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



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).

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

**Part II: Membrane Transport**

On the right side of the webpage under Cell Structure, 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. Membrane proteins are very \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, meaning that they are designed to move only one or two types of molecules or ions across the membrane.

16. What does it mean by proteins working against a concentration gradient? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

17. 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](Go%20to%20http%3A/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.