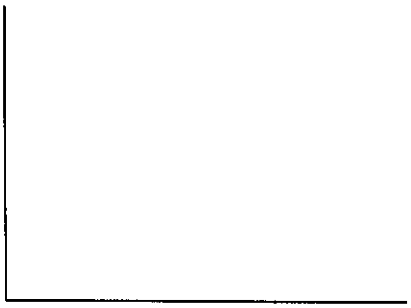
8. The type of sneakers a student wears determines the number of friends the person has.



9. The number of words a person can text per minute determines the number of people that like them.



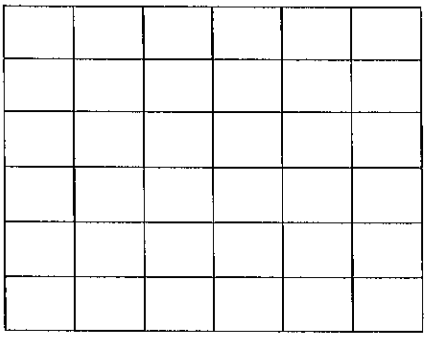
10. The temperature influences the length of a dog's hair.



11. Make the following graphs.

Temp (^{o} C)	# otters
6	121
45	150
66	61
43	118
51	100
14	62

otters



temp

12. At 100x magnification, what does the objective have written on it? _____

13. What is the total magnification of the low power objective? _____

14. What does the dissecting objective have written on it? _____

15. What objective is the high power?_ _____

16. What steps do you need to take to put away the microscope?_ _____

17. What direction does the object being viewed move when you move the stage to the right?_ _____

_____

18. How do you clean the lenses?_ _____

_____

19. What power objective must you use oil to see?_ _____

20. When making a wet mount slide, how do you get rid of air bubbles?_ _____

_____

21. If you put 23 drops of water to fill up a ml, how many drops would you need for 5 ml?_ _____

_____

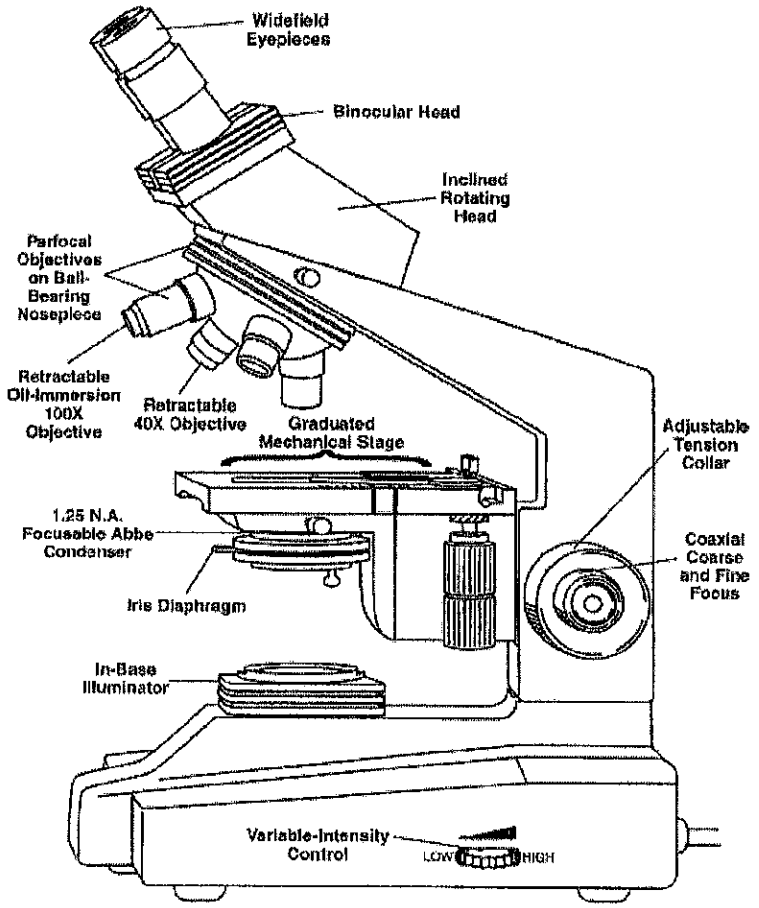
22. If you put 105 drops of water to fill up a teaspoon, how many drops does each ml contain? _____

_____

23. Where do you read the fluid in a graduated cylinder? _____

24. Label the diagram of the microscope

Advanced and Research Microscopes



Create the following graphs; use your lab table unless otherwise specified.

1. Does someone's height determine how high they can jump?

2. The effect a person's age has on their weight. (Use kilograms)

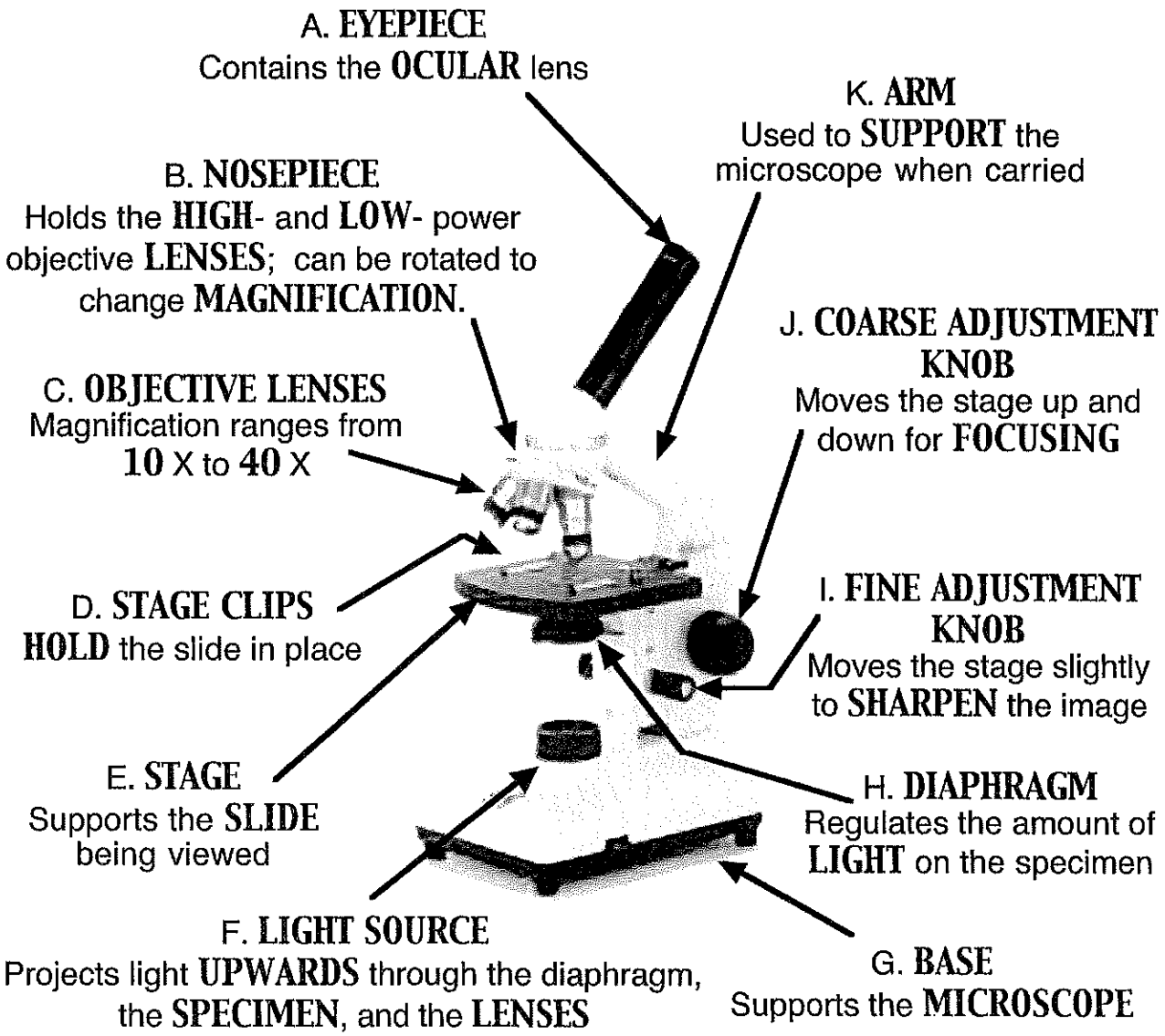
3. Does a student's hometown effect the length a person can hold their breath? Use class data.

4. Does a person's shop effect the number of jumping jacks they can complete in 1 minute?

5. Does a person's shoe size influence how fast a person can run 100 meters?

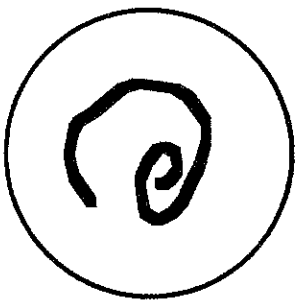
6. The favorite types of ice cream in the class.(yes this is a graph)

PARTS OF THE LIGHT MICROSCOPE

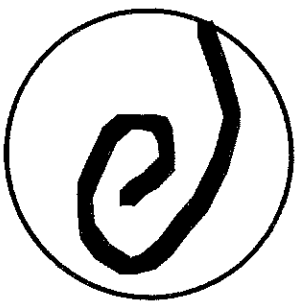


What happens as the power of magnification increases?

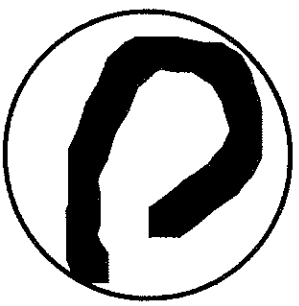
Power = 10 x 4 = 40



Power = 10 x 10 = 100



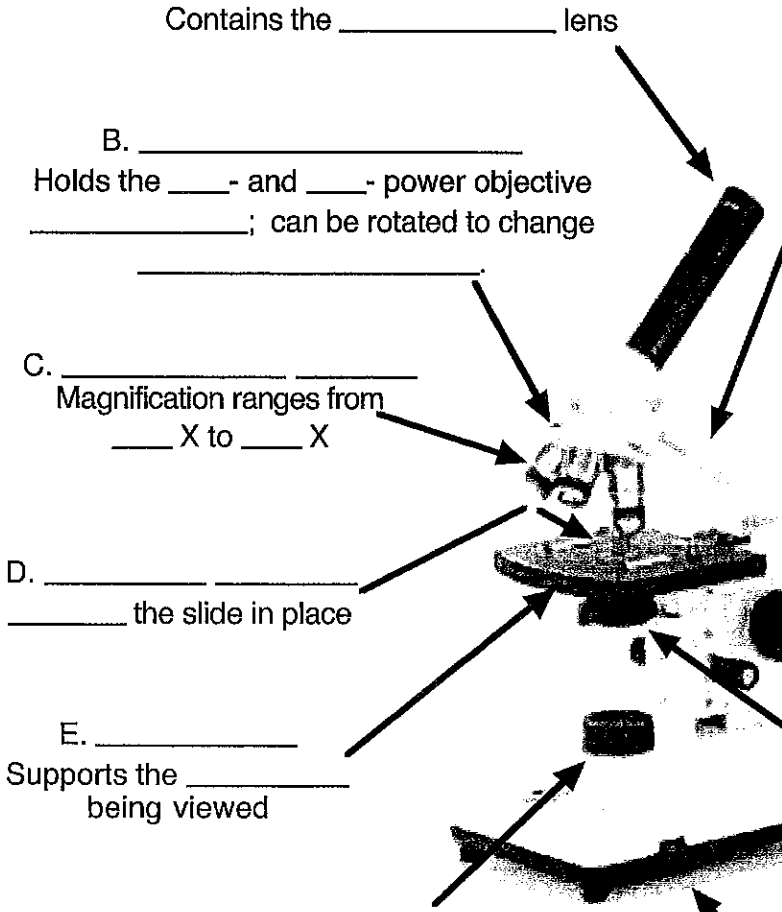
Power = 10 x 40 = 400



Microscope Mania

Name _____

Compound Light Microscope
Label each part and complete its description.



A. _____
Contains the _____ lens

B. _____
Holds the ____- and ____- power objective _____; can be rotated to change _____.

C. _____ _____
Magnification ranges from ____ X to ____ X

D. _____ _____
_____ the slide in place

E. _____
Supports the _____ being viewed

F. _____ _____
Projects light _____ through the diaphragm, the _____, and the _____

G. _____
Supports the _____

H. _____
Regulates the amount of _____ on the specimen

I. _____ _____
Moves the stage slightly to _____ the image

J. _____ _____
Moves the stage up and down for _____

K. _____
Used to _____ the microscope when carried

What happens as the power of magnification increases?

Power = ___ x ___ = ___ Power = ___ x ___ = ___ Power = ___ x ___ = ___

BIO BASICS HOMEWORK QUESTIONS

Write the questions AND answers on a looseleaf sheet of paper. Draw any required graphs

1. What is the dependant variable?

2. What is the independent variable?

Which is the dependant and independent variable in each of the following? Underline the independent, circle the dependant.

3. The number of holes in a student's jeans affects the number of detentions the student gets.

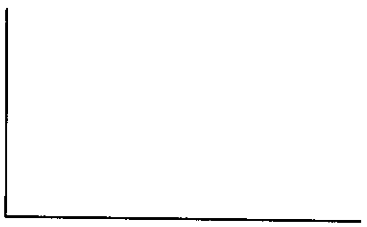
4. The amount of rain during the spring season determines the number of mosquitoes

5. A teacher's attitude is affected by the number of students in the class

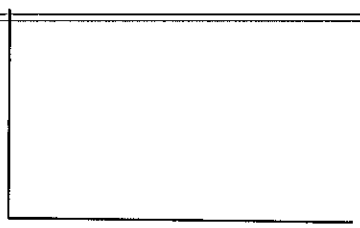
6. The number of flowers on a cactus plant is related to the amount of rainfall.

Determine the variable that goes on each axis

7. The amount of fabric softener used in the laundry affects the grades that the student gets.



8. The type of sneakers a student wears determines the number of friends the person has.



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10. The temperature influences the length of a dog's hair.

11. Make the following graphs.

Temp (^{o} C)	# otters
6	121
45	150
66	61
43	118
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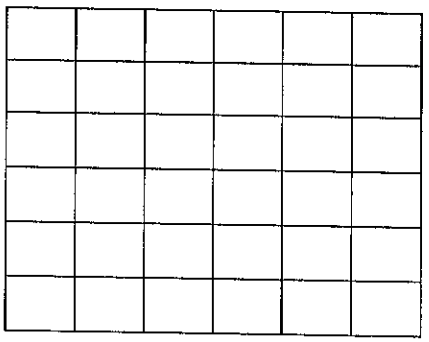
otters



temp

12. At 100x magnification, what does the objective have written on it?

13. What is the total magnification of the low power objective?

14. What does the dissecting objective have written on it?

~~15. What objective is the high power?~~

16. What steps do you need to take to put away the microscope/

17. What direction does the object being viewed move when you move the stage to the right?_ _____

_____

18. How do you clean the lenses?_ _____

_____

19. What power objective must you use oil to see?_ _____

20. When making a wet mount slide, how do you get rid of air bubbles?_ _____

_____

21. If you put 23 drops of water to fill up a ml, how many drops would you need for 5 ml?_ _____

_____

22. If you put 105 drops of water to fill up a teaspoon, how many drops does each ml contain? _____

_____

23. Where do you read the fluid in a graduated cylinder? _____

24. Label the diagram of the microscope

Electron Microscope

Name _____

The sites for this assignment are listed on the "Cells & Microscopes" page of the Kid Zone at http://sciencespot.net/.

Site #1: MOS Scanning Electron Microscope

Click the link for "How It Works" and then choose "Slide Show".

1. What does SEM mean? _____

2. How do conventional light microscopes work? _____

_____

3. What does the scanning electron microscope use to magnify images? _____

4. Why are the images black and white? _____

5. How does the SEM work? Read the captions and put the steps in order from 1 to 7.

___ As the electron beam hits each spot on the sample, secondary electrons are knocked loose from its surface, which are counted by a deflector and sent as signals to an amplifier.

___ The sample is placed inside the microscope's vacuum column through an air-tight door.

___ A set of scanning coils moves the focused beam back and forth across the specimen, row by row.

___ The final image is built up from the number of electrons emitted from each spot on the sample.

___ Air is pumped out of the column before the electron gun emits a beam of electrons, which travels downward through a series of magnetic lenses designed to focus the electrons to a very fine spot.

___ The Scanning Electron Microscope reveals new levels of detail and complexity in the amazing world of microorganisms.

___ SEM samples are coated with a very thin layer of gold by a machine called a sputter coater.

6. Watch the animation if possible. Write a paragraph to summarize what you saw.

~~Site #2: Virtual Electron Microscope~~

Click and drag the specimens on the left side under the microscope to examine. Then identify the slides by dragging them to the correct spot on the right side of the screen. Write the results below.

#1 - _____ #6 - _____

#2 - _____ #7 - _____

#3 - _____ #8 - _____

#4 - _____ #9 - _____

#5 - _____ #10 - _____

Done with your worksheet? Visit the other sites listed on the Cells & Microscopes page!

Common SI units				
Prefix	none	*kilo-*	*centi-*	*milli-*
Factor	1 (base unit)	1,000	0.01	0.001
Units used to describe volume	1 liter (L)	1 kiloliter (kL) = 1,000 L	1 centiliter (cL)= 0.01L	1 milliliter (mL) = 0.001 L
Units used to describe length	1 meter (m)	1 kilometer (km) = 1,000 m	1 centimeter (cm) = 0.01 m	1 millimeter (mm) = 0.001 m
Units used to describe mass	1 gram (g)	1 kilogram (kg) = 1,000 g	1 centigram (cg) = 0.01 g	1 milligram (mg) = 0.001 g

Name _____ Class _____ Date _____

Skills Worksheet

Science Skills

ANALYZING INFORMATION/INTERPRETING GRAPHICS

Dirt sticks to the body either by becoming trapped in microscopic wrinkles in the skin or, if the dirt is moist, by adhering to the body. Sometimes the natural oils on skin will give the dirt an oily coating. In such cases, water alone will not remove the dirt, but soap and water will. Use the information below and your understanding of polarity and chemical bonding to answer questions 1–3.

A. A soap molecule is long, with one end attracted to oil molecules.

B. One end of a soap molecule is polar, and the other end is nonpolar.

C. Soap will dissolve, and the soap molecules will float freely in water.

D. A sewing needle will rest upon the surface of water. If powdered soap is gently sprinkled near the needle, the needle will eventually sink.

Read each question, and write your answer in the space provided.

1. Explain why adding soap to water will help remove dirt and oil.

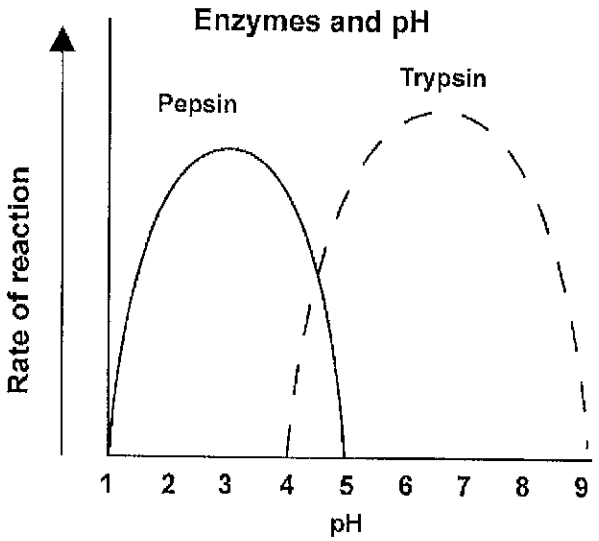
2. Why does the needle float on the water?

3. Why does the needle sink after soap is added to the water?

Name _____ Class _____ Date _____

Science Skills *continued*

The graph below shows the rate of enzyme activity in relation to pH for two enzymes—pepsin and trypsin. Both enzymes break down molecules in food taken into the human body, but the enzymes act in series. Pepsin breaks some bonds in very large molecules. Trypsin acts on the fragments produced by the action of pepsin, breaking them into even smaller units. Use the graph to answer questions 4–8.



