Name: _____ Date: _____

Cell Membrane and Cell Transport WebQuest

Part I: Cell Membranes

Go to the following website: www.biology4kids.com/files/cell_membrane.html

1. How is the cell membrane similar to a plastic bag with tiny holes?

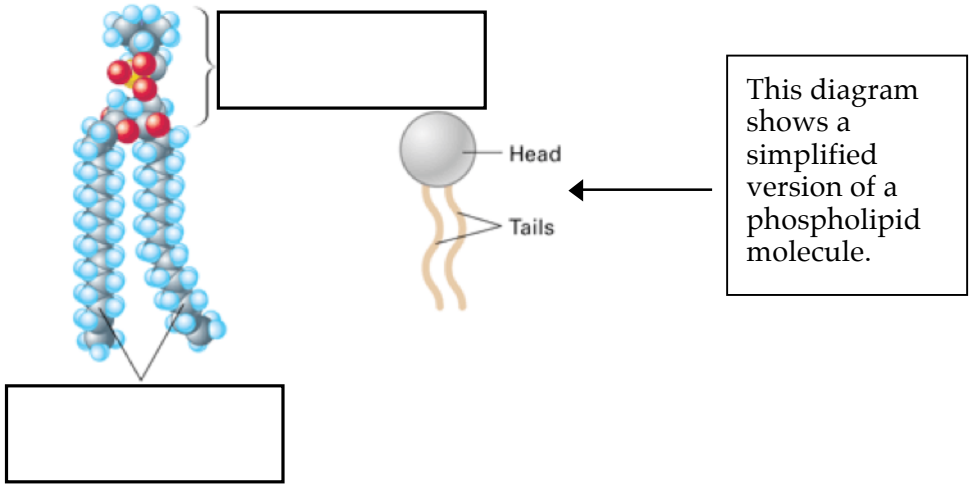
2. What two components make up the cell membrane?

    a. What are their functions?

3. What is the fluid mosaic model?

4. Sketch a section of the cell membrane, showing both phospholipids and proteins. Label your drawing.

5. Label the diagram of the phospholipid molecule below with the following terms: *hydrophilic head*, *hydrophobic tail*



Keep in mind that a phospholipid is a type of **lipid**. Think back to our unit on macromolecules. Lipids have long hydrocarbon tails (made of carbon and hydrogen). Water does not like to associate with these tails, so the tails in a phospholipid are *hydrophobic* (=water-fearing). The phospholipid heads have some charge, so they are polar. Water is also polar and likes to associate with other polar molecules. Thus, the heads are *hydrophilic* (=water-loving).

6. Given the information above, why does the arrangement of the phospholipid bilayer make sense? (The tails are facing inwards and the heads are facing the watery area surrounding the cell).

<u>Part II: Membrane Proteins</u>

On the right side of the webpage under Cell Structure, click on "Membrane Proteins."

1. Where, specifically, do you find membrane proteins?

2. What are the two types of proteins in the cell membrane?

3. Describe integral membrane proteins, including some of their jobs.

4. Describe peripheral membrane proteins.

5. How do the number of integral proteins compare to the number of peripheral proteins in the cell membrane?

Part III: Membrane Transport

On the same website, go to the top and click on "Function." (Right after it says Cell Structure & Function) > Click on "Passive Transport" on the right hand side. If you cannot find it, the URL is: www.biology4kids.com/files/cell2_main.html

1. How does passive transport differ from active transport?

2. Two types of passive transport (movement of molecules across a membrane that does not require energy) include _____ and _____.

3. What do some proteins act as to aid in moving molecules across a membrane?

4. What do you think semi-permeable means? (*permeable* means to pass into or through).

5. What is facilitated diffusion? Does it require energy to occur?

    a. What is an example of a molecule that cannot cross the membrane by simple diffusion?

6. Molecules that move from *high* to *low* concentration are said to be moving down a _____ _____.

7. Make a sketch showing molecules in high concentration on one side of the membrane, and in low concentration on the other side of the membrane and the movement of molecules down a concentration gradient.

8. How are small molecules able to freely cross the membrane without an input of energy?

9. What is osmosis?

10. In terms of ion concentration, what type of homeostasis needs to be established for a cell to survive?

11. What will happen if red blood cells are placed in water? Why does this happen?

On the right side of the webpage under Cell Function, click on "Active Transport."

12. What is active transport?

13. Why does the cell sometimes have to expend energy to move individual molecules across the cell membrane?

14. Which membrane molecules do most of the work in active transport?

15. Since these membrane proteins span the entire length of the lipid bilayer, what type of protein are they? (*hint*: see part II, question #3).

16. Membrane proteins are very _____, meaning that they are designed to move only one or two types of molecules or ions across the membrane.

17. What does it mean by proteins working against a concentration gradient?

18. Sketch a diagram of active transport, showing the phospholipids and the proteins in the membrane. Also make sure to represent that the molecule is moving from *low* to *high* concentration.

Part III: A Closer Look at Membrane Structure and Transport

Go to http://www.phschool.com/science/biology_place/biocoach/biomembrane1/intro.html

Concept 1: Membrane Structure

Membranes consist of a _____ _____ combined with a variety of _____ in a fluid _____ arrangement.

The surfaces of cell membranes are _____ (water-loving); the interiors are _____ (water-fearing).

Hydrophilic molecules tend to interact with _____ and each other. Hydrophobic molecules _____ interaction with water and tend to interact with other _____ molecules.

Concept 2: Osmosis

Osmosis (movement of _____ across membranes) depends on the relative _____ of solute molecules on either side of the _____.

The presence or absence of cell _____ influences how cells respond to osmotic fluctuations in their environment.

