**Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period: \_\_\_\_\_ Date: \_\_\_\_\_\_\_\_\_\_\_\_**

**Ms. Randall Living Environment**

**Midterm Review**

**Directions:** Use your notes to review for the midterm. This is a general review and may not cover all concepts in detail.

**List all 8 characteristics of life** and provide an example of each.

|  |  |
| --- | --- |
| Characteristic of Life | Example |
| 1. |  |
| 2. |  |
| 3. |  |
| 4. |  |
| 5. |  |
| 6. |  |
| 7. |  |
| 8. |  |

Define what homeostasis is and provide an example of an organism being out of homeostasis.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

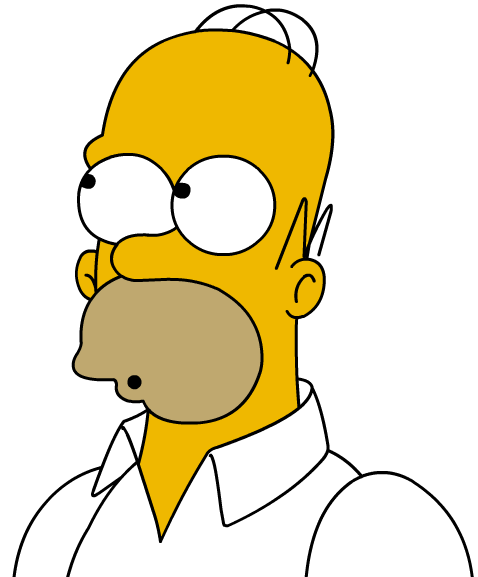
How does metabolism help maintain homeostasis? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Designing an experiment- Scientific Method**

*Define the following:*

1. Independent variable-
2. Dependent variable-
3. Control group-
4. Hypothesis-

What would make an experiment more valid? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Question:** Homer is working on a science project. His goal is to answer the question: “Does coffee affect the speed of hair growth?” He sets up a controlled experiment to investigate this problem.

1. Identify the control group in the experiment. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. What would be the independent and dependent variables? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. State a possible hypothesis for this experiment. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Graphing***- Graph the following data below. Be sure to label your axis, provide an appropriate scale for each axis and a title.*

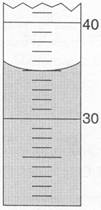
|  |  |
| --- | --- |
| Student Name | Student Grade |
| Billy Bob | 84 |
| Angelina Jolie | 76 |
| Bill Murray | 90 |
| Chris Farley | 55 |
| Chris Rock | 95 |
| Johnny Depp | 90 |



**Laboratory Measurement-**

What is the total magnification of a compound microscope using the high power objective lens? Show your work.

What is the name of the structure indicated by the arrow below?



What is the volume of the liquid above? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

If an object is 4 mm in length how many micrometers would it be? *Remember that micrometers are used to measure objects under the microscope and the conversion is listed below:*

1um (micrometer) = .001mm

**Lab Safety-**

*Why would you never heat a test tube with a stopper on it? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_*

**Biochemistry- Organic Compounds**

What is the difference between organic and inorganic compounds?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Is water organic or inorganic? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

|  |  |  |
| --- | --- | --- |
| Building Block/End Product | Organic Compound | Indicator used in lab to identify compound |
|  | Carbohydrates*-mono* |  |
|  | *-di* |  |
|  | -poly |  |
|  | Proteins |  |
|  | Lipids |  |

Enzymes end in \_ \_ \_ and are considered organic catalysts because they \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ reactions.

Name 2 factors that can affect enzyme activity.

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

How does changing the shape of an enzyme affect its function? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

What is the term for an enzyme that loses its function (changes shape)?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

How is hydrolysis similar to digestion? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

How is dehydration similar to the life function Synthesis? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**Cells**

Draw a typical plant and animal cell. Label and provide the function for the Nucleus, Mitochondria, Ribosome, Cell membrane, Cell Wall, Chloroplast, Large vacuole.