Read each question, and write your answer in the space provided.

4. The liquid in the stomach has a pH of about 2. Which of the two enzymes would be active in the stomach?

5. The liquid in the small intestine has a pH of about 8. Which of the two enzymes would be active in the small intestine?

6. What must happen to the liquid as it passes from the stomach to the small intestine for digestion to occur normally?

Name _____ Class _____ Date _____

Science Skills *continued*

7. Consider the data on the relationship between pH and enzyme activity shown in the graph. Do enzymes typically function only at a specific pH, or can they function within a range of pH values?

8. Can pepsin and trypsin function in the same environment? Explain.

BIO BASICS REVIEW

1. What is the dependant variable?_____

2. What is the independent variable?_____

Which is the dependant and independent variable in each of the following? Underline the independent, circle the dependant.

3. The number of holes in a student's jeans affects the number of detentions the student gets.

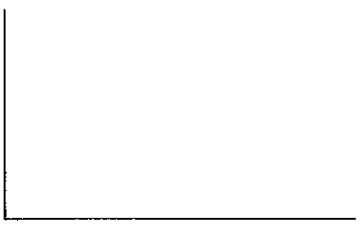
4. The amount of rain during the spring season determines the number of mosquitoes

5. A teacher's attitude is affected by the number of students in the class

6. The number of flowers on a cactus plant is related to the amount of rainfall.

Determine the variable that goes on each axis

7. The amount of fabric softener used in the laundry affects the grades that the student gets.



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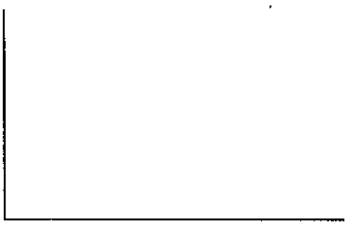

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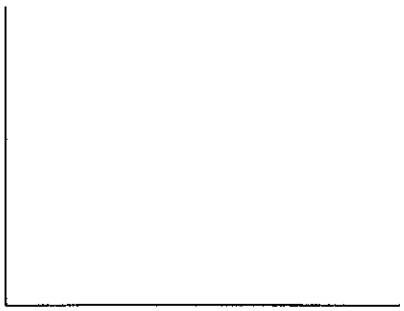

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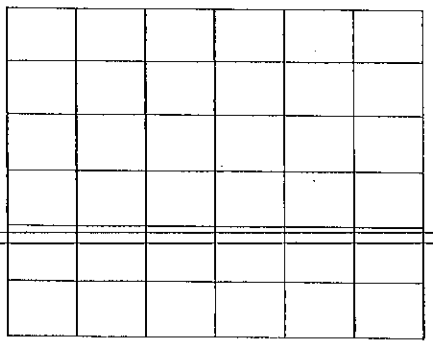

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Name_____ Class _____ Date _____

Practice Staining Techniques

The parts (organelles) of a typical cell are mostly transparent. In a technique called staining, color is added to cell parts to help identify and distinguish them.

Procedure

1. Use forceps to remove a thin layer of onion skin, and place it in the center of a glass slide. Add a drop of water, and place a coverslip over the specimen.
2. Examine the onion skin with a light microscope. Draw what you see.

3. Place a drop of iodine stain along one edge of the coverslip. Touch a piece of paper towel to the opposite edge to draw the water. When the skin is stained, examine it with the microscope.

Analysis

1. **Describe** how the stain affected the onion skin.

_____

_____

_____

2. **Critical Thinking** **Analyzing Information** What is the advantage of using the paper to draw the stain across the field of view?

_____

_____

_____

Skepticism

Observation

Hypothesis

Experiment

control group

theory

SI

Biology

cell

homeostasis

universal laws

correlation data

bias

Homeostasis

Metabolism

Responsiveness

Heredity

Skepticism

Observation

Hypothesis

CHAPTER 1 BIOLOGY AND YOU

I. **SCIENTIFIC THOUGHT** involves making observations, using evidence to draw conclusions, being skeptical about ideas, and being open to change when new discoveries are made.

II. **UNIVERSAL LAWS**-Science is governed by truths that are valid everywhere in the universe. These truths are called _____

III. **SCIENCE AND ETHICS** -Scientific experimentation and discovery can have serious ethical implications. Because of this, scientific investigations require ethical behavior. _____ are a system of moral principles and values. Scientists performing investigations must report only accurate data, must allow peers to review their work, and must behave ethically with the people involved in their investigations.

IV. **WHY DO YOU NEED SCIENCE?** An understanding of science can help you take better care of your health, be a wiser consumer, and become a better-informed citizen.

A. The same critical thinking process that scientists use is a tool that you can use in your everyday life- ex deciding which route to work has the least amount of traffic

B. You can use what you learn to increase the quality of your physical life- ex what is the best acne medication, which vitamins help you live better, etc

C. New technologies are around the corner. Understanding biology and science will help you make informed decisions- ex new drugs for obesity, removing the need for sleep. nanotechnology

V. **SCIENTIFIC EXPERIMENTS**-Scientists conduct controlled experiments or perform studies in order to test a _____

A. An experiment is a procedure that is carried out under controlled conditions to test a hypothesis.

B. There are often cases in which experiments are not possible or not ethical. In these cases, researchers perform studies or use correlation data (statistics gathered from subjects that show a relationship)

C. Scientists verify their _____ by conducting their experiments many times and by checking to see if other scientists have found similar results.

D. Every person has his or her own point of view. A point of view is called a _____

E. Scientists try to prevent bias from affecting their work, but bias can still influence an experiment. Sources of funding, personal involvement in a product, and other conflicts of interest can affect an experiment.

F. It is wise to view all scientific claims in their context and think critically about scientific theories. Ex- diet miracles

G. The main difference between a theory and a hypothesis is that a hypothesis is a specific, testable _____ for a limited set of conditions and a theory is a general explanation for a broad range of data that is consistently proven correct by new studies.

VI. **THE STUDY OF LIFE**-Biology is the scientific study of living organisms and their interactions with the environment. Some of the branches of biology are

- biochemistry,
- ecology,
- cell biology,
- genetics,
- evolutionary theory,
- microbiology,
- botany,
- zoology,
- physiology

VII. **PROPERTIES OF LIFE**-The six properties of life are :

1. _____
   i. All living things are made of one or more cells.
   ii. A cell is the smallest unit capable of all life processes.
2. _____
   i. All living organisms must maintain a stable internal environment in order to function properly.
   ii. The maintenance of a stable internal environment in spite of changes in the external environment is called homeostasis.
3. _____
   i. Living organisms carry out different chemical reactions in order to obtain energy.
   ii. The sum of all the chemical reactions carried out in an organism is called metabolism.
   iii. Almost all of the energy used by living things originally comes from the sun.
4. _____
   i. In addition to maintaining a stable internal environment, living organisms respond to their external environment.
   ii. Can you think of a way that you have responded to your environment today • Reproduction
   iii. Most living things can reproduce. Reproduction is the process by which organisms make more of their own kind from one generation to the next.
5. _____
   i. When an organism reproduces, it passes on its own traits to its offspring in a process called heredity.
   ii. Inherited characteristics change over generations. This process is called evolution.
6. _____
   i. All living organisms grow.
   ii. As organisms grow, many change. This process is called development.
   iii. Development differs from evolution because development refers to change in a single individual during that individual's life.

CHAPTER 1 *SEC 1* *Due Date*

1. Why is skepticism important in science?

2. Describe four ways to practice scientific thought.

3. What is a universal law?

4. Identify two universal laws.

5. Give three examples of ethical scientific behavior.

6. Think about some decisions you make every day. Give two examples of how you can use scientific thought to help you make good decisions.

BELLRINGER:Day *Date* *Question*

Ans

1. How do most scientific investigations begin?

2. What is the difference between a dependent variable and an independent variable?

3. How is a theory different from a hypothesis?

Underline the independent variable and circle the dependent variable in the following.

4. Telling your mother that she is a good cook increases the hour of your curfew.

5. Washing the dishes for your mother increases the amount of money she gives you on the weekend.

6. Coaches with more years of experience will have a higher percentage of wins.

7. The amount of food that a bird eats is affected by the temperature.

8. Eating chocolate affects the number of zits you get.

BELLRINGER:Day Date Question

Ans

CHAPTER 1 SEC 3 DUE DATE

1. Describe two benefits of using the SI system of measurement.

2. How many centimeters are in 1 m?

3. Why might a scientist use a microscope in a laboratory?

4. What is the purpose of using the sterile technique in the laboratory?

5. Why is it important to keep your lab area clean and organized?Give two reasons.

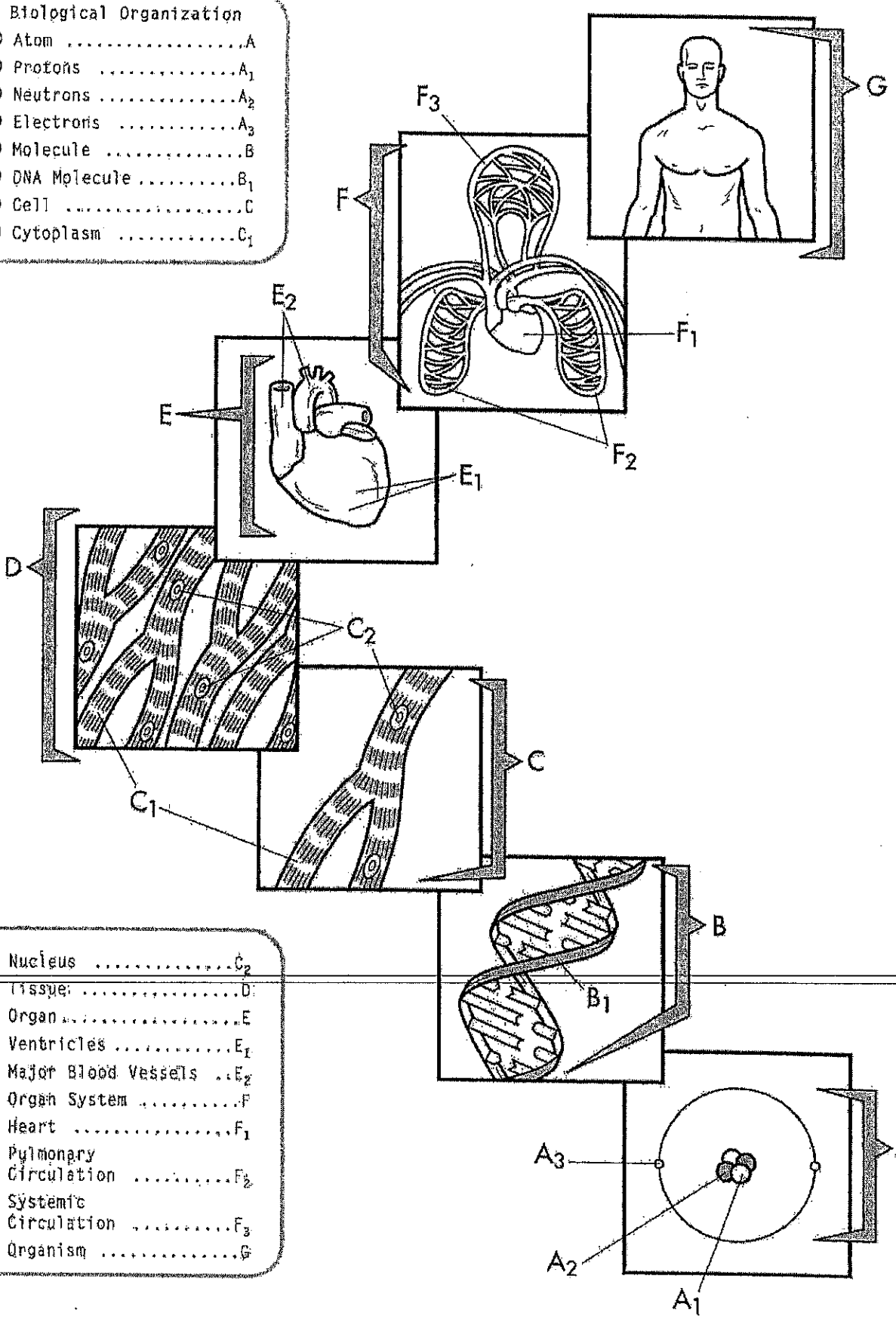
6. What should you do before a lab ? Why?

7. What should you do if an accident occurs in the lab?

BELLRINGER:Day____Date_____Question_____
Ans_____

Biological Organization

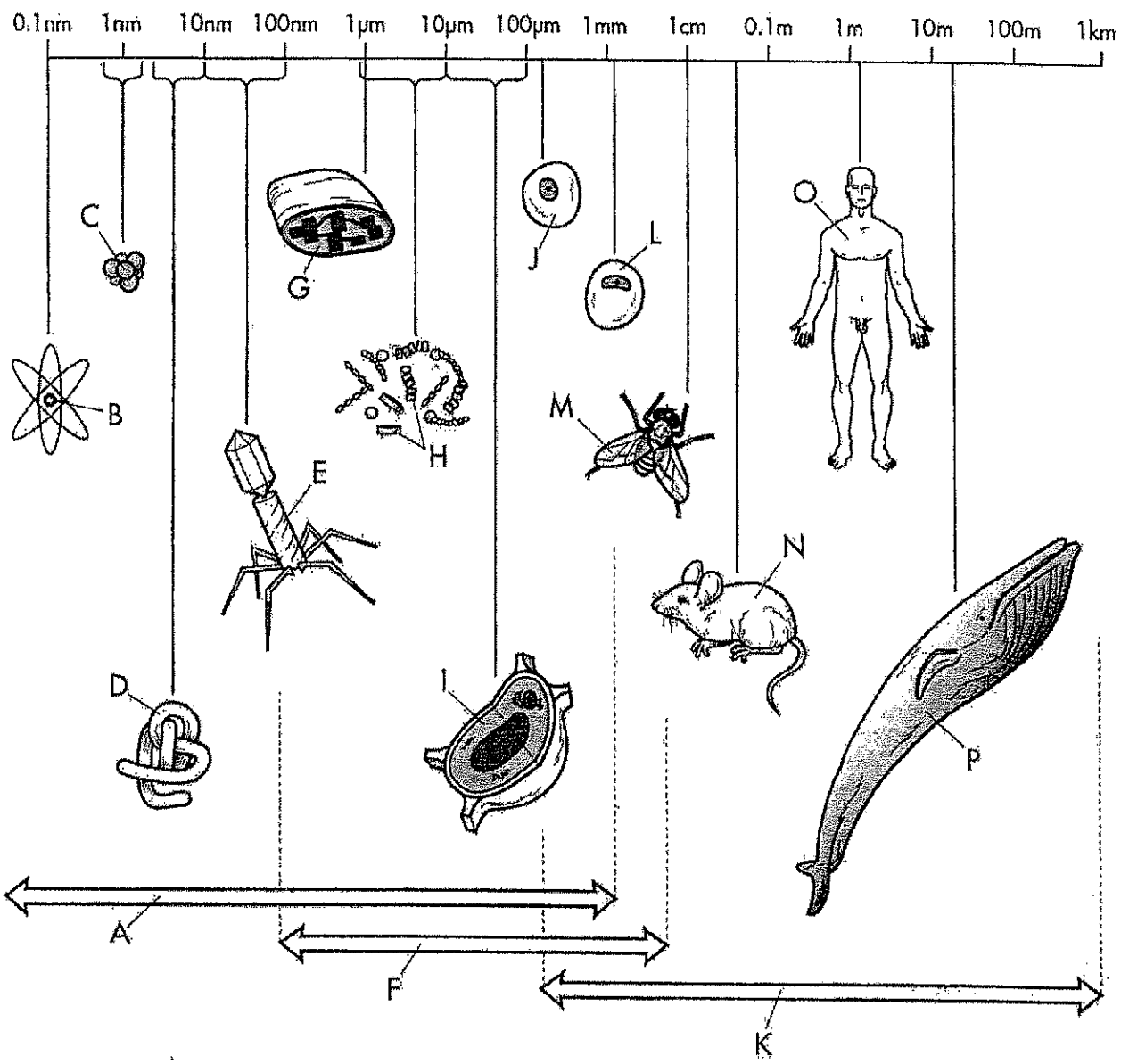
- ○ Atom ..... A
- ○ Protons ..... A_1
- ○ Neutrons ..... A_2
- ○ Electrons ..... A_3
- ○ Molecule ..... B
- ○ DNA Molecule ..... B_1
- ○ Cell C
- ○ Cytoplasm ..... C_1



- ○ Nucleus ..... C_2
- ○ Tissue ..... D
- ○ Organ ..... E
- ○ Ventricles ..... E_1
- ○ Major Blood Vessels ..... E_2
- ○ Organ System ..... F
- ○ Heart ..... F_1
- ○ Pulmonary Circulation ..... F_2
- ○ Systemic Circulation ..... F_3
- ○ Organism ..... G

Biological Organization

Size Relationships in Biology



Size Relationships in Biology

○ Electron Microscope Range ..... A	○ Light Microscope Range ..... F	○ Unaided Eye Range ..... K
○ Atom ..... B	○ Chloroplast ..... G	○ Frog Egg Cell L
○ Small Molecule C	○ Bacteria ..... H	○ Insect ..... M
○ Folded Protein ..... D	○ Plant/Animal Cell I	○ Rodent ..... N
○ Virus ..... E	○ Human Egg Cell ..... J	○ Human ..... O
		○ Whale ..... P

Using the Scientific Process

Scientific Process

- Collecting observations
- Forming hypothesis
- Making predictions
- Verifying predictions
- Performing control experiments
- Forming a theory

To show how each stage of a scientific investigation leads logically to the next, perform the following exercise and identify each stage.

(1) Collecting observations

(a) Measure (for one-minute) your resting respiratory & pulse rate

(b) Record the number of times you breathe during one minute period

(c) Record the number of times your heart beats during one minute period

Resting Respiratory Rate	Resting Pulse Rate

(2) Formulate a hypothesis:

How will exercise affect your resting respiratory & pulse (heart) rate?

(3) Making Predictions:

Note the number of breaths & pulses you think you will take in the same period of time after you have jogged in place for one minute

Predicted Respiratory Rate	Predicted Pulse Rate

(4) Verifying predictions:

Exercise by jogging in place for one minute and then immediately record your respiratory & pulse rate after exercise.

Respiratory Rate After Exercise	Pulse Rate After Exercise

(5) Performing control experiments

How do you know that exercise was the factor that affected your respiratory rate and pulse rate.

(6) Formulate a theory

Suggest a connection between exercise and your respiratory & pulse rates.

CHAPTER 3 VOCAB

Atom

Compound

Element

Ion

Molecule

valence electron

acid

adhesion

base

buffer

cohesion

pH

solution

amino acid

ATP

Carbohydrate

DNA

Lipid

nucleic acid

nucleotide

protein

RNA

activation energy

active site

energy

enzyme

product

reactant

substrate

Covalent

Chapter 3 Chemistry of Life

I. **ATOMS** -All matter is made up of atoms. An atom is the smallest unit of matter that cannot be broken down by chemical means.

A. Matter is anything that has _____ and takes up space.

B. The nucleus of an atom is made up of positively charged protons and uncharged neutrons. Negatively charged electrons have very little mass and move around the nucleus in a large region called the _____

C. An element is a substance made up of atoms that have the same number of protons. For example, each atom of the element carbon has six protons.

D. Atoms of an element may have different numbers of neutrons. These atoms are called _____ of elements.

II. **CHEMICAL BONDS** -Chemical bonds form between groups of atoms because most atoms become stable when they have eight electrons in the valence shell.

A. Electrons in the outermost level, or shell, are called _____.

B. Atoms tend to combine with each other such that eight electrons will be in the valence shell. When atoms combine, a force called a chemical bond holds them together.