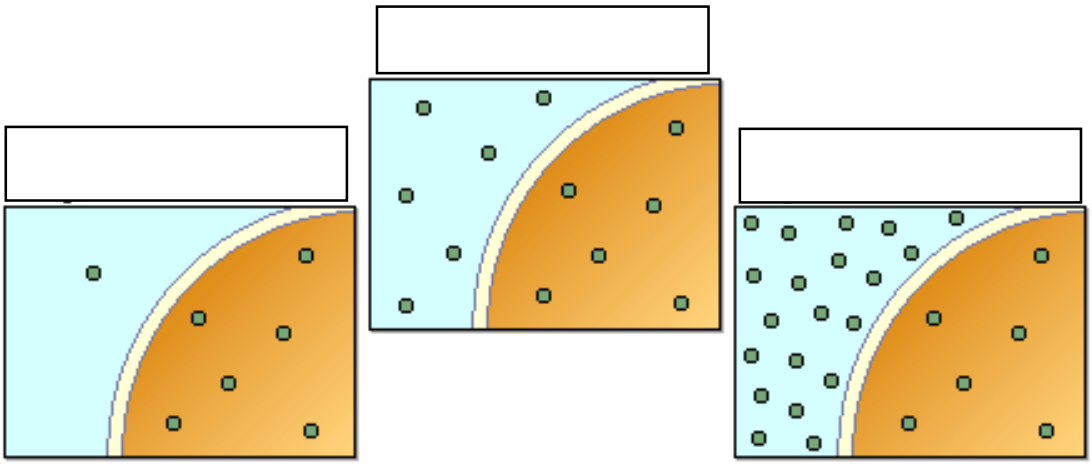
Click on "Review" in the upper right hand corner. It will open up a new screen.

Concept 2 Review: Isotonic, Hypotonic, and Hypertonic Solutions

Water moves readily across cell membranes through special protein-lined _____, and if the total concentration of all dissolved solutes is not

_____ on both sides, there will be net _____ of water molecules into or out of the cell. Whether there is net movement of water into or out of the cell and which _____ it moves depends on whether the cell's environment is isotonic, hypotonic, or hypertonic.

Label the three illustrations below as *isotonic*, *hypotonic*, or *hypertonic*.



Click "Next" on the bottom left side of the screen.

Concept 2 Review: Cells in Isotonic Solutions

When two environments are isotonic, the total concentration of dissolved solutes is the _____ in both of them.

When cells are in isotonic solution, movement of water out of the cell is exactly _____ by movement of water into the cell. A _____ solution of NaCl (saline) is isotonic to _____ cells.

Select "animate" to watch the movement of water molecules through protein channels in the cell membrane in an isotonic solution.

Make your own sketch of a cell in an isotonic solution:

Click “Next” on the bottom left side of the screen.

Concept 2 Review: Cells in Hypotonic Solutions

Hypotonic comes from the Greek “hypo,” meaning _____ and “tonos” meaning _____. In a hypotonic solution, the total concentration of all dissolved solute particles is _____ than that of another solution or less than that of a _____.

If concentrations of dissolved solutes are less _____ the cell than _____, the concentration of water outside is correspondingly greater. When a cell is exposed to such hypotonic solutions, there is net movement of water _____ the cell. Cells without cell _____ will swell and may _____(lyse) if excess water is not removed from the cell. Cells with cell walls often benefit from the _____ pressure that develops in hypotonic environments.

Select “animate” to watch the movement of water molecules across the cell in a hypotonic solution.

Make your own sketch of a cell in a hypotonic solution:

Select “A Closer Look” to see plant and animal cells in hypotonic environments on the bottom of the page.

Compare and contrast what happens when a plant cell and animal cell are placed in a hypotonic solution.

Click “Back to Review” and then select “Next” to view cells in hypertonic solutions.

Concept 2 Review: Cells in Hypertonic Solutions

Hypertonic comes from the Greek “hyper,” meaning _____, and “tonos,” meaning stretching. In a hypertonic solution, the total concentration of all dissolved solute particles is _____ than that of another solution, or greater than the concentration in a _____.

If concentrations of dissolved solutes are greater _____ the cell, the concentration of water outside is correspondingly _____. As a result, water inside the cell will flow _____ to attain equilibrium, causing the cell to _____. As cells lose water, they lose the ability to _____ or _____. Hypertonic environments, such as concentrated brines or _____, have been used for food preservation because microbial cells that would otherwise cause spoilage are _____ in these very hypertonic environments and are unable to function.

Select “animate” to watch the movement of water molecules across the cell in a hypertonic solution.

Make your own sketch of a cell in a hypertonic solution:

Select “A Closer Look” to see plant and animal cells in hypertonic environments on the bottom of the page.

Compare and contrast what happens when a plant cell and animal cell are placed in a hypertonic solution.

Close the review screen you are on to go back to the BioCoach Activity. You should still be on *Concept 2: Osmosis*. Click "Next Concept."

Concept 3: Selective Permeability of Membranes

Cell membranes are selectively permeable. Some solutes can cross the membrane _____, some cross with _____, and others do not cross at all.

A few lipophilic (lipid-loving) substances move freely across the cell membrane by _____ _____. Most small molecules or ions require the assistance of specific _____ _____ to transport them across the membrane. _____ molecules do not cross intact cell membranes, except in certain special cases.

Concept 4: Passive and Active Transport

Most biologically important solutes require _____ carriers to cross cell membranes, by a process of either _____ or _____ transport.

Active transport uses _____ to move a solute "uphill" against its gradient, whereas in facilitated diffusion, a solute moves _____ its concentration gradient and no _____ input is required.

In the illustration below, label which type of transport is shown: *facilitated diffusion* or *active transport*.