Name three differences between plant and animal cell.

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

How do cell communicate with each other? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Name the 3 parts of the cell theory:

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What is one exception to the cell theory? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Complete the following:

Organelle \_\_\_\_\_\_\_\_\_\_\_\_ Tissues \_\_\_\_\_\_\_\_\_\_\_\_ Organ System \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Cell Transport*-***

The cell membrane is made of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

What molecules can easily pass through the cell membrane? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Passive Transport uses NO ENERGY in moving material from an area of \_\_\_\_\_\_\_\_\_\_\_\_ concentration to an area of \_\_\_\_\_\_\_\_\_\_ concentration.

Active Transport uses requires energy in the form of ATP to move materials from an area of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ concentration to an area of \_\_\_\_\_\_\_\_ concentration.

Diffusion and osmosis are a form of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ transport.

**Cell Energy**Photosynthesis takes place in the cell organelle known as the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Write the equation for photosynthesis: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

*Define:*

Aerobic respiration- \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Anaerobic respiration- \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

ATP- \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

What are the reactants (goes into) and products (goes out) of:

Aerobic Respiration- In\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Out\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Anaerobic Respiration- In\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

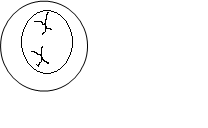
(Lactic acid fermentation) Out\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Where does the glucose used in cellular respiration come from? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

When does respiration occur? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**Cell Replication**

Show how two chromosomes are passed from mother cell to two daughter cells during mitosis (asexual reproduction).



What is the result of asexual reproduction? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**State Lab Review:**

***Making Connections***

***Key Points I***

In order to find a hypothesis, one looks for patterns. For example, we did not see a connection between pulse rate and height, but we did see a connection between pulse rate and exercise.

Graphs and data tables present data in a clear, organized way that is easy to understand.

Pulse rate increases during exercise because the cells need to be provided with more food and oxygen and more wastes are produced which need to be transported to the lungs (CO2) and the kidneys (urea).

Muscles become fatigued, tired, due to waste products building up in them.

Organ systems interact in order to maintain homeostasis.

***Procedure I***

* Students found their average pulse rates after three trials.
* Class results were graphed in a histogram, bar graph.
* Pulse rates were found to increase after exercising.
* A clothespin was squeezed rapidly for one minute. The number of times that it was squeezed was recorded.
* The clothespin was squeezed the same way for another minute.
* Analysis:
* Organ systems interacted to maintain homeostasis during exercise. For example:
* The respiratory system takes in oxygen, which is transported to cells by the circulatory system. As cells use oxygen at a higher rate, an increased heart rate would get the oxygen to the cells more quickly
* As muscle cells increase their activity, they produce waste products at a higher rate. These wastes are carried to the excretory system by the blood (circulatory system) more efficiently when the heart rate increases.
* A reliable way to test a hypothesis or a claim is to do an experiment.

***Key Points II:***

* Know how to design an experiment and how to interpret an experiment’s design.
* Independent variable: The variable that the scientist changes. Only one of these in an experiment. This is put on the x-axis in a graph.
* Dependent variable: The variable that is changed by the independent variable. The results. Only one of these in an experiment. This is put on the y-axis in a graph.
* Controlled variable: The variable that remains the same for all trials. All variables except for the independent and dependent variables must be controlled variables. If this is not true, the results may be invalid.
* Control group: A group in which the independent variable is set to 0. This group is used to compare with an experimental group. Without this group, the results may be invalid.
* Increasing the number of trials increases the validity of the experiment.
* You should be familiar with constructing a data table and a graph (line and bar).

**Procedure:**

* An experiment was designed to determine the effect on exercise on squeezing a clothespin using the “Guidelines for Designing a Controlled Experiment.” These guidelines are in your packet, and they were also a part of your independent investigation project.
* You did the experiment following your design.
* The data was included in a data table and a graph.
* You determined if your data accepted or rejected your hypothesis.
* Suggestions for improvement and further research were included in the final report.