C. When atoms of different elements combine, a _____ forms. A compound is a substance made of the bonded atoms of two or more elements.

D. Types of bonds-

1. _____- sharing valence electrons forms a covalent bond.

a) A _____is a group of atoms held together by covalent bonds.

b) A water molecule, H_2O, forms when an oxygen atom forms covalent bonds with two hydrogen atoms.

2. _____-Atoms can achieve a stable valence level by losing or gaining electrons, resulting in a positive or negative charge. An ion is an atom or group of atoms that has an electric charge because it has gained or lost electrons. The attractive force between oppositely charged ions is an ionic bond.

III. **POLARITY** – some bonds may have charges that are not distributed equally. Molecules with partial charges on opposite ends are said to be _____

A. In some covalent bonds, the shared electrons are attracted more strongly to one atom than to the other. As a result, one end of the molecule has a partial negative charge, while the opposite end has a partial positive charge.

B. The partially charged ends of polar molecules attract opposite charges. Because of this behavior, polar molecules can dissolve other polar molecules and ionic compounds.

C. Nonpolar substances, such as _____, grease, and _____, do not dissolve well in water.

D. When bonded to an oxygen, nitrogen, or fluorine atom, a hydrogen atom has a partial charge nearly as great as a proton's charge. It attracts the negative pole of other nearby molecules. This attraction, called a _____, is stronger than attractions between other molecules, but not as strong as covalent bonds.

IV. **PROPERTIES OF WATER** -Most of the unique properties of water result because water molecules form hydrogen bonds with each other.

A. When water freezes, the crystal structure formed due to hydrogen bonding makes ice _____ than liquid water.

B. Water can absorb a large amount of heat without changing temperature. This property can help organisms maintain a constant internal temperature.

C. The attraction of particles of the same substance, such as water, is called _____. Cohesion keeps water from evaporating easily; thus, water is a liquid at ordinary temperatures.

D. Water molecules also stick to other polar molecules. This attraction between particles of different substances is called _____.

V. **SOLUTIONS** - A solution is a mixture in which ions or molecules of one or more substances are evenly distributed in another substance.

A. Many substances are transported throughout living things as solutions of water. Dissolved substances can move more easily within and between cells.

B. Some water molecules break apart to form _____(H+) and _____(OH-) ions. In pure water, hydronium and hydroxide ions are present in equal numbers.

VI. **ACIDS/BASES**- Acids and bases are compounds that change the balance of these ions.

A. Acids are compounds that form extra _____(H+) ions when dissolved in water.

B. Bases are compounds that form extra _____(OH-) ions when dissolved in water.

C. When acids and bases are mixed, the extra hydronium and hydroxide ions react to form water.

VII. **pH** is a measure of how acidic or basic a solution is.

A. Each one-point increase in pH represents a _____ decrease in hydronium ion concentration. (logorathmic scale)

B. Pure water has a pH of ___. Acidic solutions have a pH _____ 7, and basic solutions have a pH _____7.

C. The pH of solutions in living things must be stable. For a stable pH to be maintained, the solutions in living things contain buffers.

D. A _____ is a substance that reacts to prevent pH changes in a solution.

VIII. **BUILDING BLOCKS OF CELLS** – biomolecules contain carbon (also called organic). They include carbohydrates, proteins, lipids and nucleic acids

A. _____ - Carbohydrates are molecules made of sugars. A sugar contains carbon, hydrogen, and oxygen in a ratio of _____.

1. Carbohydrates are a major source of energy

2. Chitin and cellulose are complex carbohydrates that provide support.

a) _____ is found in the shells of insects and the cell walls of mushrooms.

b) _____ is found in the cell walls of plants.

B. _____ - Lipids are another class of biomolecules, which includes fats, phospholipids, steroids, and waxes.

1. Lipids consist of chains of carbon atoms bonded to each other and to hydrogen atoms. This structure makes lipids _____water.

2. The main purpose of _____ is to store energy. Fats can store energy even more efficiently than carbohydrates.

3. The cell's boundary(cell membrane) is made of _____. The structure of cell membranes depends on how this molecule interacts with water.

C. _____-Proteins are chains of amino acids that twist and fold into certain shapes that determine what the proteins do. Proteins may be involved in structure, support, movement, communication, transportation, and carrying out chemical reactions.

1. A protein is a molecule made up of amino acids, building blocks that link to form proteins.

a) Every amino acid has an _____group and a _____ group. Units of amino acids can form links called peptide bonds.

b) The _____ group gives an amino acid its unique properties. _____ different amino acids are found in proteins.

2. For each type of protein, there are different levels of structure

a) amino acids are arranged in a specific order, the protein's primary structure. 1

b) The interactions of the various side groups may form coils and folds, the protein's secondary structure. 2

c) The overall shape of a single chain of amino acids is the protein's tertiary structure. 3

d) The quaternary structure is the overall shape that results from combining the chains to form proteins. 4

D. _____ - A nucleic acid is a long chain of nucleotide units. A nucleotide is a molecule made up of three parts: a _____, a _____, and a _____ group.

1. Nucleotides of deoxyribonucleic acid, or _____, contain the sugar deoxyribose. DNA molecules act as "instructions" for the processes of an organism's life

2. Nucleotides of ribonucleic acid, or _____, contain the sugar ribose. RNA also interacts with DNA to help decode the information.

3. Adenosine triphosphate, or _____, is a nucleotide that has three phosphate groups and supplies energy to cells. Energy is released in the reaction that breaks off the third phosphate group.

IX. CHANGING MATTER

A. A _____ change occurs when only the form or shape of the matter changes.

B. A _____change occurs when a substance changes into a different substance.

C. Matter is neither created nor destroyed in any change. This observation is called the _____. Every change in matter requires a change in energy.

D. Energy may change from one form to another, but the total amount of energy does not change. This observation is called the _____

X. **CHEMICAL REACTIONS** -Chemical reactions can only occur when the activation energy is available and the correct atoms are aligned.

A. Changing a substance requires a chemical reaction. During this process, bonds between atoms are broken, and new ones are formed.

B. A _____ is a substance that is changed in a chemical reaction.

C. A _____is a new substance that is formed.

D. Chemical reactions can only occur under the right conditions. The activation energy of a reaction is the _____ kinetic energy required to start a chemical reaction. Even if enough energy is available, the product still may not form. The correct atoms must be brought together in the proper orientation.

XI. **BIOLOGICAL REACTIONS** - By assisting in necessary biochemical reactions, enzymes help organisms maintain homeostasis.

A. In living things, chemical reactions occur between large, complex biomolecules. Many of these reactions require large activation energies.

B. An _____ is a molecule that increases the speed of reactions.

1. Enzymes hold molecules close together and in the correct orientation. An enzyme lowers the activation energy of a reaction.

2. Each enzyme has an _____, the region where the reaction takes place.

3. The shape of the active site determines which reactants, or substrates, will bind to it. Each different enzyme acts only on specific substrates.

4. Most enzymes need a certain range of _____ and _____

1. How are atoms and elements related?

2. Fill in the blank spaces in the table below.

Type of particle	Location within an atom	Charge
	outside the nucleus	
Proton		
	in the nucleus	0 (neutral)

3. Why do atoms form chemical bonds?

4. How is a covalent bond different from an ionic bond?

5. What is a hydrogen bond?

6. Give one reason that hydrogen bonds are important in living things.

7. Why does sodium have a positive charge when it is in solution?.

Bellringer:DayM T W Th F Date_____ Question_____

Answer_____

CHAPTER 3 SEC2 DUE DATE

1. A student empties the water out of a glass. The student observes that small droplets of water remain stuck to the glass. Which two properties of water explain the student's observation?

2. Oceans and other bodies of water warm up more slowly than air or land.

Describe how the hydrogen bonds between water molecules cause this effect.

3. When carbon dioxide, CO_2, dissolves in water, some of the CO_2 molecules react with water. This forms carbonate ions and hydronium ions. Will a solution of CO_2 in water be acidic, basic, or neutral? Explain your answer.

4. What is a buffer? Why do the solutions in living things contain buffers?

Bellringer:DayM T W Th F Date Question

Answer

CHAPTER 3 SEC 3 DUE DATE

1. What are biomolecules?

2. Fill in the spaces in the table below.

Type of biomolecule	What are the building blocks of this type of biomolecule?	What is one main function of this type of biomolecule?
Carbohydrate		
	chains of carbon and hydrogen atoms	
Protein		
	Nucleotides	

3. Why can proteins perform so many different functions?

4. What is the difference between a nucleic acid and a nucleotide?

Bellringer:DayM T W Th F Date Question

Answer

CHAPTER 3 SEC 4 DUE DATE

1. Where do living things get the energy they need?

2. How is a physical change different from a chemical change?

3. Give two conditions that must be met for a chemical reaction to occur.

4. Identify the products and the reactants in the chemical reaction shown below. Write only the chemical formulas for the products and reactants.

$$CO_2 + H_2O \rightarrow C_6H_{12}O_6 + O_2$$

5. Why are enzymes important to living things?

6. What is the relationship between an active site and a substrate?

7. Why may an enzyme not work properly if temperature or pH changes?

Bellringer DayM T W Th F Date Question

Answer

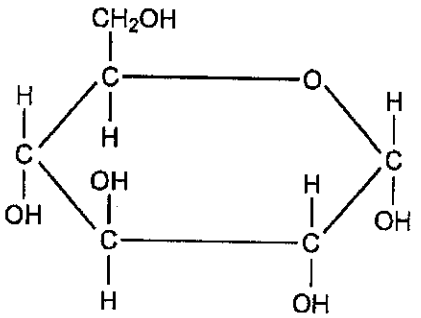
CHAPTER 3 HOMEWORK QUESTIONS

Write the questions AND answers on a looseleaf sheet of paper.

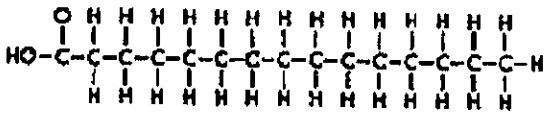
1) Atoms are composed of what?
2) What are ionic bonds? How do they form?
3) What is an element?
4) What is a molecule? What is the difference between an atom and a molecule?
5) What is a covalent bond? How does it form?
6) Why don't oil and water mix?
7) What types of bonds share electrons? Donate electrons?
8) What element is contained in all biomolecules? What are the types of biomolecules?
9) What is a polar molecule? Why is water a polar molecule? What does the polarity do?
10) What is a non-polar molecule? What charges does a non-polar molecule have?
    What is a polar molecule? What charges do a polar molecule have?
11) What so nonpolar molecules look like? Are the ends charged? How do non-polar molecules behave?
12) What is an electron? Where is an electron cloud found? Where do electrons stay? What is the valence shell?
13) What is the smallest particle of matter that retains the properties of the element? What is the difference between an atom, element and molecule?
14) What are polysaccharides, sugars, chitin and cellulose?
15) What are the unique properties of water?
16) If the electrons in the valence shell are shared , what type of bond is it? What does this do to the stability of the molecule?
17) What are hydronium ions? What do excess hydronium ions do to the pH of the substance?
    What are hydroxide ions? What do excess hydroxide ions do to the pH of the substance?
18) What types of molecules are classified as carbohydrates?

19) What types of molecules are classified as lipids?

20) What type of molecule is this?



21) What type of molecule is this?



22) How are lipids and carbohydrates similar? What do they have in common in structure?

23) What are the four levels of protein organization? What are the characteristics of each level?

24) What is cohesion? What is adhesion? What properties of water do each of these influence?

25) What are the attractions between water molecules called? How do they form? Why are they important?

26) Give 3 examples of lipids

27) Why is each amino acid unique? What portion of the structure is responsible for this uniqueness?

28) What is the substrate of an enzyme? What is the reactant of an enzyme? What is the active site of an enzyme?

29) What is matter composed of?

30) What are the two types of nucleic acids?

31) A pH less than seven means that the substance is what?

32) How do you form an electron bond? Are the electrons shared or donated?

33) What are the parts of a DNA molecule?

34) What is the link between a carboxyl group of an amino acid and the amino group of another amino acid called?

35) How do enzymes make reactions proceed? What do they do to the activation energy?

36) Where are long chains of amino acids found?

37) What molecule does an enzyme act on?

38) If a substance has a pH greater than 7 mean the substance is what?

39) How does ATP store energy?

40) What is the force that allows water to climb up a glass tube called? What is the type of bonding that is responsible for it called?

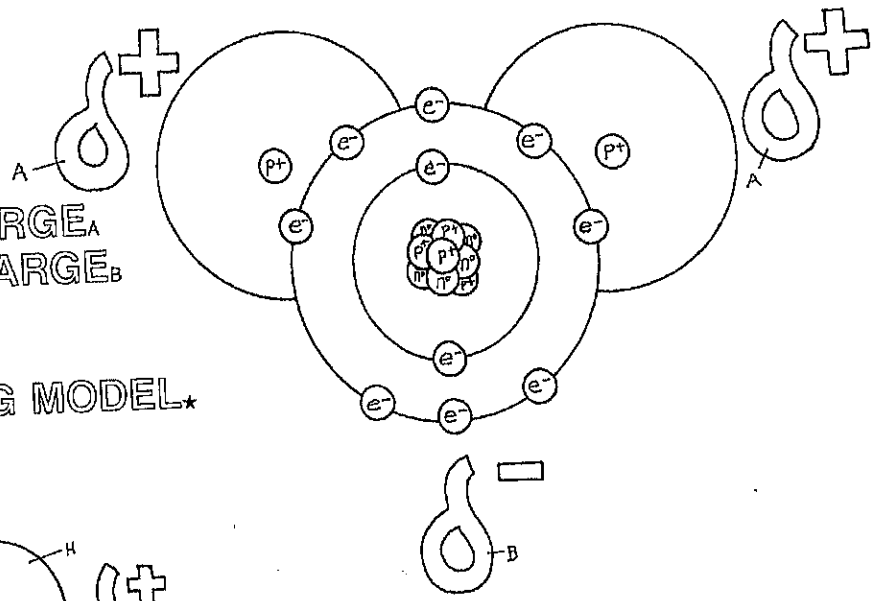
41) What are the charges of a

a. neutron
b. proton
c. electron

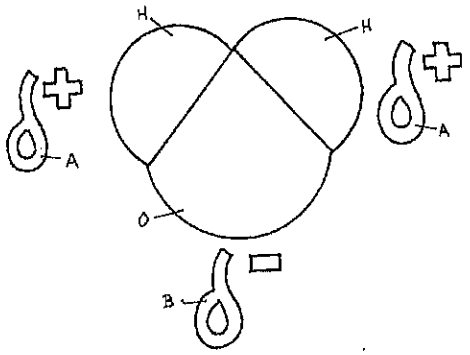
42) Where can each subatomic particle be found?

WATER MOLECULES.

ELECTRON DIAGRAM★
- PROTON$_{p+}$
- NEUTRON$_{n^0}$
- ELECTRON$_{e-}$
- POSITIVE CHARGE$_A$
- NEGATIVE CHARGE$_B$



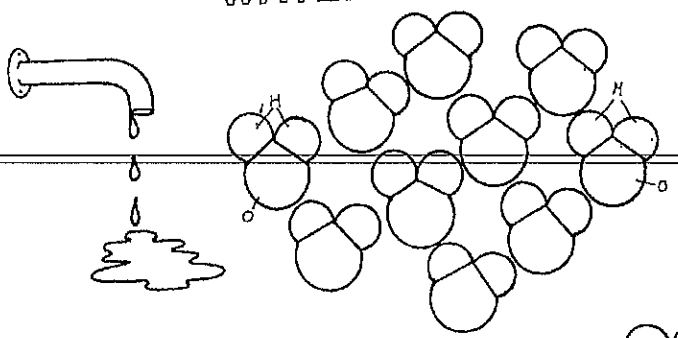
SPACE-FILLING MODEL★
- HYDROGEN$_H$
- OXYGEN$_O$



EMPIRICAL FORMULA$_{H_2O}$

H_2O

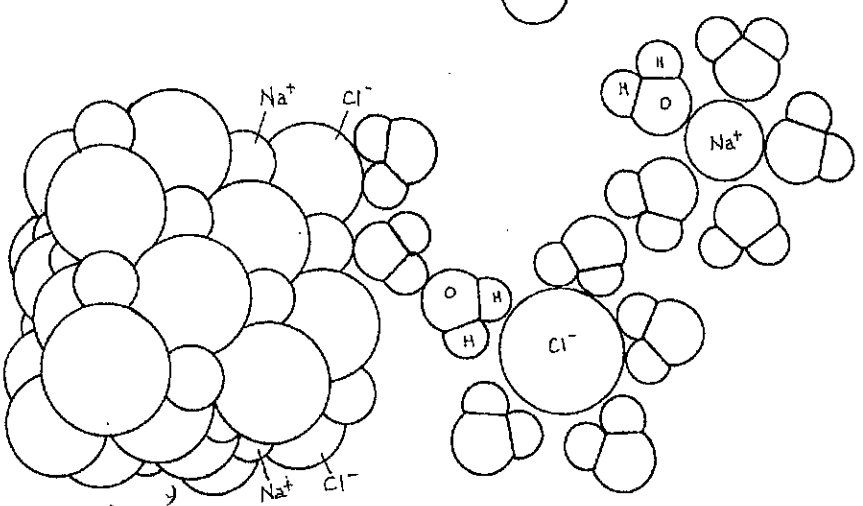
HYDROGEN BONDING OF WATER MOLECULES★



DISSOLVING OF AN IONIC COMPOUND★

SODIUM ION$_{Na^+}$

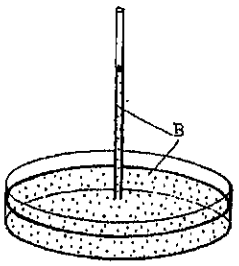
CHLORIDE ION$_{Cl^-}$



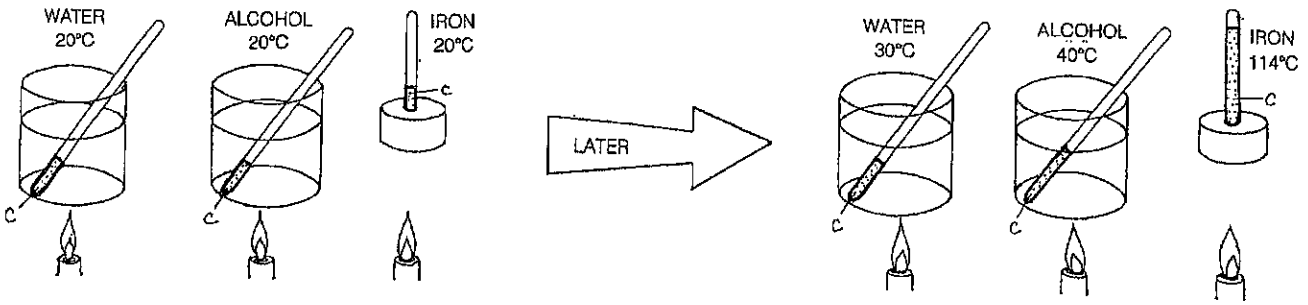
UNUSUAL PROPERTIES OF WATER.

