Cell Membrane & Tonicity Worksheet

Composition of the Cell Membrane & Functions

The cell membrane is also called the _______________ membrane and is made of a phospholipid _____________. The phospholipids have a hydrophilic (water attracting) ____________ and two hydrophobic (water repelling) ____________. The head of a phospholipid is made of an alcohol and __________ group, while the tails are chains of __________. Phospholipids can move __________ and allow water and other __________ molecules to pass through into or out of the cell. This is known as simple __________ because it does not require __________ and the water or molecules are moving __________ the concentration gradient.

Another type of lipid in the cell membrane is ____________ that makes the membrane more fluid. Embedded in the phospholipid bilayer are ____________ that also aid in diffusion and in cell recognition. Proteins called ____________ proteins go all the way through the bilayer, while ____________ proteins are only on one side. Integral proteins are also called ____________ proteins. Large molecules like ____________ or carbohydrates use proteins to help move across cell membranes. Some of the membrane proteins have carbohydrate __________ attached to help cells in recognize each other and certain molecules.

List 4 functions of the cell or plasma membrane:

a. ________________________________
b. ________________________________
c. ________________________________
d. ________________________________

Correctly color code and identify the name for each part of the cell membrane.

<table>
<thead>
<tr>
<th>Letter</th>
<th>Name/Color</th>
<th>Letter</th>
<th>Name/Color</th>
</tr>
</thead>
<tbody>
<tr>
<td>______</td>
<td>Phospholipid bilayer (no color)</td>
<td>______</td>
<td>Peripheral protein (red)</td>
</tr>
<tr>
<td>______</td>
<td>Integral protein (pink)</td>
<td>______</td>
<td>Cholesterol (blue)</td>
</tr>
<tr>
<td>______</td>
<td>Fatty acid tails (orange)</td>
<td>______</td>
<td>Glycoprotein (green)</td>
</tr>
<tr>
<td>______</td>
<td>Phosphate heads (yellow)</td>
<td>______</td>
<td>Glycolipids (purple)</td>
</tr>
</tbody>
</table>

Match the cell membrane structure or its function with the correct letter from the cell membrane diagram.

<table>
<thead>
<tr>
<th>Letter</th>
<th>Structure/Function</th>
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</tr>
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<tbody>
<tr>
<td>______</td>
<td>Attracts water</td>
<td>______</td>
<td>Repels water</td>
</tr>
<tr>
<td>______</td>
<td>Helps maintain flexibility of membrane</td>
<td>______</td>
<td>Make up the bilayer</td>
</tr>
<tr>
<td>______</td>
<td>Involved in cell-to-cell recognition</td>
<td>______</td>
<td>Help transport certain materials across the cell membrane</td>
</tr>
</tbody>
</table>
Define osmosis. _____________________________________

In which direction does water move across membranes, up or down the concentration gradient?

Define these 3 terms:
a. isotonic- _______________________________________
b. hypertonic _______________________________________
c. hypotonic _______________________________________

*Use arrows* to show the direction of water movement into or out of each cell. *Color and label* the cell in an isotonic environment light blue, the hypotonic environment yellow, and the hypertonic environment light green.

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**Match the description or picture with the osmotic condition:**

A. Isotonic
   - solution with a lower solute concentration
   - solution in which the solute concentration is the same

B. Hypertonic
   - condition plant cells require
   - condition that animal cells require

C. Hypotonic
   - red blood cell bursts (cytolysis)
   - plant cell loses turgor pressure (Plasmolysis)
   - solution with a higher solute concentration
   - plant cell with good turgor pressure
   - solution with a high water concentration

**Label the tonicity for each solution (isotonic, hypotonic, or hypertonic):**

**Transport Requiring Energy**

What type of transport is represented by the following picture? _______________________

What energy is being used? ______________

In which direction (concentration gradient), is the movement occurring? ______________

Color the internal environment of the cell yellow.

*Color and Label* the transport proteins red and the substance being moved blue.
One type of active transport is called the __________________ pump which helps muscle cells contract. This pump uses ___________ to move ions ______________ the concentration gradient. The protein that is used to pump the ions through is called a __________________ protein and it changes its __________ to move the ions across the cell membrane.

**Label and color** the carrier proteins red and the ions green.

**TONICITY AND OSMOSIS**

**Part I – Fill in the blanks.**
A _______________________ is a fluid in which a substance is dissolved.
A _______________________ is a substance dissolved in a solvent.
A _______________________ is a combination of solute and solvent.
The process by which water diffuses across a membrane called _______________________.

**Part II – Look at the solutions illustrated above and fill in the blanks.**
1. Solution B is ______________________ to Solution A. This is because Solution B has a greater concentration of ______________ in it than does Solution A. Solution C has no solutes dissolved in it, therefore it is ______________________ to both Solutions A and B.

2. As a relative concentration of solutes in two solutions increases, of necessity the concentration of water in the same two solutions ______________. Solution A has a lower concentration of ______________ than does Solution C; Solution A is also hypertonic to Solution C.

3. If you wanted to make Solution A isotonic to Solution B, you could add water to Solution ____ or you could add solute to Solution ____. If you took all three solutions, put them into a large container and mixed them thoroughly, then redistributed the solution among three containers, Solution A would be __________ to Solution B. Solution A would also be ______________ to Solution C, and Solution C would be ______ to Solution B.

**Part III – Look at the solutions and cells illustrated above and fill in the blanks.**
1. Because the cytoplasms of the plant and the animal cell have equal concentrations of solutes, we can say their cytoplasms are ______________ to each other. If we put both the plant and the animal cells into
**Solution A**, we would expect no change in the cells, because **Solution A** is __________ to the cytoplasm of each cell.

2. Let’s put both cells into **Solution B**. Because **Solution B** is hypertonic to the cytoplasms of the cells, we would expect water to ______ the cells through the process of __________. This would result in the cytoplasm of both cells shrinking.

3. Now we’ll put both the plant and animal cell into **Solution C**, which, because it contains no solutes at all, is ______________ to the cytoplasm of both cells. ______________ will enter both cells through osmosis. The animal cell is likely to ____________, unfortunately. The plant cell, however, is protected from this because of the presence of its _______ _______.

Refer to the U-tube pictures above when answering the questions below.

1. Why did the number of water molecules on each side of the membrane change, whereas the number of sugar molecules stayed the same?

2. How does the plasma membrane of a cell compare with the membrane in the U-shaped tube?

3. Explain the behavior of water molecules in the isotonic solution.

4. Does osmosis occur if a cell is placed in an isotonic solution?

5. Why does water enter a cell that is placed in a hypotonic solution?

6. What happens to the pressure inside a cell that is placed in a hypertonic solution?

7. What can happen to animal cells when placed in a hypotonic solution? Explain.

8. What causes a plant to wilt?