**Questions:**

Base your answers to questions 1 and 2 on the information below and on your knowledge of biology.

In an investigation, 28 students in a class determined their pulse rates after performing each of three different activities. Each activity was performed three times during equal time intervals. The average results are shown in the graph below.



1. Before constructing the graph it would have been most helpful to organize the results of the investigation in

(1) a research plan

(2) an equation

(3) a data table

(4) a generalization

2. Some students concluded that males always have a higher pulse rate than females. Does the graph support this conclusion? Justify your answer. [1]

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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3. When a person exercises, changes occur in muscle cells as they release more energy. Explain how increased blood flow helps these muscle cells release more energy. [1]

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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4. An increase in heart rate will most likely result in

(1) a decrease in metabolic rate

(2) an increase in pulse rate

(3) an increase in cell division

(4) a decrease in body temperature

5. A student squeezed a clothespin as many times as possible in a 30-second time period.

The student repeated this procedure nine more times in quick succession. The data obtained are in the chart below.



State one hypothesis that this data would support concerning the relationship between number of trials and number of squeezes in 30 seconds. [1]

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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6. On a television talk show, a guest claims that people who exercise vigorously for 15 minutes or more every day are able to solve math problems more rapidly than people who have no vigorous exercise in their daily routine. Describe a controlled experiment that could be conducted to test this claim. In your description be sure to:

• state the purpose of the experiment [1]

• state why the sample to be used should be large [1]

• describe how the experimental group will be treated and how the control group will be treated [2]

• state the specific data to be collected during the experiment [1]

• state one way to determine if the results support the claim [1]

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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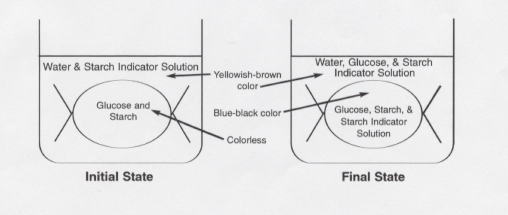
# Diffusion Through A Membrane

# Key Points I

1. Molecules tend to move from high to low concentration without the use of energy (*diffusion*).
2. Membranes may allow some molecules to pass through while not allowing others (*selectively permeable*).
3. *Indicators* are used to show the presence of certain kinds of molecules.

# Procedure I

1. A model cell is made using a plastic membrane (usually *dialysis tubing*) containing *starch* and *glucose*. The bag is sealed with string.
2. *Starch indicator* (iodine) is placed in solution outside the ‘cell’.
3. Because of the differences in concentration, starch indicator diffuses in and glucose diffuses out. Starch ‘wants’ to diffuse out, but cannot because the molecule is too large to pass through the membrane.



1. Starch (milky white) + starch indicator (brown) = blue-black color
2. The inside of the bag turns blue-black while the outside stays brown, proving that indicator went in, but starch did not leave.
3. *Glucose indicator* (blue) + glucose (clear) + HEAT = green, brown, red, or orange
4. Testing the fluid outside the ‘cell’ shows glucose has left. This is tested by placing fluid from outside into a test tube, adding indicator solution, and heating the mixture.
5. You may prove that #6 is true by testing (heating) indicator alone and also testing indicator + starch. Both of these *controls* result in a blue color (no change).

# Analysis I

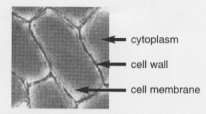
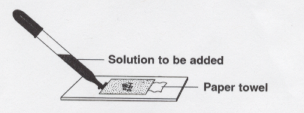
1. Glucose and starch indicator may pass through the membrane. Starch may not. This is because starch is a much larger molecule than glucose or starch indicator.
2. This shows the importance of breaking down large molecules inside the digestive system in order for nutrients to enter the bloodstream.