GOOD SOLVENT$_A$

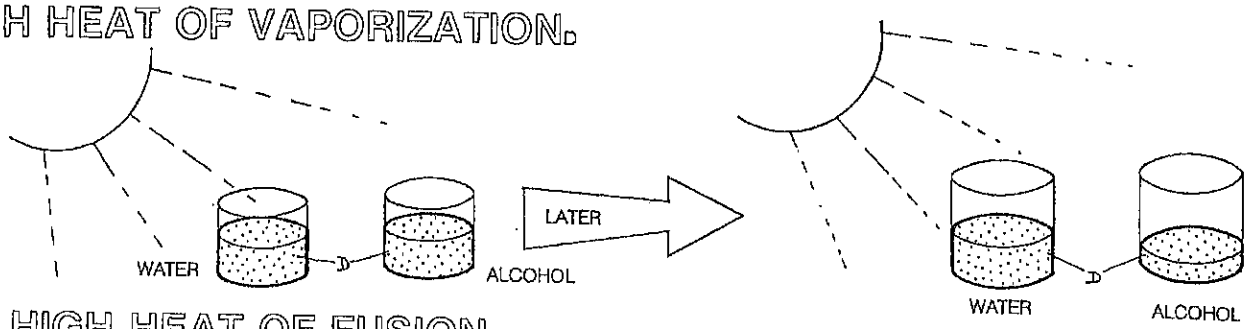
CAPILLARY ACTION$_B$



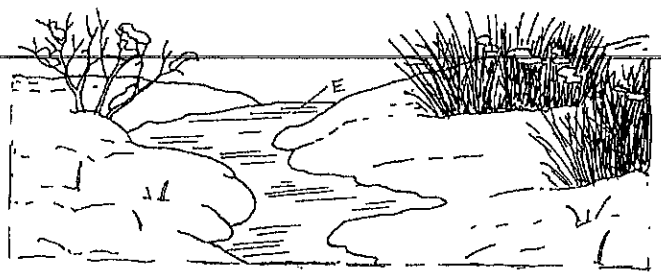
HIGH SPECIFIC HEAT$_C$



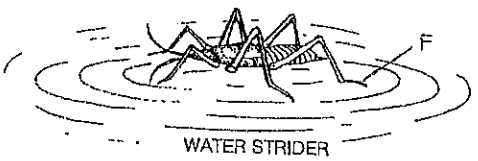
HIGH HEAT OF VAPORIZATION$_D$



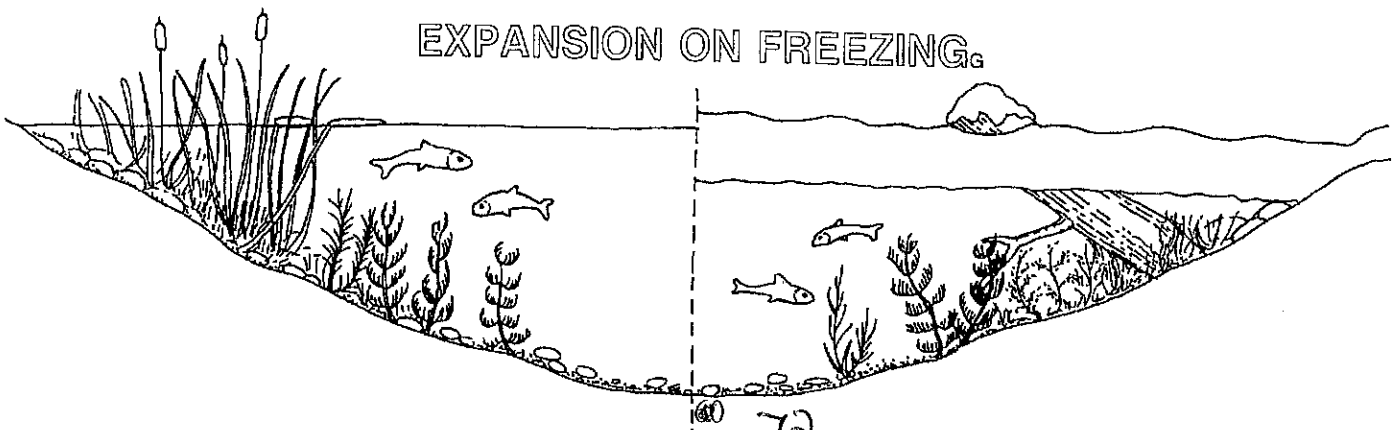
HIGH HEAT OF FUSION$_E$



HIGH SURFACE TENSION$_F$



EXPANSION ON FREEZING$_G$



Molecular Model Race

You will be racing the other lab tables to create 1 model of each of the four biomolecules.

Carbohydrates (glucose), Protein (amino acid), Nucleic Acid (deoxyribonucleic acid) and lipid.

You must also color in the corresponding drawings (except lipid) in your packet.

The first team to complete the task will get 5 extra credit points on the Chapter 3 Test.

PLASTIC MODEL

Black=Carbon

White=Hydrogen

Red=Oxygen

Blue=Nitrogen

Blue=Phosphorous

Yellow=Side Group

Yellow=Base

WOODEN MODEL

Black=Hydrogen

Yellow=Hydrogen

Red=Oxygen

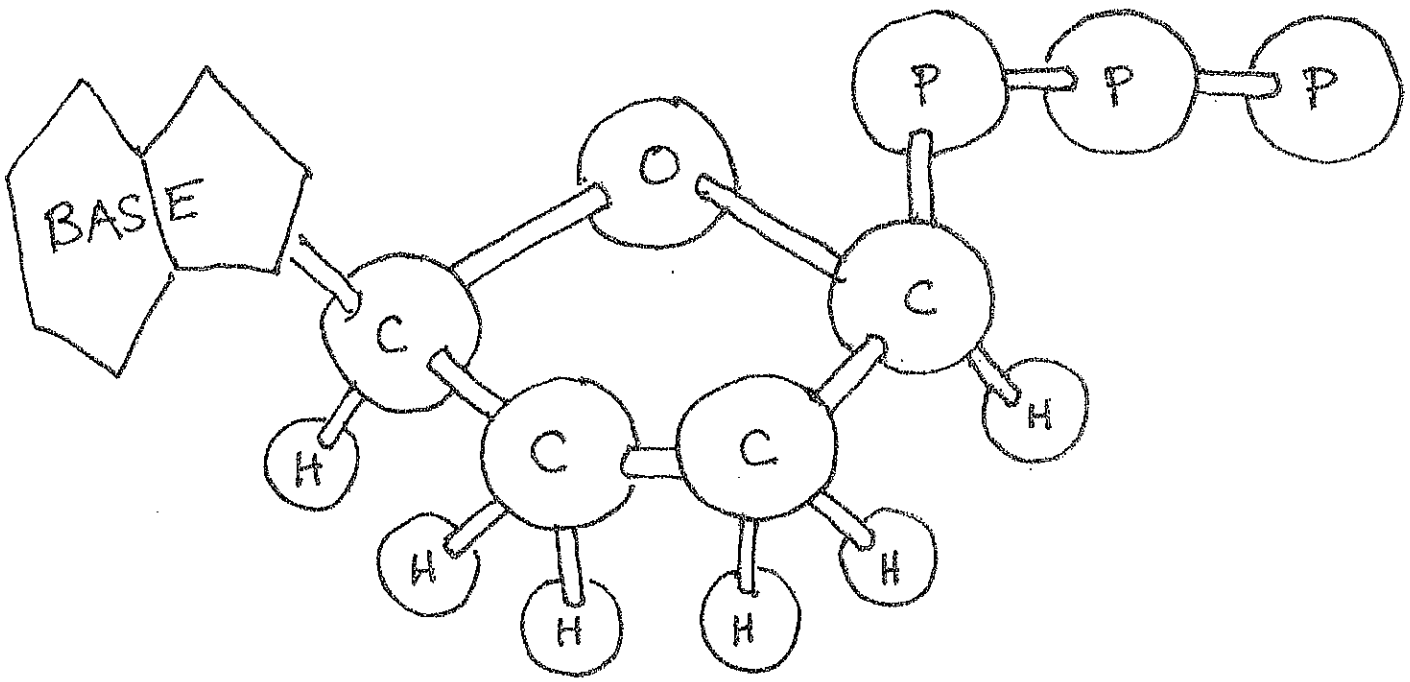
Light Blue=Nitrogen

Light Blue w/P= Phosphorous

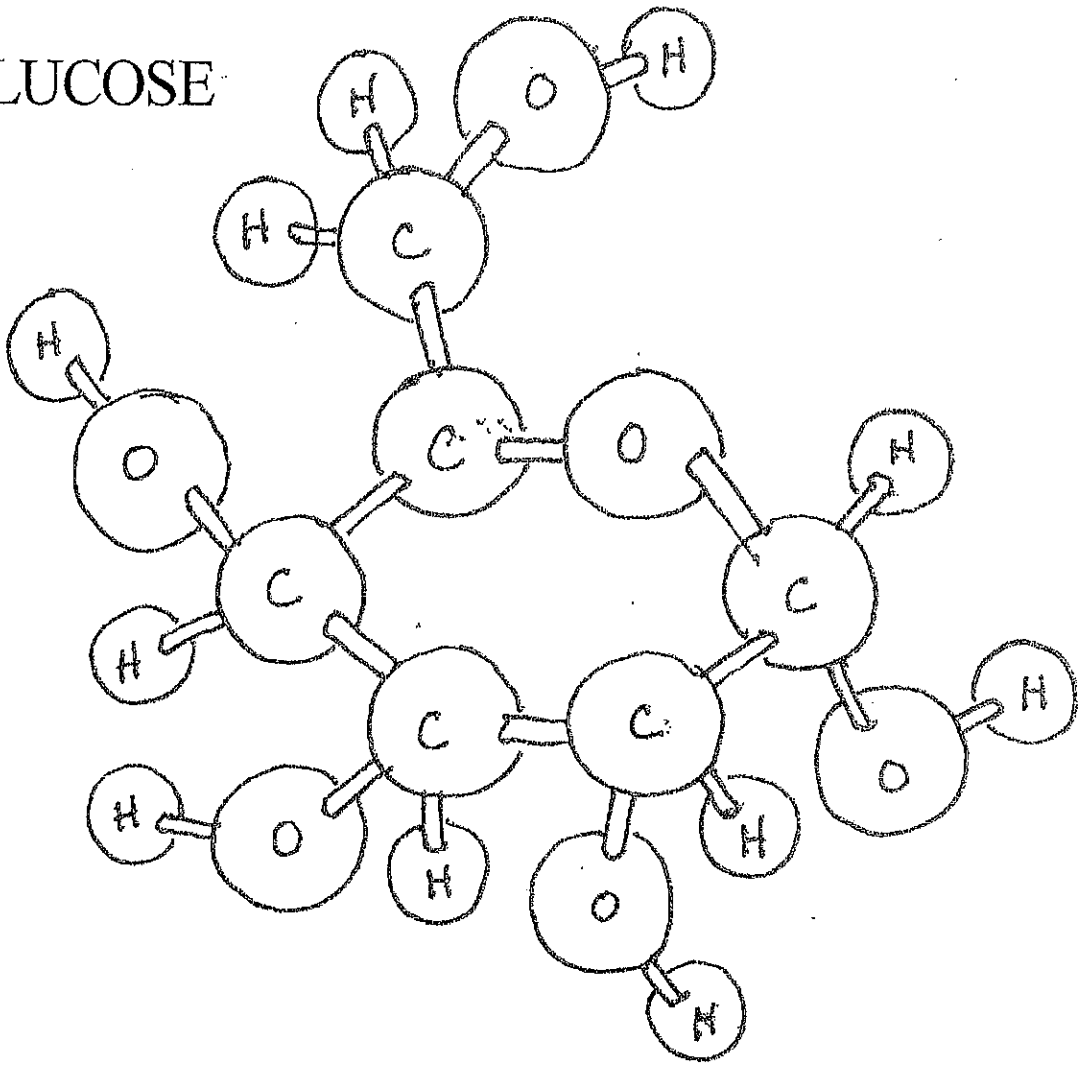
Green=Side Group

Orange=Base

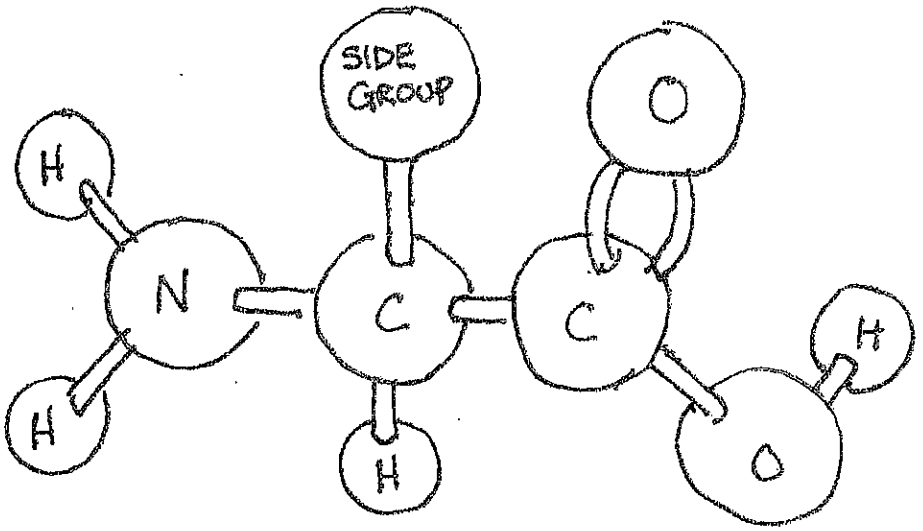
NUCLEIC ACID (DNA)



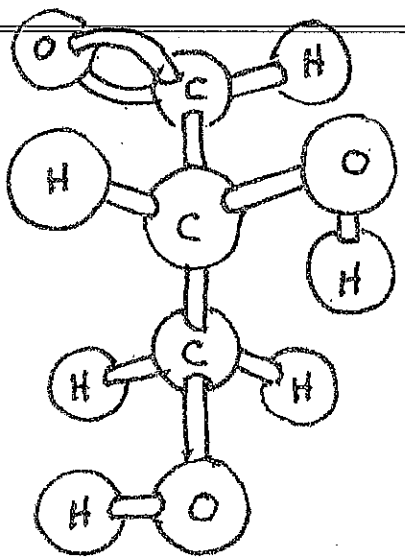
GLUCOSE

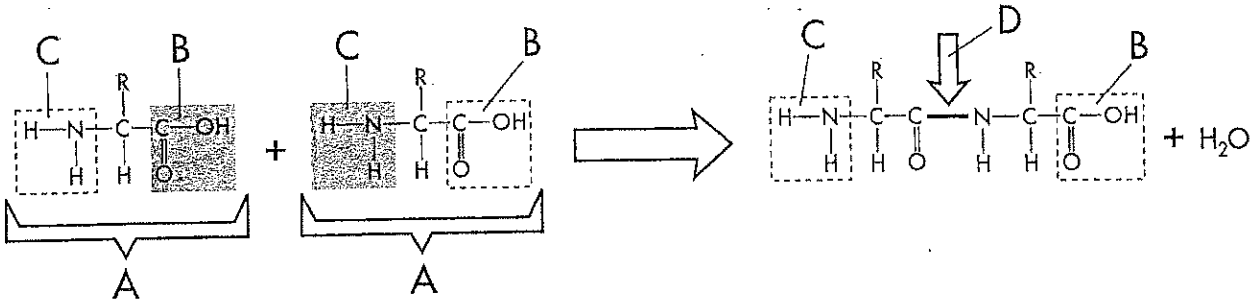


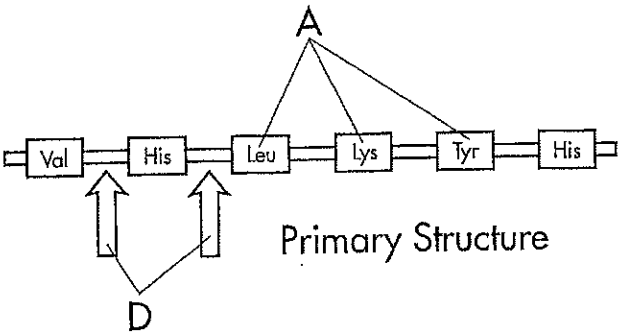
AMINO ACID

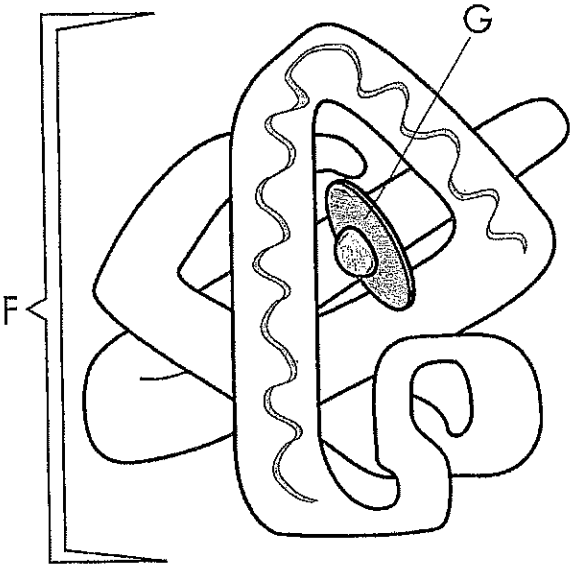


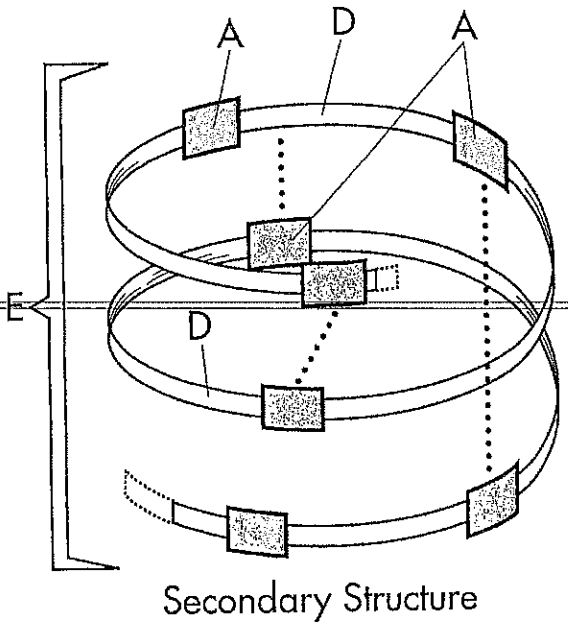
CARBOHYDRATES

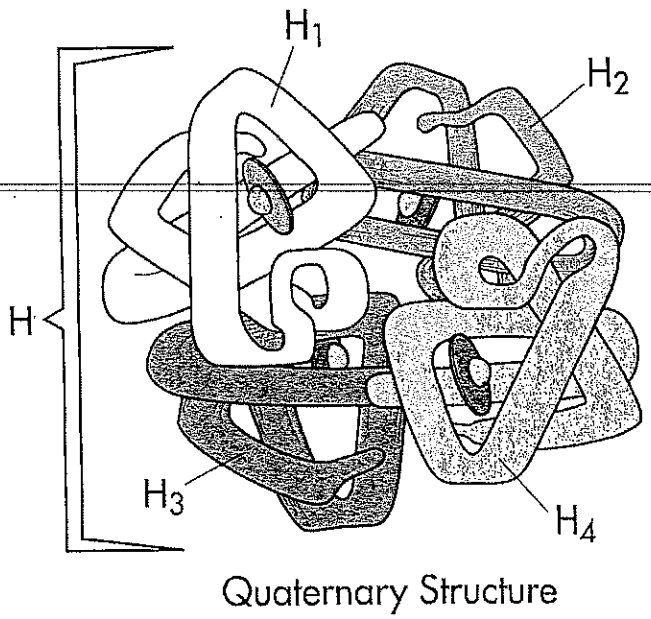



C
B
R
H
N
C
OH
O
H
H
A
+
C
B
R
H
N
C
OH
O
H
H
A
C
D
B
R
R
H
N
C
C
N
C
C
OH
+ H_2O
H
H
O
H
H
O


A
Val
His
Leu
Lys
Tyr
His
D
Primary Structure


G
F
Tertiary Structure

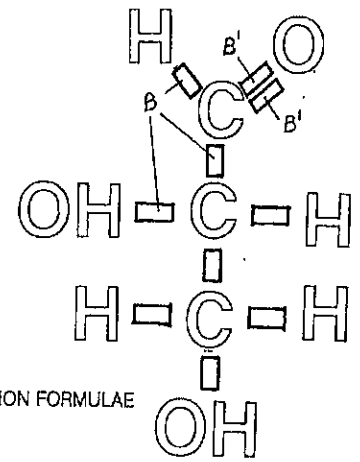

A
D
A
E
D
Secondary Structure


H_1
H_2
H
H_3
H_4
Quaternary Structure

CARBOHYDRATES I.

