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

**AP Unit 2 Review Packet: Cell Structure and Transport**

Ms. Ottolini (2012-2013)

**Textbook Chapters:**  6 (A Tour of the Cell), 7 (Cell Membrane and Transport)

**Standards and Measures of Success:** see the back of the Unit 2 calendar for a unit checklist

**Review Resources:** Notes (Unit 2: Parts A and B), Cell Organelle Flash Cards, Prokaryotic vs. Eukaryotic Cells One Page Paper, Endomembrane System Concept Map/ Flow Chart

**Test Format:** approximately 60 multiple choice questions and one long essay question (Hint:

**Key Vocabulary:**

|  |  |  |
| --- | --- | --- |
| Cell Theory  Light Microscope  Transmission Electron Microscope  Scanning Electron Microscope  Cell Fractionation  Prokaryotic Cells  Eukaryotic Cells  Nuclear Envelope  Nuclear Pores  Nuclear Lamina  Chromatin  Chromosomes  Nucleolus  Ribosomal RNA  Ribosomes (Free vs. Bound)  Rough ER  Smooth ER  Secretory Proteins  Golgi Apparatus (cis, trans, cisternae)  Lysosomes  Hydrolytic Enzymes  Apoptosis  Vacuole  Tonoplast  Peroxysomes  Catalase  Endomembrane System | Mitochondria  Cristae  Matrix  Cell Respiration  Chloroplast  Grana  Stroma  Thylakoid  Endosymbiont Theory  Centrioles  Centrosome  Cytoskeleton  Tubulin Microtubules  Actin Microfilaments  Intermediate Filaments  Motor Proteins  Cilia  Flagella  Cell Wall  Cellulose  Plasmodesmata  Extracellular Matrix  Tight Junctions  Desmosomes  Gap Junctions  Phospholipid Bilayer  Fluid Mosaic Model  Hydrophilic Heads  Hydrophobic Tails | Integral Proteins  Peripheral Proteins  Glycolipid  Glycoprotein  Cholesterol  Semi Permeable  Selectively Permeable  Channel Proteins  Protein Pumps  Passive Transport  Active Transport  Diffusion  Facilitated Diffusion  Osmosis  Isotonic  Hypertonic  Hypotonic  Osmoregulation  Contractile Vacuole  Lysis  Turgid  Flaccid  Plasmolyzed  Sodium-Potassium Pump  Endocytosis  Phagocytosis  Pinocytosis  Receptor-Mediated Endocytosis  Exocytosis  Surface Area / Volume Ratio  Microvilli |

**Sample Questions by Topic**

***Cell Structure and Function***

1. List the similarities and differences between prokaryotic and eukaryotic cells in the table given below

|  |  |
| --- | --- |
| **Similarities** | **Differences** |
|  |  |

1. Explain the theory of endosymbiosis and provide two pieces of evidence to support that theory.
2. Which organelles are involved in the endomembrane system? How do these organelles work to create and secrete proteins from the cell?
3. The following organelles are involved in either the synthesis or secretion of macromolecules. For each organelle, indicate whether it is involved in synthesis or secretion by placing a check in the appropriate column. Also, indicate what type of molecule is created or secreted by this organelle.

|  |  |  |  |
| --- | --- | --- | --- |
| **Organelle** | **Synthesis?** | **Secretion?** | **Type of Molecule** |
| Ribosome |  |  |  |
| Rough ER |  |  |  |
| Golgi Apparatus |  |  |  |
| Smooth ER |  |  |  |

1. What functions do lysosomes perform in the cell? In which type of cell (animal or plant) are lysosomes found?
2. The nuclear membrane and rough ER are connected to one another. Why might these two structures be connected? (Hint: consider the function of the nucleus and Rough ER)
3. Which organelles in the cell contain or are made of nucleic acids (either DNA or RNA)? Circle the appropriate organelles from the list below.

Golgi Apparatus, Lysosome, Peroxisome, Mitochondrion, Smooth ER, Ribosome, Chloroplast, Vacuole, Nucleus

1. How are the functions of the smooth and rough ER different?
2. List the organelles that are ONLY found in a plant or animal cell

|  |  |
| --- | --- |
| **Plant** | **Animal** |
|  |  |

1. Proteins that are going to be used in the cytosol are typically made in the

**free ribosomes / bound ribosomes** (circle one)

Proteins that are going to be secreted from the cell are typically made in the

**free ribosomes / bound ribosomes** (circle one)

1. Where are chromosomes typically found in a eukaryotic cell?

Where are chromosomes typically found in a prokaryotic cell?

1. What is the function of the pores in the nuclear envelope? What types of substances do they allow to pass in and out of the nucleus?
2. List similarities and differences between mitochondria and chloroplasts.

|  |  |
| --- | --- |
| **Similarities** | **Differences** |
|  |  |

Which organelle was originally aerobic (oxygen consuming) bacteria? \_\_\_\_\_\_\_\_\_\_\_\_\_\_

Which organelle was originally photosynthetic bacteria? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Which type of microscope would a scientist use to study the internal structures of cells?

Which type of microscope would as scientist use to study the external (3D) features of cells?