# Key Points II

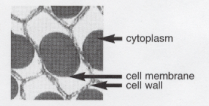
1. Basic parts of the cell that are easily seen under the microscope are the *cytoplasm*, *cell membrane*, and *cell wall* (in plants).
2. Molecules tend to move from high to low concentration without the use of energy (*diffusion*).
3. Diffusion of water molecules is particularly important and has the special name of *osmosis*.
4. The balance of water molecules inside and outside the cell is extremely important for the survival of all organisms, including humans.

# Procedure II

1. Make a *wet mount* slide of a thin section of red onion cells. The cells are taken from the outer ‘skin’ of the onion bulb and a small piece is placed in a drop of water on a microscope slide. A *cover slip* is placed on top by touching it to the water at an angle, and then carefully placing it on the specimen, trying not to get air bubbles underneath.
2. The cells are examined under the light (compound) microscope. You should be able to identify the cytoplasm, cell membrane, and cell wall.
3. It is important to see that the cell membrane and cytoplasm completely fill the space within the cell wall.



1. Place a 10% salt solution under the cover slip. This is done by putting a drop of salt solution next to one edge of the cover slip, then absorbing water from the opposite side of the slip using a paper towel.
2. Observe the cells in the salt solution. It is important to see that the cytoplasm and cell membrane have shriveled up inside the cell wall. This is due to water molecules leaving the cell and entering the salty (low water) solution.



1. Place distilled water under the cover slip using the technique described in #4 above.
2. Observe the cells in distilled water. It is important to see that the cytoplasm and cell membrane have swollen back to fill the entire space available within the cell wall.

# Analysis II

1. Cells placed in very salty solutions will lose water, causing them to collapse and possibly lose the ability to complete life functions.
2. Cells placed in very watery solutions will tend to gain water, which causes them to swell and might cause them to burst/break open, destroying the cell. Note that this did not happen in the plant cells because the cell wall prevents the cell membrane from easily expanding.
3. Freshwater creatures, particularly single-celled organisms, must cope with too much water entering the cells. Saltwater organisms tend to have the opposite problem and must try to reclaim lost water.

**Questions:**

Base your answers to questions 12 and 13 on the diagrams below and on your knowledge of biology.

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1. Describe how to prepare a wet-mount slide of red onion cells with the cell membrane shrinking away from the cell wall, as shown in diagram 1. The following materials are available: microscope slide, pipettes, cover slips, paper towels, water, salt solution, and red onion sections. [3]

2. List the laboratory procedures to follow that would cause the cells in diagram 1 to resemble the cells in diagram 2. [2]

3. A student places an artificial cell, similar to the one used in the laboratory activity *Diffusion Through a Membrane*, in a beaker containing water. The artificial cell contains starch and sugar.A starch indicator is added to the water in the beaker. Explain how the student will know if thestarch is able to diffuse out of the artificial cell. [1]

4. An investigation was set up to study the movement of water through a membrane. The results are shown in the diagram below.

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Based on these results, which statement correctly predicts what will happen to red blood cells when they are placed in a beaker containing a water solution in which the salt concentration is much higher than the salt concentration in the red blood cells?

(1) The red blood cells will absorb water and increase in size.

(2) The red blood cells will lose water and decrease in size.

(3) The red blood cells will first absorb water, then lose water and maintain their normal size.

(4) The red blood cells will first lose water, then absorb water, and finally double in size.

5. State *one* factor that influences which molecules can pass through the cell membrane of a human cell. [1]

6. An indicator for a protein is added to a solution that contains protein and to a solution that does *not* contain protein. State *one* way, other than the presence or absence of protein that the two solutions may differ after the indicator has been added to both. [1]

7. A student prepared a wet-mount slide of some red onion cells and then added some salt water to the slide. The student observed the slide using a compound light microscope. Diagram *A* is typical of what the student observed after adding salt water. Complete diagram *B* to show how the contents of the red onion cells should appear if the cell were then rinsed with distilled water for several minutes. [1]

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