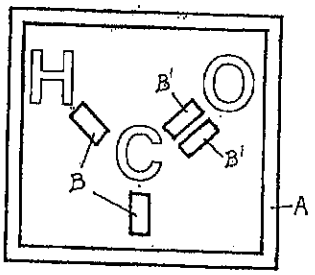
L-GLYCEROSE ISOMER★
EMPIRICAL FORMULA$_{C+H+O}$

D-GLYCEROSE ISOMER★

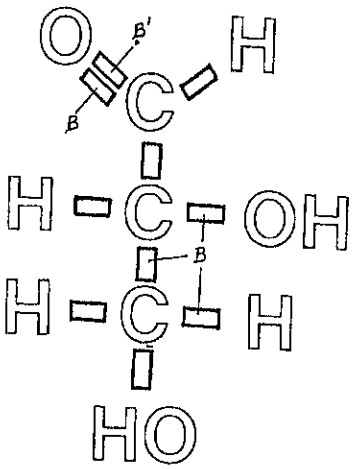


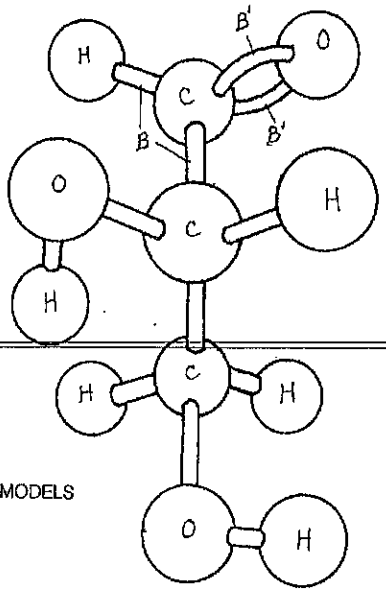
FISCHER PROJECTION FORMULAE

$C_3H_6O_3$



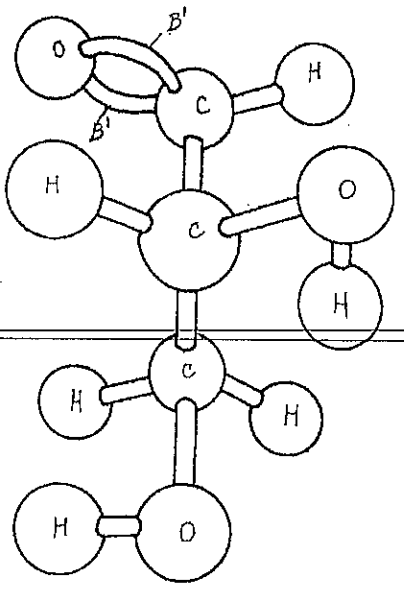
ALDEHYDE$_A$
CARBON$_C$
HYDROGEN$_H$
OXYGEN$_O$

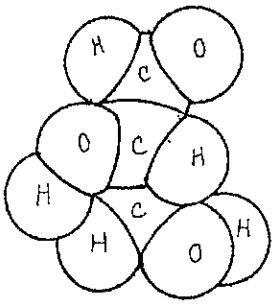




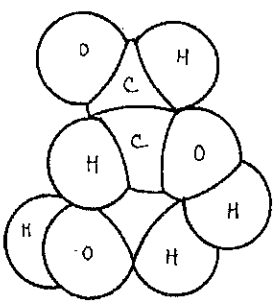
BALL-AND-STICK MODELS

SHARED ELECTRONS★
ONE PAIR$_B$
TWO PAIRS$_{B'}$





SPACE-FILLING MODELS



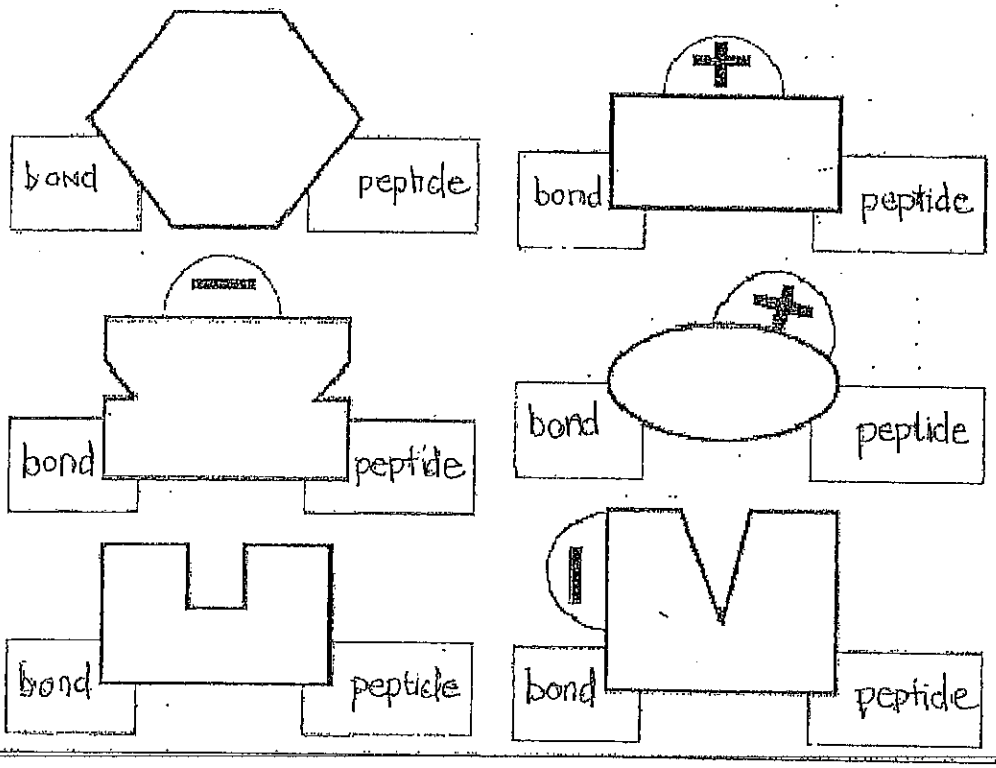
Directions:

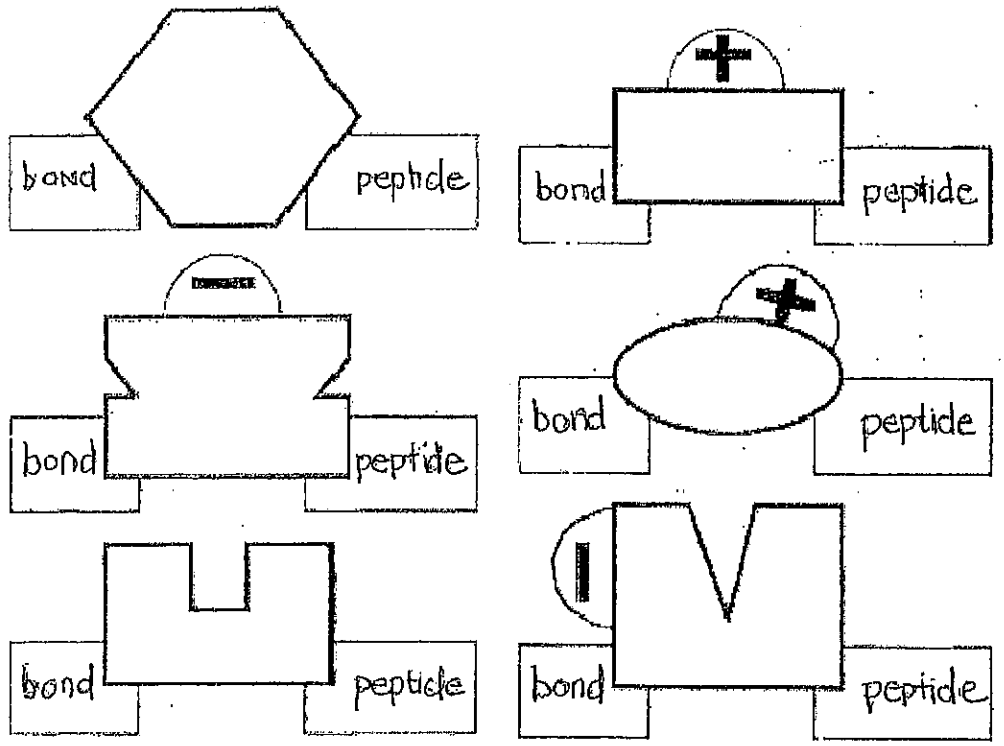
1. Each piece shown represents an amino acid. Cut out at least 8 of these amino acids, making sure not to remove the peptide or bond words or the plus or minus signs. Tape the amino acids together to show a primary structure of a protein. To taspe these together, tape a peptide tab to a bond tab to spell out the word <u>peptide bond.</u>

2. Now gently twist the chain to tape the + to a – sign. Not all the plus and minus signs will be used. Tape as many as possible without breaking apart the chain.This is the secondary structure.

3. To show the tertiary structure, tape any remaining + and – signs together. To do this, you may have to fold the coiled chain in upon itself.. This is the tertiary structure.

4. To show the quarternary structure, tape two to three different chains, attaching them at any available + or –signs.




bond
peptide
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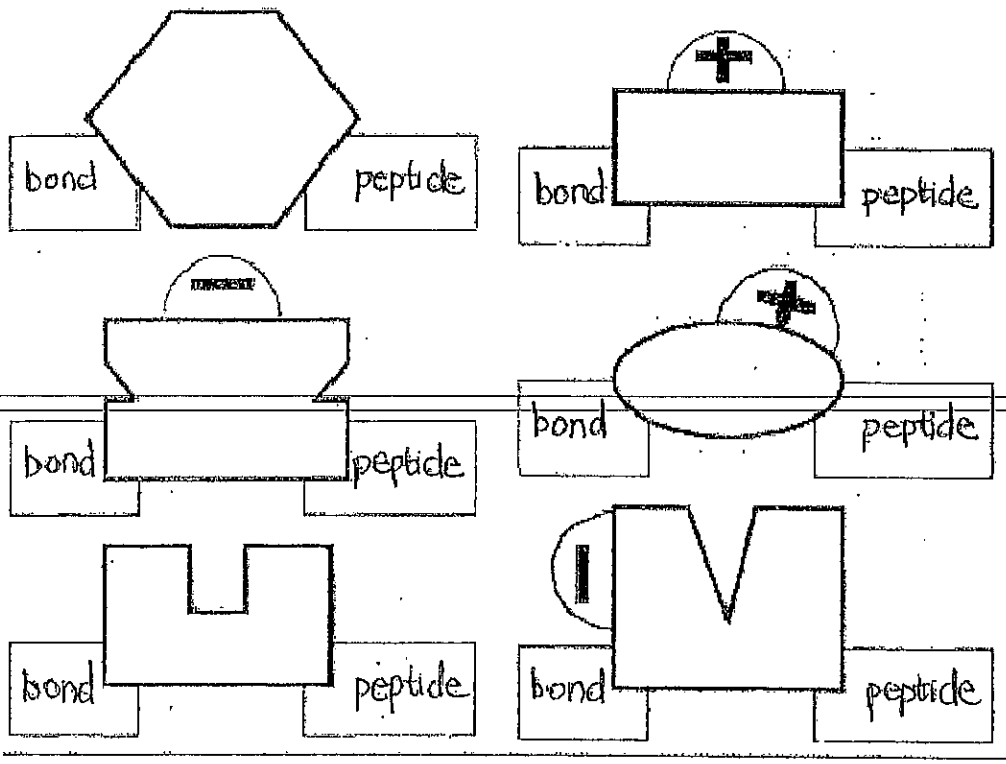
peptide


bond
peptide
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bond
peptide
bond
peptide
bond
peptide

CHAPTER 7 VOCAB

Cell membrane

Cytoplasm

Ribosome

Prokaryote

Eukaryote

Nucleus

Organelle

Vesicle

endoplasmic reticulum

Golgi apparatus

Vacuole

Chloroplast

Mitochondrion

Flagellum

Tissue

Organ

organ system

colonial organism

Chapter 7 Cell Structure

I. **THE DISCOVERY OF CELLS-** Microscope observations of organisms led to the discovery of the basic characteristic common to all living things.

A. Robert Hooke used a microscope to discover cells in _____.

B. Anton van Leeuwenhoek used a more powerful microscope to see single-celled organisms in pond water.

II. **CELL THEORY**-The cell theory states:

A. All living things are made up of one or more _____.

B. Cells are the basic units of structure and function in organisms.

C. All cells arise from _____cells.

III. **CELL FUNCTION-** A cell's shape reflects the cell's function. Cell size is limited by a cell's _____

A. All substances that enter or leave a cell must cross the surface of the cell.

B. A cell's ability to move substances across its surface can be estimated by finding its surface area-to-volume ratio.

C. Cells with _____ surface area-to-volume ratios can exchange substances more efficiently.

D. When comparing cells of the same shape, small cells have greater surface area-to-volume ratios than large cells. Small cells function_____ efficiently than large cells.

IV. **CELL FEATURES-** Because of their complex organization, eukaryotic cells can carry out more specialized functions than prokaryotic cells can. All cells share common structural features, including a cell membrane, cytoplasm, ribosomes, and DNA.

A. The cell membrane is the outer layer that covers a cell's surface and acts as a _____between the outside environment and the inside of the cell.

B. The cytoplasm is the region of the cell within the cell membrane. The _____includes the fluid inside the cell called the cytosol.

C. A _____ is a cellular structure (but does not have a membrane) that makes proteins.

D. The _____ of a cell provides instructions for making proteins, regulates cellular activities, and enables cells to reproduce.

V. DIFFERENCES BETWEEN TYPES OF CELLS

A. _____- A prokaryote is an organism made of a single prokaryotic cell.

1. Prokaryotic cells do not have a nucleus or other internal compartments. The genetic material of a prokaryotic cell is a single loop of DNA.

2. Prokaryotes are more _____ and existed first

B. _____- A eukaryote is an organism made up of one or more eukaryotic cells. All multicellular organisms are made of eukaryotic cells.

1. The DNA of a eukaryotic cell is found in an internal compartment of the cell called the nucleus.

2. All eukaryotic cells have membrane-bound organelles. An organelle is a small structure found in the cytoplasm that carries out specific activities inside the cell.

VI. **THE FRAMEWORK OF THE CELL**-The cytoskeleton helps the cell move, keep its shape, and organize its parts.Eukaryotic cells have an intricate network of protein fibers called the cytoskeleton which provides the interior framework of the cell.

A. There are three different kinds of cytoskeleton fibers:

1. Microfilaments

2. Microtubules

3. Intermediate fibers.

VII. **DIRECTING CELLULAR ACTIVITY**- DNA is the "brain" of the cell. It has the instructions for making all proteins. The proteins then go on to complete ALL activities. DNA is like a general, the proteins are the soldiers. The soldiers are actually doing all the work but without the general making the decisions, there would be chaos.

A. DNA contains instructions for making proteins which control most of the activity of the cell.

B. The DNA of eukaryotic cells is stored in the _____.

C. A double membrane called the nuclear _____ surrounds the nucleus. Nuclear pores located on the nuclear envelope act as channels to allow certain molecules to move in and out of the nucleus.

D. The _____ is a structure within the nucleus where ribosome parts are made. These ribosome parts are transported out of the nucleus into the cytoplasm where they are assembled to form a complete ribosome. Ribosomes are the machines that make the proteins.

E. Ribosomes that are suspended in the cytosol are called _____ ribosomes.

F. Free ribosomes make _____that remain inside the cell.

G. Ribosomes that are attached to the endoplasmic reticulum are called _____ribosomes. Bound ribosomes make proteins that are exported from the cell.

H. Ribosomes can switch between being bound or free, depending on what proteins the cell needs to make.

VIII. **PROTEIN PROCESSING**- The endoplasmic reticulum and Golgi apparatus are both involved in protein processing

A. _____ - The endoplasmic reticulum and the Golgi apparatus are organelles that prepare proteins for extracellular export.

1. Proteins that are sent outside the cell are packaged in vesicles. Vesicles are small, membrane envelopes that enclose the proteins and keep them separate from the rest of the cytoplasm.

2. The endoplasmic reticulum, or ER, is a system of membranes that moves proteins and other substances through the cell and make the vesicles.

3. The endoplasmic reticulum is divided into two portions: rough ER and smooth ER.

4. The ribosomes on the rough ER make proteins that are packaged into vesicles.

5. Enzymes of the smooth ER make lipids and break down toxic substances.

B. _____- The Golgi apparatus is a set of flattened, membrane-bound sacs. The Golgi apparatus helps modify, sort, and package cell products for distribution.

1. The ribosomes located on the rough ER make proteins which then cross into the membranes of the ER.

2. The ER membrane then pinches off and forms a vesicle around the proteins.

3. Vesicles move from the rough ER to the Golgi apparatus, where they are modified by enzymes and repackaged in new vesicles then are sent out of the cell or stored.

IX. **STORAGE AND MAINTENANCE**- Vesicles help maintain homeostasis by storing and releasing various substances as the cell needs them. They are Lysosomes and vacuoles

A. _____A lysosome is a vesicle produced by the Golgi apparatus that contains enzymes that break down large molecules. Lysosomes recycle old or damaged organelles and digest food particles to provide nutrients for the cell.

B. _____-A vacuole is a fluid-filled vesicle found in the cytoplasm of many plant cells.

1. Plant cells contain a large compartment called the central vacuole, which stores water, ions, nutrients, and wastes.

2. Some protists have contractile vacuoles which pump excess water out of the cell in order to control the concentration of salts and other substances.

3. A food vacuole is formed when the cell membrane surrounds food particles outside the cell and pinches off to form a vesicle inside the cell.

X. **ENERGY PRODUCTION**- The energy for cellular functions is produced by chemical reactions that occur in the mitochondria and chloroplasts. Cells can only use ATP for energy, much like a car can only use gas. If you put diesel fuel in a car gas tank, it will not run because it can't use the diesel. Cells must convert sugars and fats to ATP to use.

A. _____-A chloroplast is an organelle found in plant and algae cells that uses light energy to make carbohydrates from carbon dioxide and water. Carbohydrates are then used to make ATP.

1. Chloroplasts are surrounded by two membranes and have several stacks of flattened sacs where energy production takes place.

2. Plant cells may have several chloroplasts.

B. _____- mitochondria are cell organelles that use other forms of energy to make ATP. ATP needed by a cell is produced inside mitochondria. Both animal and plant cells contain mitochondria. Even though plants have chloroplasts which make sugars by photosynthesis, the plant cell can not use the photosynthestic sugar as energy- it still needs to be changed into ATP.

XI. **DIVERSITY IN CELLS**- The different organelles and features of cells enable organisms to function in unique ways in different environments. The function of a cell is determined by its shape and the organelles found in the cell.

A. Prokaryotes can vary in shape, the way they obtain and use energy, and their ability to move.

1. Many prokaryotes have a flagellum, a long, hair-like structure that grows out of the cell and enables the cell to move through its environment.

2. Prokaryotes may also have pili, short outgrowths that allow the cell to attach to surfaces or other cells.

B. Eukaryotic cells can vary in shape, external features and internal features. Eukaryotic cells usually have a "specialty"- a specific job they must do for the health of the whole organism. Remember eukaryotes are multicellular.

1. Your skin cells and brain cells do not have the same job and so do not look or function the same.

2. Animal and plant cells are two types of eukaryotic cells. Both have many of the same organelles, but plant cells also have chloroplasts, a large central vacuole, and a cell wall.

XII. **LEVELS OF ORGANIZATION**- Plants and animals have many highly specialized cells that are arranged into tissues, organs, and organ systems.

A. A _____ is a distinct group of similar cells that perform a common function.

B. An _____ is a collection of tissues that work together to form a structure which performs a specific function.

C. An _____ is composed of a group of organs that work together to perform major body functions.

XIII. **BODY TYPES**- organisms can be unicellular or multicellular.

A. _____organisms can thrive independently or live together in groups.

B. Cells that are permanently associated but do not work together or integrate cell activities are called _____ organisms.