1. How are plant cells able to have larger volumes than animal cells but still transport materials efficiently into and out of the cell? (Hint: it has to do with the vacuole!)
2. Why is there a limit to cell size?
3. Explain how the different sides (cis vs. trans) of the golgi apparatus help it to perform its function in the endomembrane system.
4. Describe the basic structure and function of cilia and flagella. Make sure to distinguish between the two structures and discuss microtubule arrangement.
5. What are the functions of the cytoskeleton in eukaryotic cells?
6. What are plant cells walls composed of? How is this different from the molecular composition of the cytoskeletal fibers?
7. What are the structures/functions of the following four types of intercellular junctions. In what types of cells are these junctions found?

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Structure**  (draw a picture if necessary) | **Function** | **Cell Type** |
| Tight Junctions |  |  |  |
| Desmosomes |  |  |  |
| Gap Junctions |  |  |  |
| Plasmodesmata |  |  |  |

***Cell Membrane and Transport***

22. Which types of molecules (hydrophobic, hydrophilic, small, large) can diffuse across the lipid bilayer? What types of molecules can diffuse across the lipid bilayer? Which types of molecules cannot?

23. How might a cell “eat” another cell? Would it use active or passive transport and which type specifically?

24. How are phagocytosis and pinocytosis different?

25. How is receptor-mediated endocytosis different from phagocytosis and pinocytosis?

26. How is facilitated diffusion different from and similar to simple diffusion?

27. Osmosis is a rather slow and inefficient process. What structures have cell membranes evolved to move water quickly?

28. Explain the meaning of the term fluid mosaic model with regard to plasma membrane structure.

29. What is the role of carbohydrate chains in glycoproteins or glycolipids on the outer surface of the cell membrane?

30. How might cell membranes of organisms in a cold environment adapt to resist solidifying?

31. Draw a cell membrane and label the following parts: phospholipid head, phospholipid tail, glycoprotein, glycolipid, integral protein, peripheral protein, extracellular matrix fibers, cytoskeletal fibers

32. During osmosis, water moves from a…

\_\_\_\_\_\_ (high or low) water concentration 🡪 \_\_\_\_\_ (high or low) water concentration

\_\_\_\_\_\_ (high or low) solute concentration 🡪 \_\_\_\_\_ (high or low) solution concentration

\_\_\_\_\_\_ (high or low) water potential 🡪 \_\_\_\_\_ (high or low) water potential

\_\_\_\_\_\_ (up or down) water’s concentration gradient

33. What happens to an **animal cell** with a 0.25 M NaCl concentration that is placed in a 0.50 NaCl solution? Is this solution hypertonic, isotonic, or hypotonic to the animal cell? Use specific vocabulary in your answer.

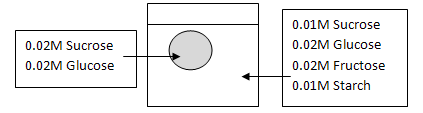
What happens to an **animal cell** with a 0.8 M NaCL concentration that is placed in a 0.1 M NaCl solution? Is this solution hypertonic, isotonic, or hypotonic to the animal cell? Use specific vocabulary in your answer.

What happens to a **plant cell** with a 0.25 M NaCl concentration that is placed in a 0.50 NaCl solution? Is this solution hypertonic, isotonic, or hypotonic to the animal cell? Use specific vocabulary in your answer.

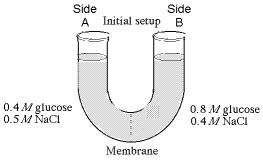
What happens to a **plant cell** with a 0.8 M NaCL concentration that is placed in a 0.1 M NaCl solution? Is this solution hypertonic, isotonic, or hypotonic to the animal cell? Use specific vocabulary in your answer.

34. A selectively permeable dialyzing membrane containing specific concentrations of two solutions is immersed in a beaker containing four different solutions. The membrane is permeable to simple sugars but impermeable to disaccharides and polysaccharides.

Which solute will diffuse into the cell?



Is the solution outside the cell hypertonic, hypotonic, or isotonic to the solution inside the cell (see diagram on previous page)?

35. The solutions in the arms of a U-tube are separated at the bottom of the tube by a selectively permeable membrane. The membrane is permeable to sodium chloride but not to glucose. Side A is filled with a solution of 0.9 *M* glucose and 0.3 *M* sodium chloride (NaCl), and side B is filled with a solution containing 0.5 *M* glucose and 0.4 *M* sodium chloride. Initially, the volume in both arms is the same.

0.5 M glucose

0.4 M NaCl

0.9 M glucose

0.3 M NaCl

Side A is considered hypertonic / hypotonic / isotonic (circle one) to Side B

If you looked at this system after three days, what would you see?

36. A cell is in equilibrium with its surroundings. The molarity of the surrounding solution is 0.5M. To convert molarity to solute potential in MPa, use the formula for solute potential:

**(ψS) = – iCRT** where

i = ionization constant (assume that is 1)

C=molar concentration (given above)

R = pressure constant (R=0.00831 liter MPa/mole oK)

T = temperature in oK (room temp is about 293oK)

Also, keep in mind the equation for water potential, which is **ψ = ψP + ψS**

1. Calculate the solute potential of the surrounding solution.
2. Find the water potential of the surrounding solution.
3. What is the water potential of the cytoplasm of the cell?
4. **True, false, or not enough information**: The cell’s molar concentration is equal to the molar concentration of the surrounding solution. (explain your answer)