C. True multicellularity occurs only in eukaryotes. In a multicellular body, cells are interdependent – they can NOT live alone. Distinct types of cells have specialized functions to help the organism survive. Most multicellular organisms begin as a single cell, which divides to form more cells. These cells then grow and become specialized in a process called differentiation. Once differentiation occurs, the specialized cells can not exist on their own.

CHAPTER 7 SEC 1 DUE DATE

1. Indicate whether each structure or feature below is found in a prokaryotic cell, a eukaryotic cell, or both.

Cell structure or feature	Prokaryotic cell	Eukaryotic cell
Nucleus	no	yes
Cell membrane		
Cytoplasm		
DNA		
Ribosomes		
Membrane bound organelles		

2. What are the three parts of the cell theory?

3. Could a cell be the size of an elephant? Explain your answer.

4. How does the location of DNA differ in prokaryotic and eukaryotic cells?

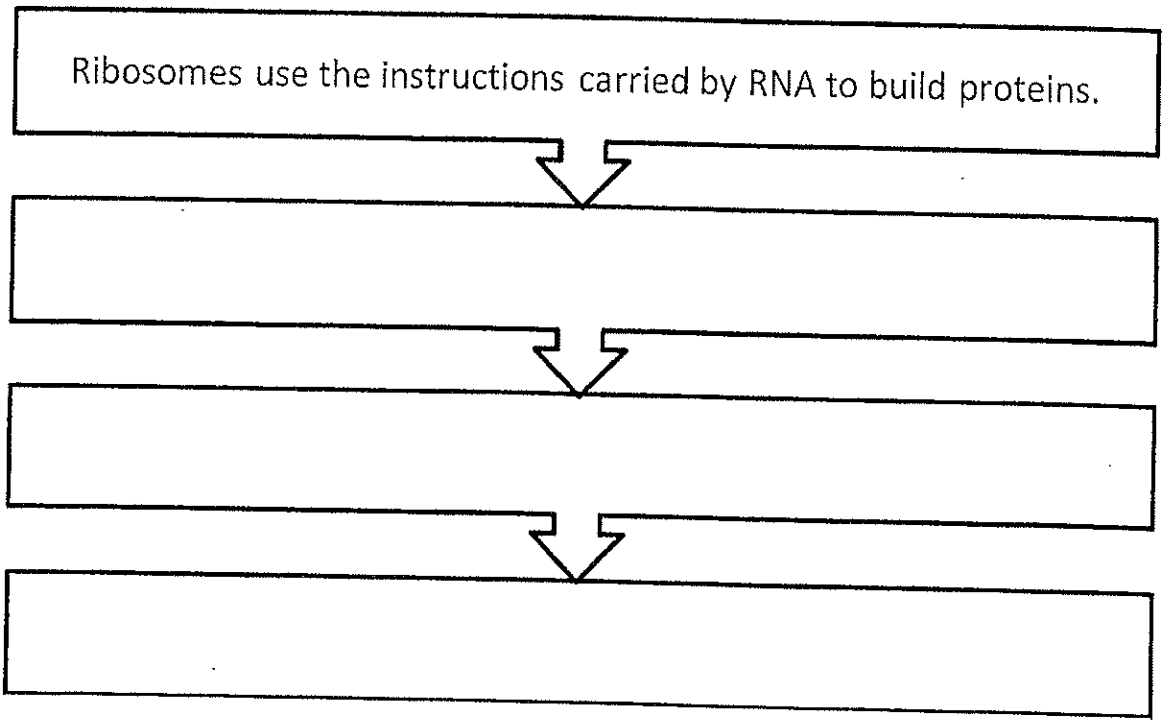
Bellringer Day M T W Th F Date Question

Answer

87

CHAPTER 7 SEC 2 DUE DATE

1. Complete the process chart to describe how proteins are made andmoved out of the cell.



2. How does DNA direct the cell's activities, such as making proteins, if DNA stays inside the nucleus?

3. Why do plant cells need both chloroplasts and mitochondria?

Bellringer:Day M T W Th F Date Question

Answer

CHAPTER 7 SEC 3 DUE DATE

1. Why are specialized cells found only in multicellular organisms?

2. Identify four ways that prokaryotes can differ from one another.

3. Why are colonial organisms not truly multicellular?

4. How would pili be important to colonial bacteria?

5. What are the four levels of organization of complex multicellular organisms?

Bellringer Day M T W Th F Date Question

Answer

EUKARYOTES AND PROKARYOTES

EUKARYOTIC CELL ✿

NUCLEUS a

NUCLEAR ENVELOPE a^1

CHROMATIN b

NUCLEOLUS c

CYTOPLASM d

MITOCHONDRIA e

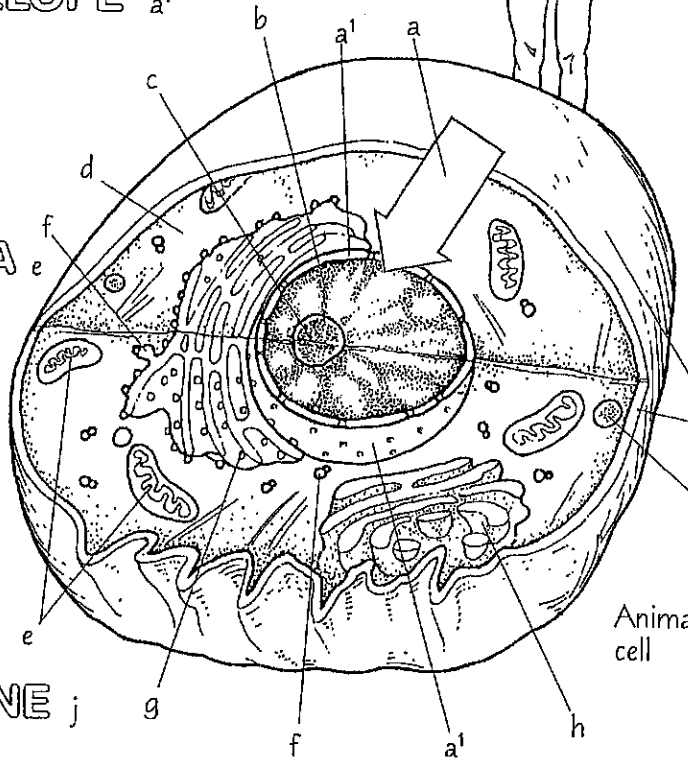
RIBOSOME f

ENDOPLASMIC RETICULUM g

GOLGI APPARATUS h

LYSOSOME i

CELL MEMBRANE j



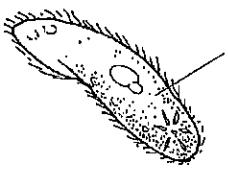
Animal cell

EUKARYOTES ✿

ANIMAL k

PLANT l

PROTOZOAN m



FUNGUS n

PROKARYOTIC CELL ✿

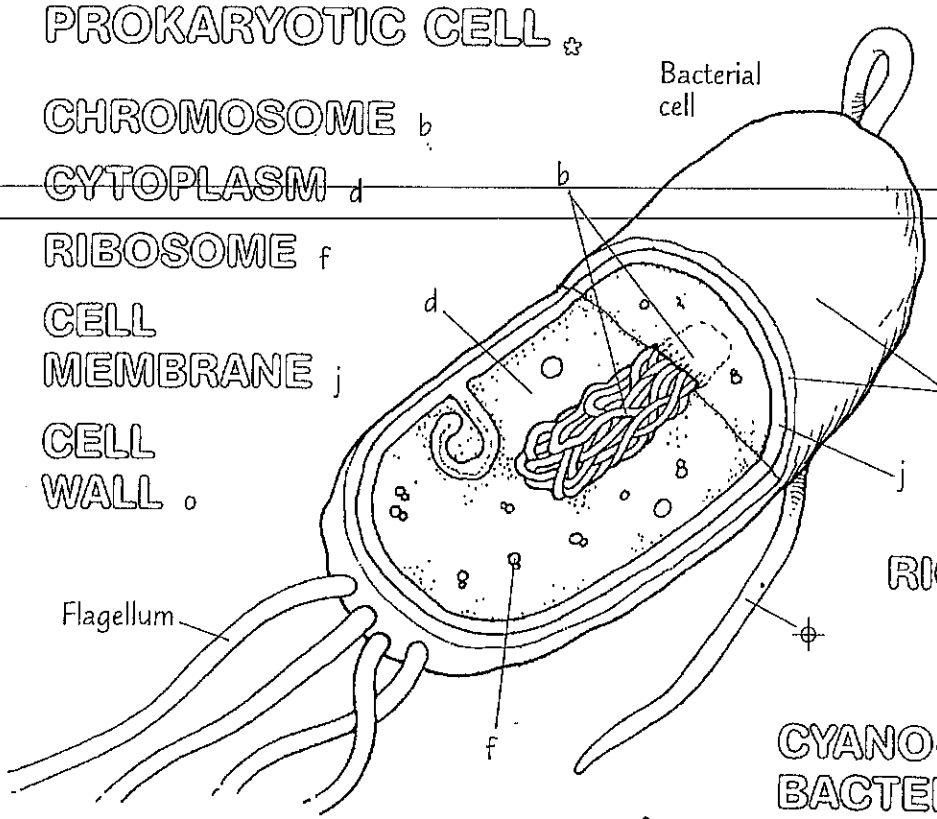
CHROMOSOME b

CYTOPLASM d

RIBOSOME f

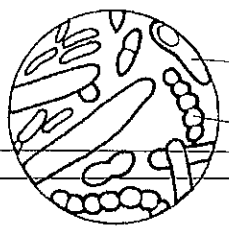
CELL MEMBRANE j

CELL WALL o

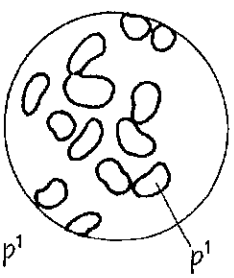


PROKARYOTES ✿

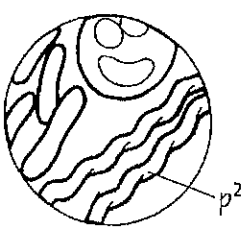
BACTERIUM p



RICKETTSIA p^1

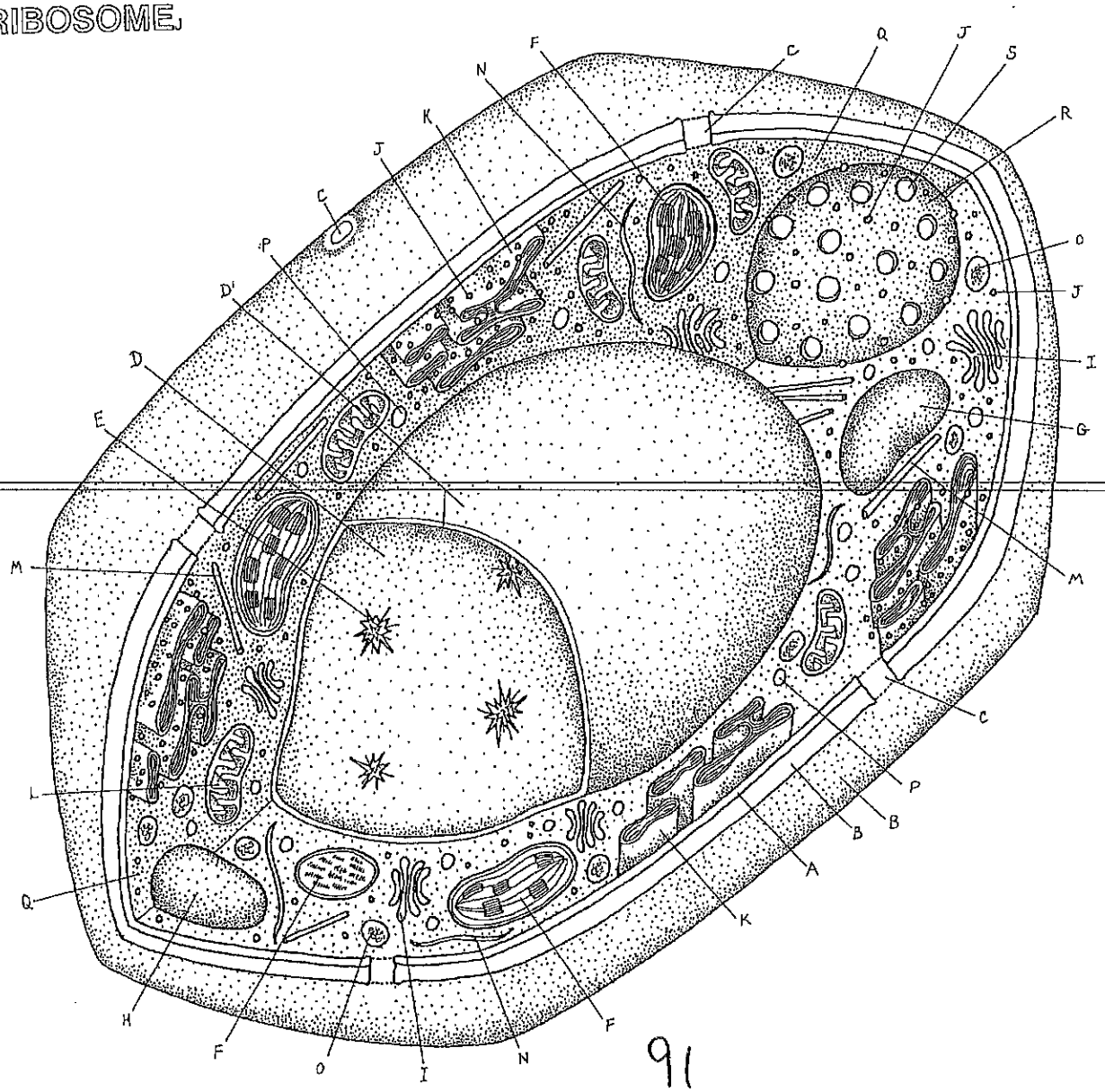


CYANO-BACTERIUM p^2



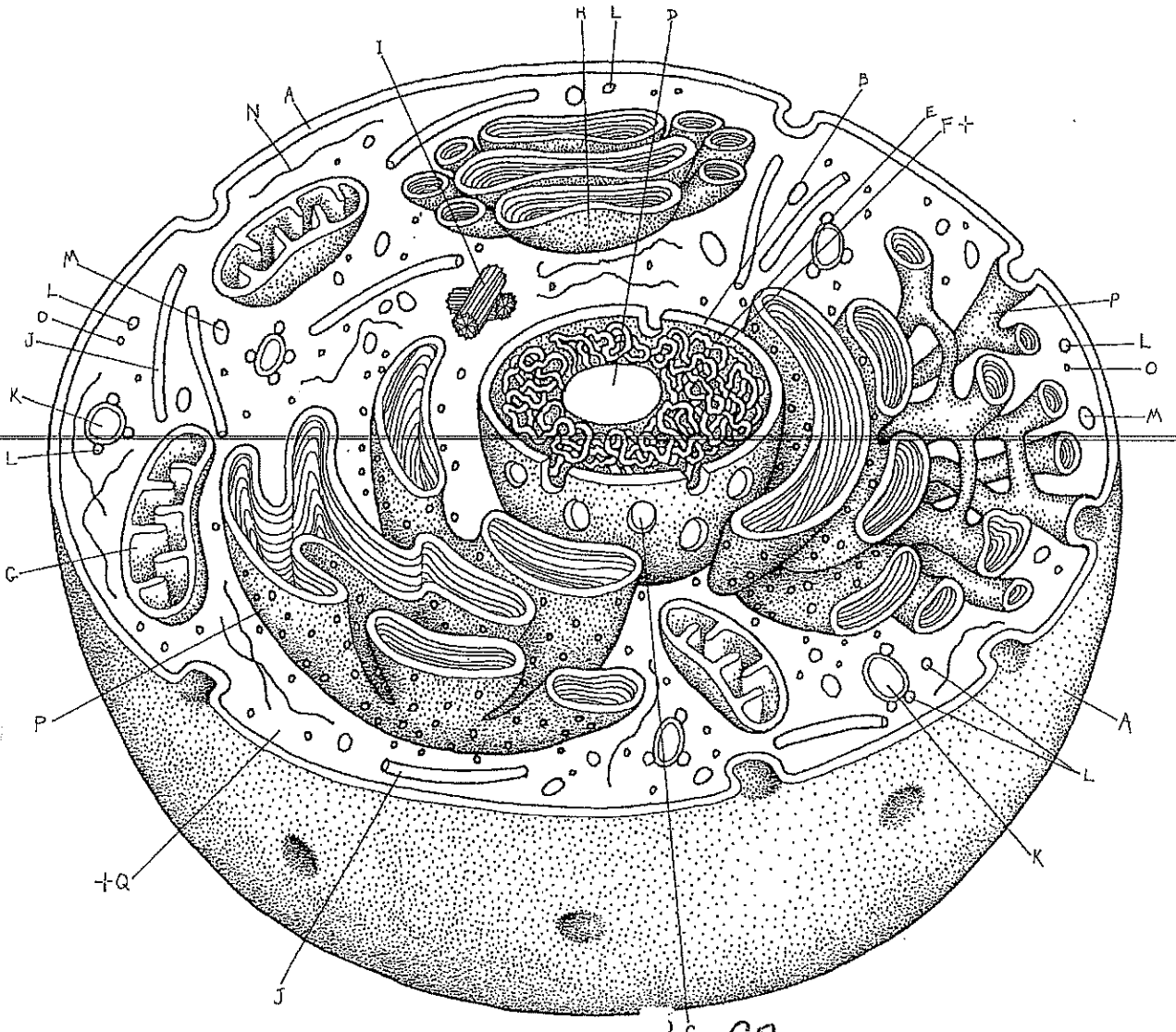
PLANT CELL.

CELL MEMBRANE$_A$
CELL WALL$_B$
PLASMODESMA$_C$
VACUOLE$_D$
  TONOPLAST$_{D'}$
  CRYSTAL$_E$
PLASTIDS$_\star$
  CHLOROPLAST$_F$
  LEUCOPLAST$_G$
  CHROMOPLAST$_H$
GOLGI COMPLEX$_I$
RIBOSOME$_J$
ENDOPLASMIC RETICULUM$_K$
MITOCHONDRION$_L$
MICROTUBULE$_M$
MICROFILAMENT$_N$
LYSOSOME$_O$
MICROBODY$_P$
HYALOPLASM$_Q$
NUCLEUS$_\star$
  NUCLEAR ENVELOPE$_R$
  NUCLEAR PORE$_S$



ANIMAL CELL.

CELL MEMBRANE$_A$
NUCLEUS$_\star$
NUCLEAR ENVELOPE$_B$
NUCLEAR PORE$_C$
NUCLEOLUS$_D$
CHROMATIN$_E$
NUCLEAR SAP$_{F+}$
CYTOPLASM$_\star$
MITOCHONDRION$_G$
GOLGI COMPLEX$_H$
CENTRIOLE$_I$
MICROTUBULE$_J$
VACUOLE$_K$
LYSOSOME$_L$
MICROBODY$_M$
MICROFILAMENT$_N$
RIBOSOME$_O$
ENDOPLASMIC RETICULUM$_P$
HYALOPLASM$_{Q+}$

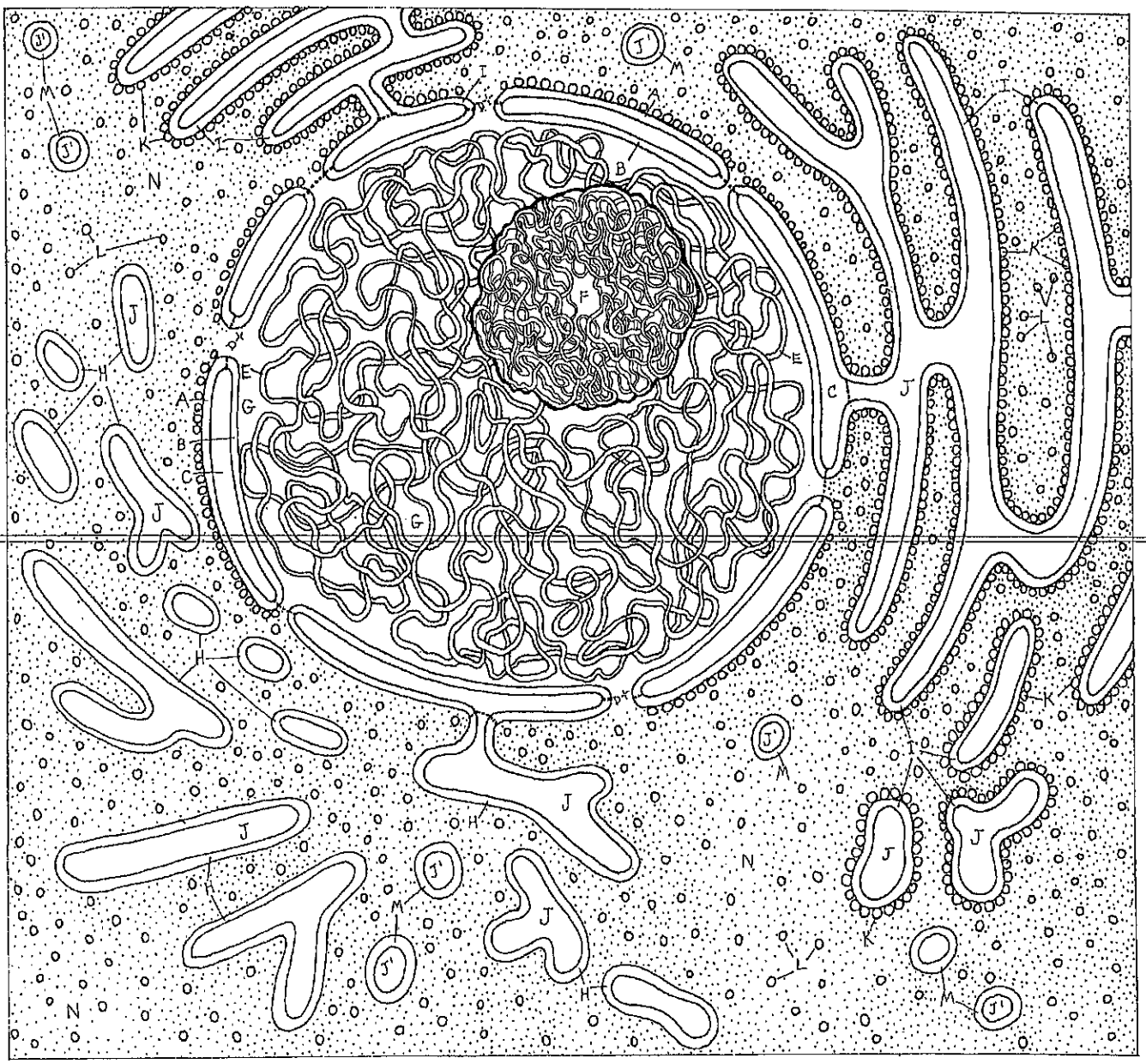


NUCLEUS AND ENDOPLASMIC RETICULUM.

NUCLEAR ENVELOPE★
- OUTER MEMBRANE A
- INNER MEMBRANE B
- PERINUCLEAR SPACE C
- NUCLEAR PORE D

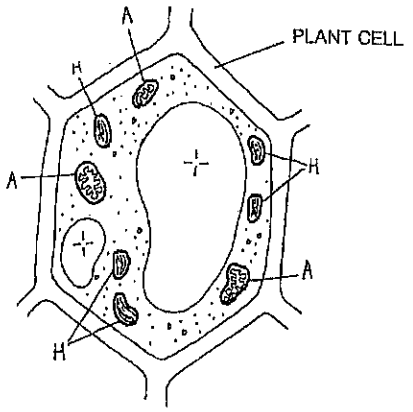
CHROMATIN E
NUCLEOLUS F
NUCLEAR SAP G
SMOOTH ENDOPLASMIC RETICULUM H
ROUGH ENDOPLASMIC RETICULUM I
CISTERNA J
ATTACHED RIBOSOME K
FREE RIBOSOME L
VESICLE M
- CONTENTS J'

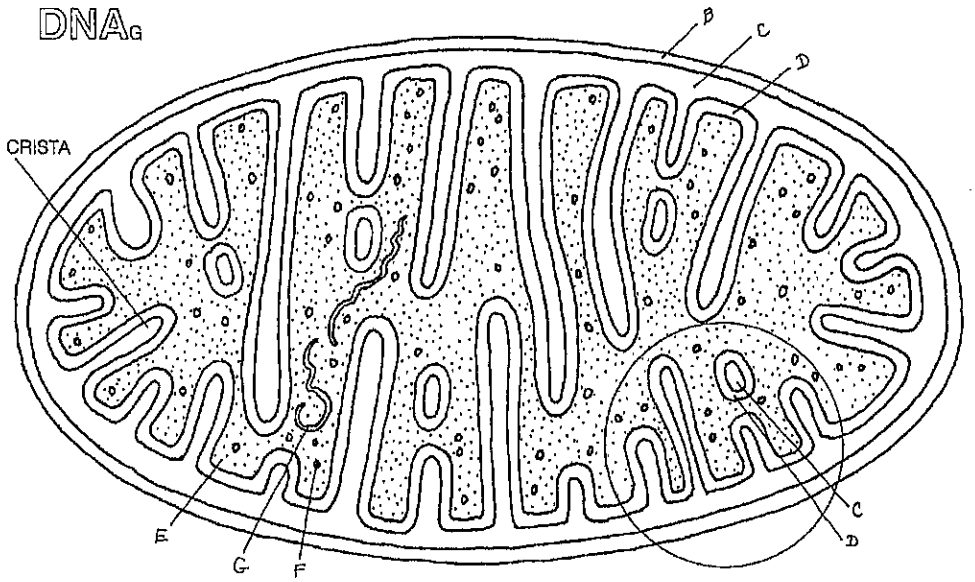
HYALOPLASM N

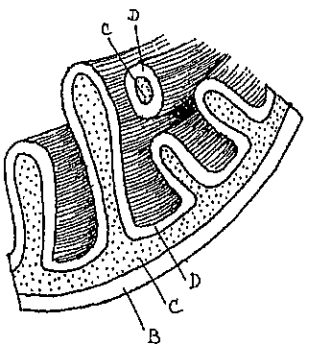


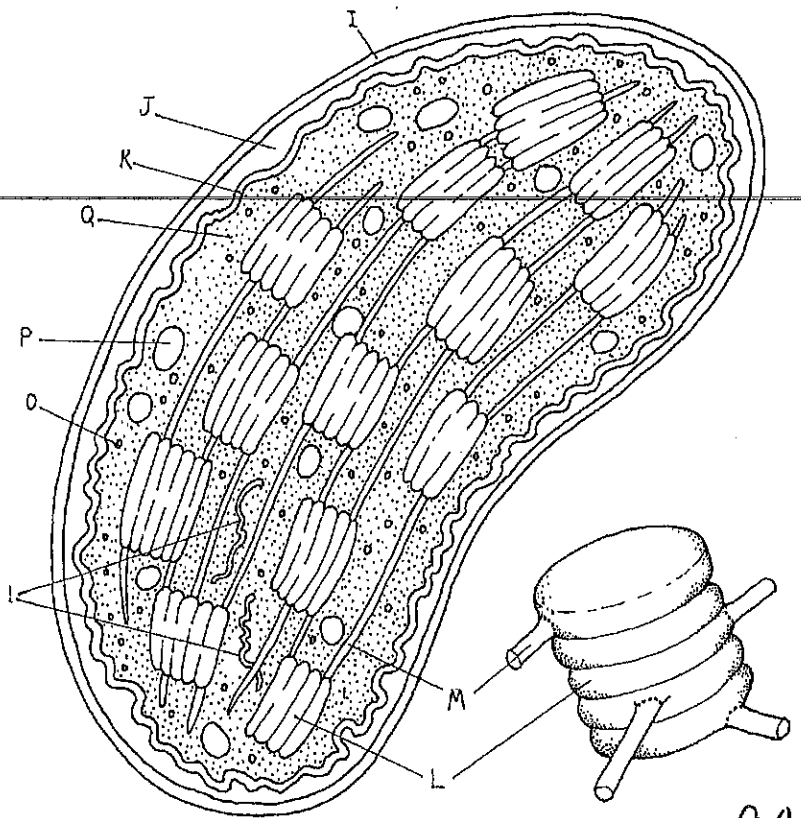
MITOCHONDRION AND CHLOROPLAST.

MITOCHONDRION$_A$
- OUTER MEMBRANE$_B$
- INTERMEMBRANE SPACE$_C$
- INNER MEMBRANE$_D$
- MATRIX$_E$
- RIBOSOME$_F$
- DNA$_G$





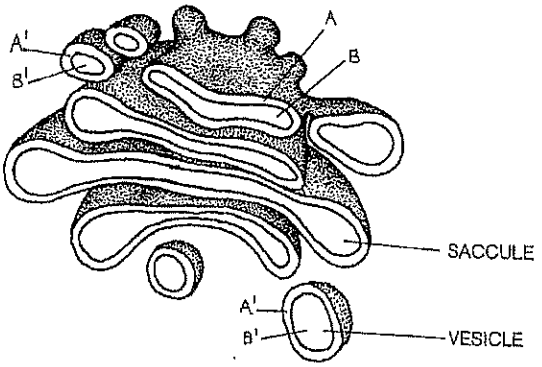




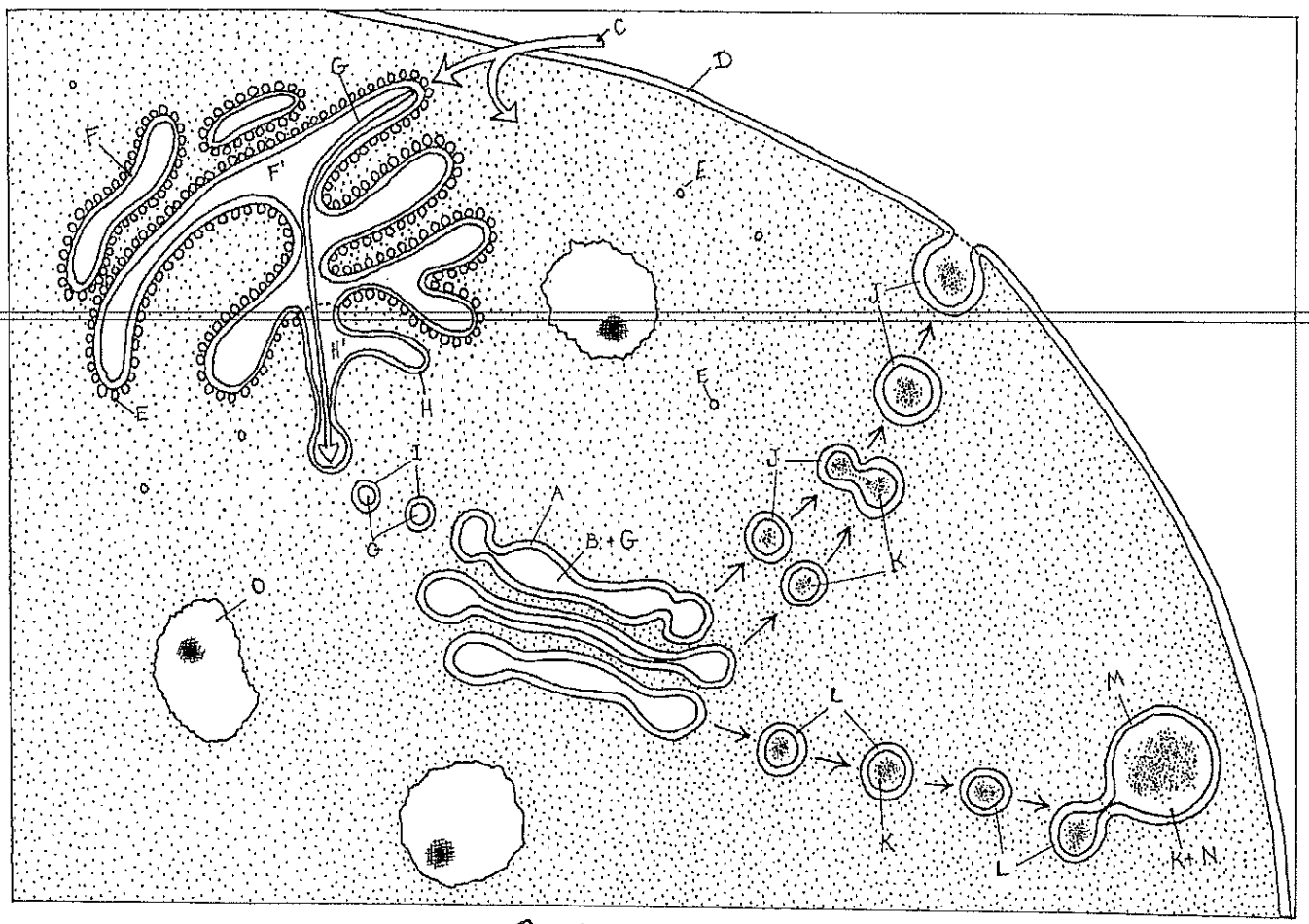
CHLOROPLAST$_H$
- OUTER MEMBRANE$_I$
- INTERMEMBRANE SPACE$_J$
- INNER MEMBRANE$_K$
- GRANUM$_\star$
  - THYLAKOID$_L$
- STROMAL LAMELLA$_M$
- DNA$_N$
- RIBOSOME$_O$
- STARCH GRAIN$_P$
- STROMA$_Q$

GOLGI COMPLEX, LYSOSOMES, MICROBODIES.

GOLGI COMPLEX★
SACCULE/VESICLE★
MEMBRANE$_{A,A'}$
COMPARTMENT$_{B,B'}$
GOLGI COMPLEX IN ACTION★
AMINO ACID MOLECULES$_C$
CELL MEMBRANE$_D$
RIBOSOME$_E$
ROUGH ER MEMBRANE$_F$
CISTERNA$_{F'}$
POLYPEPTIDE CHAINS$_G$
SMOOTH ER MEMBRANE$_H$
CISTERNA$_{H'}$
TRANSITION VESICLE$_I$



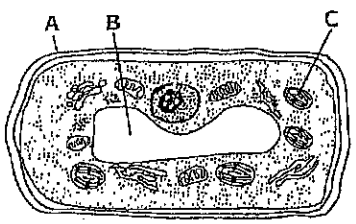
SECRETION VESICLE$_J$
PROTEIN COMPLEX$_K$
LYSOSOME$_L$
FOOD VACUOLE$_M$
FOOD$_N$
MICROBODY★
PEROXISOME$_O$



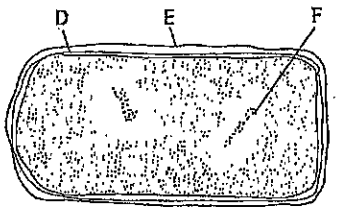
Science Skills

INTERPRETING GRAPHICS

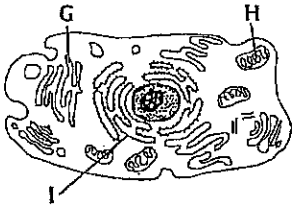
Biology students were working on a class project. They prepared copies of transmission electron micrographs of a bacterium, a plant cell, and an animal cell for display in their classroom. Unfortunately, the pictures were not labeled and got mixed up. Help these students correctly identify the cells and cell structures. Use the figures below to answer questions 1–5.



Cell 1



Cell 2



Cell 3

In the space provided, write the names of each cell's labeled structures (A–I). Using this information, write the identity of each cell—bacterium, plant cell, or animal cell.

1. Cell 1 identity _____

   A. _____

   B. _____

   C. _____

2. Cell 2 identity _____

   D. _____

   E. _____

   F. _____

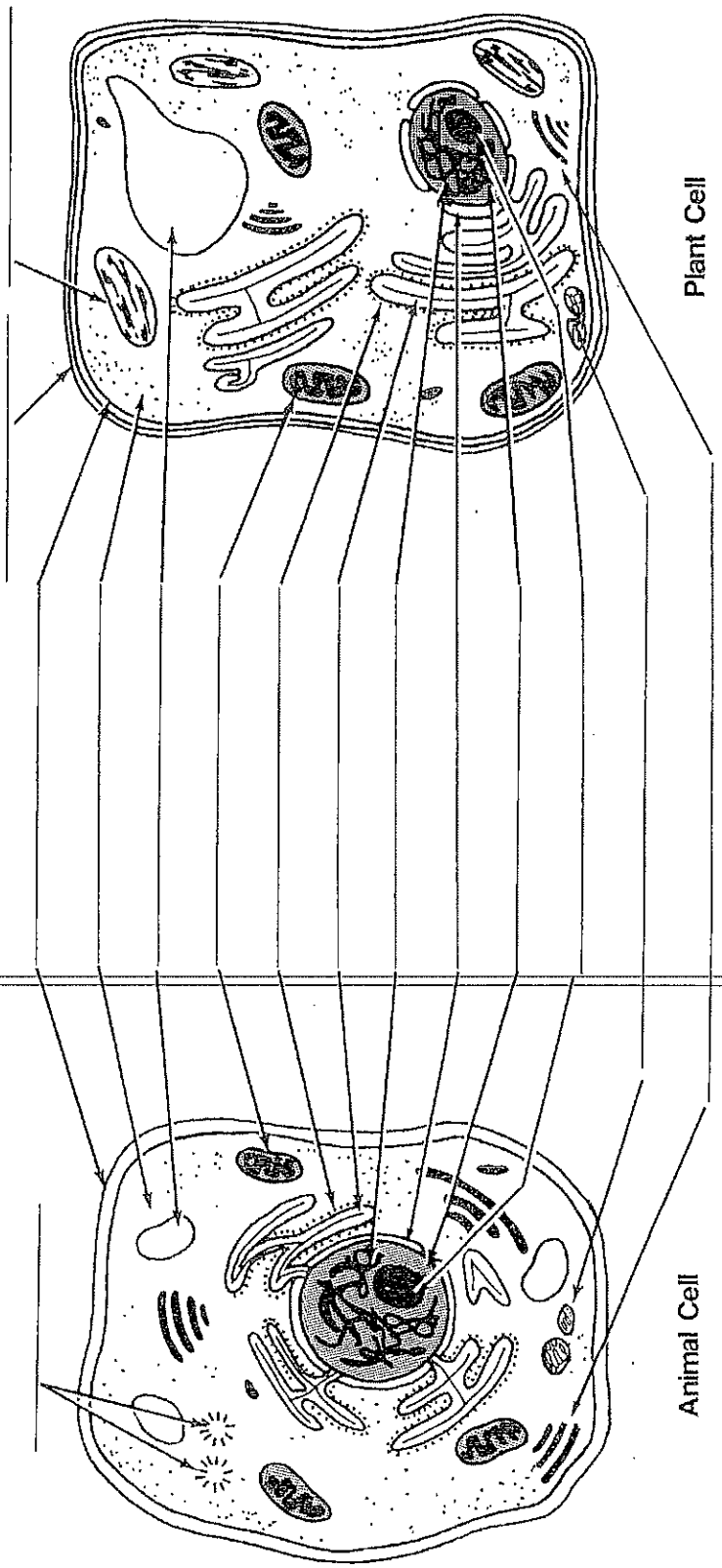
3. Cell 3 identity _____

   G. _____

   H. _____

   I. _____

PLANT CELL AND ANIMAL CELL STRUCTURES



CHAPTER 8 VOCAB

phospholipid

lipid bilayer

equilibrium

concentration gradient

diffusion

carrier protein

osmosis

sodium

signal

receptor protein

second messenger

hypertonic solution

hypotonic solution

isotonic solution

concentration gradient

Chapter 8 Cells and Their Environment

I._____- Homeostasis is the maintenance of stable internal conditions in a changing environment. One way that a cell maintains homeostasis is by controlling the movement of substances across the cell membrane. The cell membrane is a gatekeeper. The cell membrane also provides structural support to the cytoplasm, recognizes foreign material, and communicates with other cells, all of which contribute to maintaining homeostasis.

II. _____- The cell membrane is made of phospholipids. A phospholipid is a specialized lipid made of a phosphate "head" and two fatty acid "tails."

A. The phospholipids form a barrier through which only small, nonpolar substances can pass. Ions and most polar molecules are repelled by the nonpolar interior of the lipid bilayer.

B. The phosphate head is _____ and is attracted to water.

C. The fatty acid tails are _____ and are repelled by water.

D. Because there is water inside and outside the cell, the phospholipids form a double layer called the lipid _____.

1. The nonpolar tails, repelled by water, make up the interior of the lipid bilayer.

2. The polar heads are attracted to the water, so they point toward the surfaces of the lipid bilayer.

III. **MEMBRANE PROTEINS**- Proteins in the cell membrane include cell-surface markers, receptor proteins, enzymes, and transport proteins.

A. Cell-surface markers -act like a name tag. A unique chain of sugars acts as a marker to identify each type of cell. These sugars (carbohydrates) are attached to the cell surface by proteins called glycoproteins. Glycoproteins help cells work together.

B. _____ -enable a cell to sense its surroundings by binding to certain substances outside the cell. When this happens, it causes changes inside the cell.

C. _____ -Many substances that the cell needs cannot pass through the lipid bilayer. Transport proteins aid the movement of these substances into and out of the cell.

D. _____- allow reactions to take place- can break a larger molecule into 2 smaller molecules

IV. **TRANSPORT ACROSS THE MEMBRANE-** There are 2 types of transport- passive and active

A. **PASSIVE TRANSPORT**-In passive transport, substances cross the cell membrane down their concentration gradient. No energy is required for this. Passive transport includes

1. _____ Small, nonpolar molecules can pass directly through the lipid bilayer. This type of movement is called simple diffusion. Oxygen moves down its concentration gradient into the cell. Carbon dioxide diffuses out of the cell. Also,natural steroid hormones, which are nonpolar and fat soluble, can also diffuse across the lipid bilayer.

2. _____- Many ions and polar molecules that are important for cell function do not diffuse easily through the nonpolar lipid bilayer. During facilitated diffusion, transport proteins help these substances diffuse through the cell membrane. Two types of transport proteins are

   a) channel proteins –channel proteins, sometimes called pores, serve as tunnels through the lipid bilayer. Each channel allows the diffusion of specific substances that have the right size and charge. Ions, sugars, and amino acids can diffuse through the cell membrane through channel proteins

   b) carrier proteins- A carrier protein binds to a specific substance on one side of the cell membrane. This binding causes the protein to change shape. As the protein's shape changes, the substance is moved across the membrane and is released on the other side.Carrier proteins transport substances that fit within their binding site.

3. _____-Water can diffuse across a selectively permeable membrane in a process called osmosis. Osmosis allows cells to maintain water balance as their environment changes. Remember that in osmosis, ONLY the water molecules are free to move.

   a) If the solution is hypertonic, or has a higher solute concentration than the cytoplasm does, water moves out of the cell. The cell loses water and shrinks.

   b) If the solution is isotonic, or has the same solute concentration that the cytoplasm does, water diffuses into and out of the cell at equal rates. The cell stays the same size.

   c) If the solution is hypotonic, or has a lower solute concentration than the cytoplasm does, water moves into the cell. The cell gains water and expands in size. If left unchecked, the swelling caused by a hypotonic solution could cause a cell to burst.

   d) The rigid cell walls of plants and fungi prevent the cells of these organisms from expanding too much. In fact, many plants are healthiest in a hypotonic environment.

   e) Some unicellular eukaryotes have contractile vacuoles, which collect excess water inside the cell and force the water out of the cell.

   f) Animal cells have neither cell walls nor contractile vacuoles. Many animal cells can avoid swelling caused by osmosis by actively removing solutes from the cytoplasm

B. **ACTIVE TRANSPORT**- Active transport requires energy to move substances against their concentration gradients. In order to move substances against their concentration gradients, cells must use energy. Most often, the energy needed for active transport is supplied directly or indirectly by ATP.

1. _____- In active transport, the carrier proteins do require energy to "pump" substances against their concentration gradient.

a) The sodium-potassium pump is a carrier protein that actively transports three sodium ions out of the cell and two potassium ions into the cell. This pump is one of the most important carrier proteins in animal cells. It prevents sodium ions from building up in the cell, resulting in osmosis into the cell making it burst.

b) The concentration gradients of sodium ions and potassium ions also help transport other substances, such as glucose, across the cell membrane.

2. _____- Many substances, such as proteins and polysaccharides, are too large to be transported by carrier proteins. Instead, they cross the cell membrane in vesicles, which are membrane-bound sacs made by pinching off of the membrane.

a) _____- The movement of a large substance <u>into</u> a cell by means of a vesicle. Vesicles that form by endocytosis may fuse with lysosomes or other organelles.

b) _____- The movement of material <u>out</u> of a cell by means of a vesicle. These vesicles are usually from the Golgi

V. **SENDING SIGNALS**- Cells communicate and coordinate activity by sending chemical signals that carry information to other cells.

A. A signaling cell produces a signal, often a molecule, that is detected by the target cell. Target cells have specific proteins that recognize and respond to the signal. These proteins are usually on the cell membrane (except in steroids)

B. Neighboring cells can communicate through direct contact between their membranes.

C. Long-distance signals are carried by hormones and nerve cells.
_____ are distributed widely in the bloodstream

VI. **RECEIVING SIGNALS**- _____cells have receptor proteins.A receptor protein binds only to signals that match the specific shape of its binding site (the key for your front door will not open your neighbors front door) The outer part of the receptor protein is folded into a unique shape, called the binding site. Only the "right" shape can fit into the receptor protein while the "wrong" shape have no effect on that particular receptor protein. Once it binds the signal molecule, the receptor protein changes

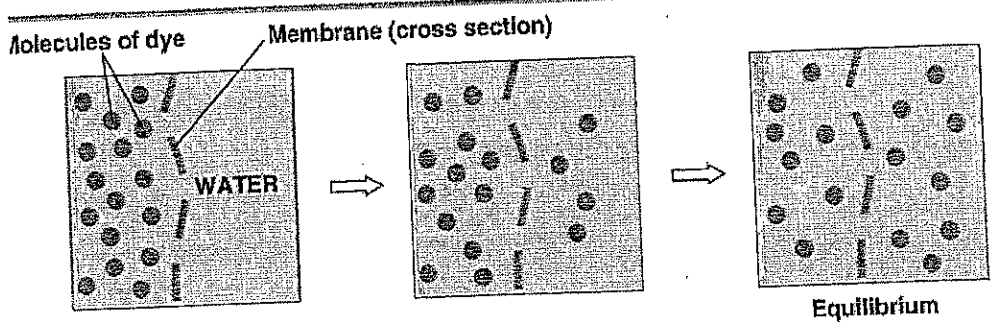
its shape in the membrane. This change in shape relays information into the cytoplasm of the target cell.

VII. **RESPONDING TO SIGNALS**-The cell may respond to a signal by

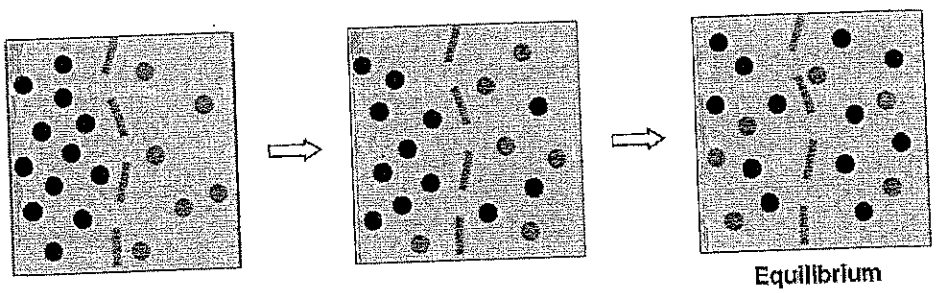
A. changing its membrane permeability

B. activating enzymes

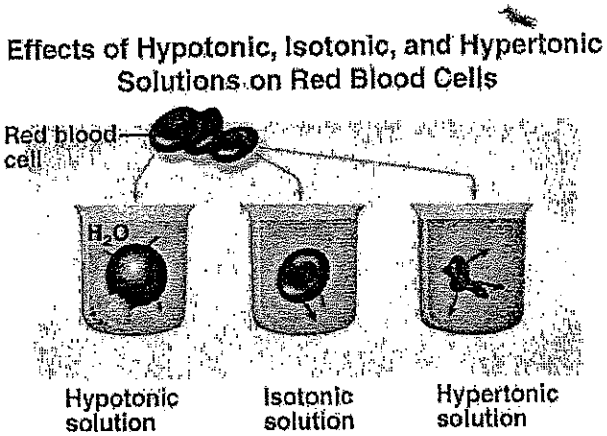
C. forming a second messenger.

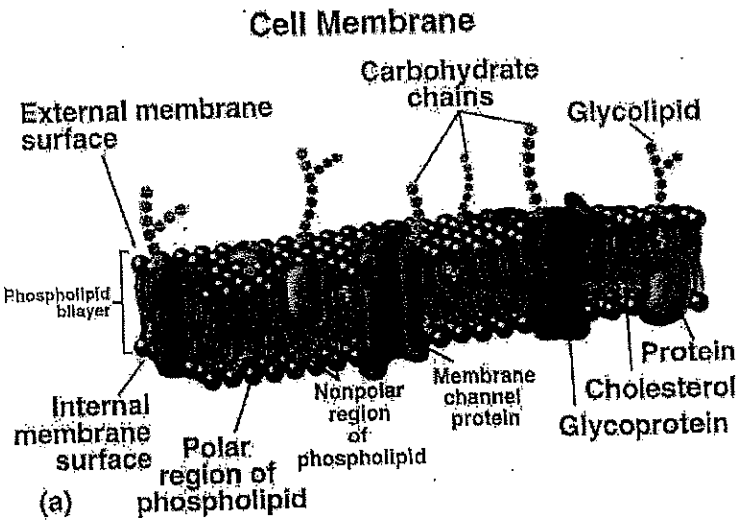


(a) Diffusion of one solute



(b) Diffusion of two solutes

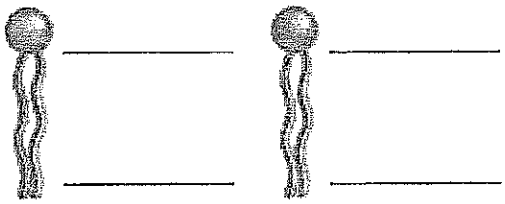




CHAPTER 8 SEC 1 DUE DATE

1. What are four functions of the cell membrane that help a cell maintain homeostasis?

2. Label the two main parts of the structure below. Which of these parts faces the area between the two layers of the lipid bilayer? Which faces out? Why?



3. Why are ions and polar molecules unable to pass easily though the lipid bilayer?

4. What are two functions of cell-surface markers?

5. Suppose a cell were exposed to a drug that caused transport proteins in the cell membrane to stop working. What would happen to the cell?

Bellringer Day M T W Th F Date Question

Answer

CHAPTER 8 SEC 2 DUE DATE

1. Why does diffusion of water happen when there are dissolved particles on one side of a membrane but not on the other?

2. Complete the following table

TYPE OF SOLUTION	DESCRIPTION
HYPERTONIC	
HYPOTONIC	
	The concentrations of solutes and water in the solution are equal to those in the cell cytoplasm. Water diffuses into and out of the cell at equal rates.

3. If a cell were unable to make ATP, how would the cell's transport processes be affected?

Bellringer:Day M T W Th F Date Question

Answer

CHAPTER 8 SEC 3 DUE DATE

1. What are two ways cells can communicate over long distances? What is one way cells can communicate with cells that are nearby?

2. What is the function of receptor proteins?

3. What happens when a receptor protein binds to a signal molecule?

4. What are three ways a cell may respond when a signal molecule binds to a receptor protein?

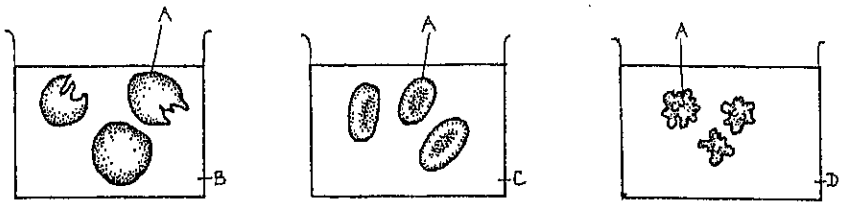
5. Why is it important that each receptor protein binds to only one signal molecule?

Bellringer-Day M T W Th F Date Question

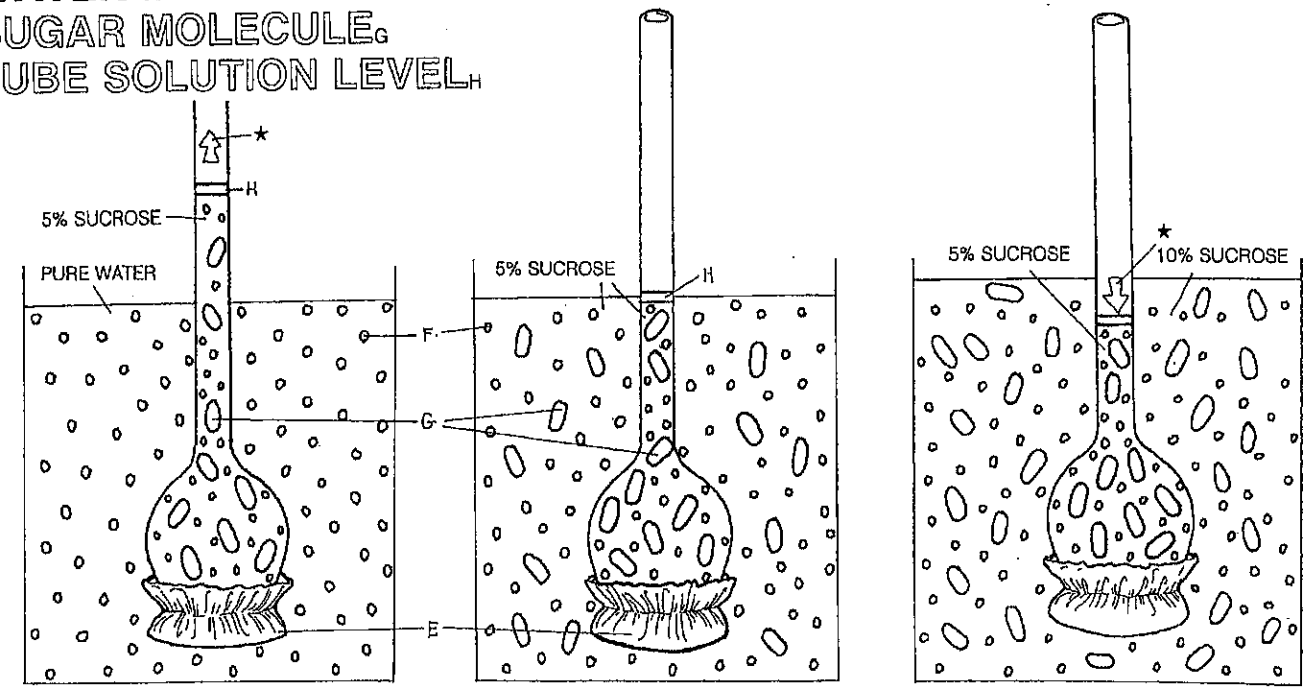
Answer

OSMOSIS.

ERYTHROCYTE$_A$
PURE WATER$_B$
0.85% SALT SOLUTION$_C$
2% SALT SOLUTION$_D$

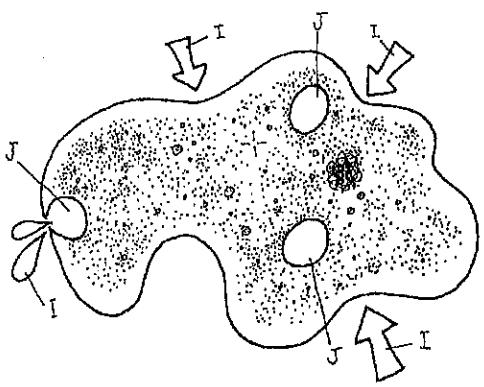


OSMOMETER$_\star$
SELECTIVELY PERMEABLE MEMBRANE$_E$
WATER MOLECULE$_F$
SUGAR MOLECULE$_G$
TUBE SOLUTION LEVEL$_H$

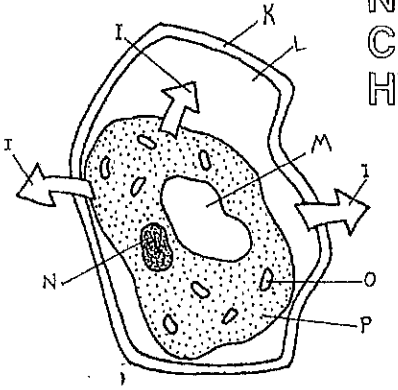


HYPOTONIC$_\star$ ISOTONIC$_\star$ HYPERTONIC$_\star$

AMOEBA$_\star$
WATER$_I$
CONTRACTILE VACUOLE$_J$



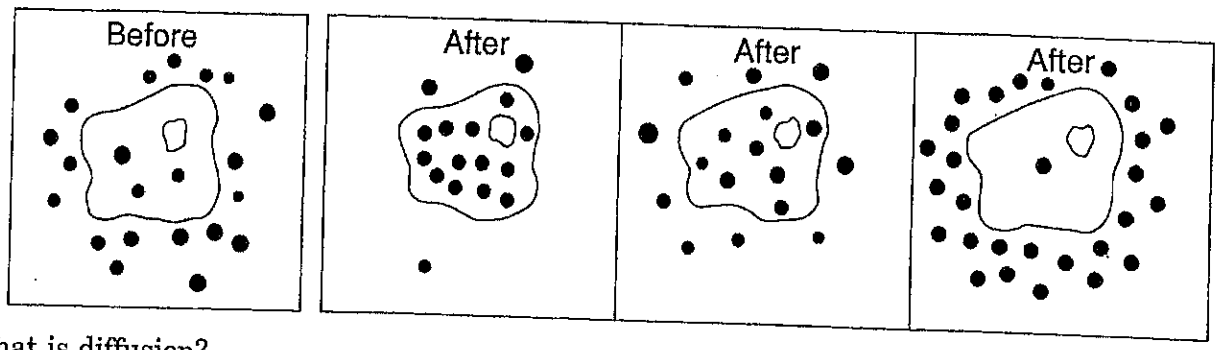
WILTING PLANT CELL$_\star$
CELL WALL$_K$
AIR SPACE$_L$
SHRUNKEN VACUOLE$_M$
NUCLEUS$_N$
CHLOROPLAST$_O$
HYALOPLASM$_P$



SPECIAL CELL PROCESSES

In your textbook, read about diffusion and osmosis

1. The first picture below, labeled *Before*, shows a cell surrounded by oxygen molecules before diffusion takes place. Each of the small black dots represents an oxygen molecule. Which of the three pictures labeled *After* shows where these oxygen molecules would be found after diffusion takes place? Circle your answer.



2. What is diffusion? _____

3. How do molecules get through the cell membrane? _____

4. What is osmosis? _____

5. Which way would the water molecules move in the following situations?

   a. cucumber slice is placed in salt water _____

   b. salt is poured on a snail _____

   c. vegetables are sprinkled with water _____

   d. potato slice is placed in pure water _____

6. Circle the letter in front of the sentence that best explains the process of osmosis.

   a. Osmosis is the movement of water into or out of a cell from where it is in large amounts to where it is in small amounts.

   b. Osmosis is the movement of water into or out of a cell from where it is in small amounts to where it is in large amounts.

   c. Osmosis is the movement of salt into or out of a cell from where it is in large amounts to where it is in small amounts.