**Cell Test Review/Study Sheet** Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Block \_\_\_ # \_\_\_\_

**Cells and Cell Transport**

**Vocabulary**

Cell theory

Cell size (volume vs surface area)

cell

tissue

cell membrane (plasma membrane)

Cell wall

Cytoplasm; cytosol

Nucleus

Nucleoid region

ribosome

mitochondrion

chloroplast

lysosome

centriole

vacuole

vesicle

Golgi apparatus

Rough ER

Smooth ER

cytoskeleton

protein synthesis

active transport

passive transport

carrier (transport) proteins

concentration gradient

diffusion

facilitated diffusion

osmosis

Tonicity (types)

endocytosis

phagocytosis

pinocytosis

exocytosis

semipermeable

phospholipid

proteins (transport/channels)

enzymes

cholesterol

Glycoproteins & Glycolipids

Intracellular vs extracellular

organelle

pumps for active transport (ion or molecular)

unicellular

multicellular

prokaryotic & eukaryotic

**What is the Cell Theory?**

**a-**

**b-**

**c-**

**Differences between Prokaryotic vs Eukaryotic Cells**

1. **Prokaryotic Cells:**
2. **Eukaryotic Cells:**
3. **Sketch and label these cells:**

Prokaryotic

Eukaryotic

1. Complete the Venn Diagram comparing prokaryotic and eukaryotic cells.

 Prokaryotic Eukaryotic

**Directions**: Write a **P** if the statement refers to Prokaryotes and an **E** if the statement

refers to Eukaryotes, if the statement refers to both Prokaryotes and Eukaryotes write a **B** on the line.

\_\_\_ 1. This type of cell does not have membrane bound organelles.

\_\_\_ 2. This type of cell contains DNA.

\_\_\_ 3. This type of cell contains organelles.

\_\_\_ 4. A bacterium is an example of this type of cell.

\_\_\_ 5. This type of cell contains a nucleus.

**Cell Structures & Functions: Eukaryotic**

All cells are enclosed by a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Inside this region is the semi-solid gel like substance called the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Within this region are organized structures that perform specific functions. These structures are called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Please Note: The letters next to the structure of the cell indicates where the structure if found**

**A =animal cells**

**P = plant cells.**

**AP = both plant and animal**

**(A, P) Cell Membrane**- surrounds the cell. It plays an active role in determining which substances enter and exit the cell. Some substances can pass freely through the cell membrane and others cannot, the membrane is said to be selectively permeable, or semipermeable. The cell membrane is composed primarily of lipids (phospholipids), proteins, and carbohydrates.



**(A, P) Nucleus**- control center for all cell functions. Within the nucleus are chromosomes and at least one nucleolus. The **nucleolus is a site for \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**.

**(A, P) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**- the material in the cell outside the nucleus. It consists mainly of water. Within this are the various organelles of the cell. This provides the environment in which the organelles carry on the life processes of the cell.

**(A, P) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**- are found in the cytoplasm. Most stages of cellular respiration (breaking down glucose) occur here. The energy released during respiration is stored in the form of high-energy chemical bonds in molecules of ATP.

**(P) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (a type of plastid)**-contain green pigment called chlorophyll, which carries on the process of photosynthesis.

**Mitochondria & Chloroplast-Developed from prokaryotic cells? WHAT?!?!**

Check out this really good explanation…relating to endosymbiotic theory <http://www.youtube.com/watch?v=fAjev01mDZM>

**Related questions:**

1. Why are mitochondria and chloroplasts unique?

 **(A, P) Ribosomes**- are small, dense granules (look like tiny circles on the diagrams) found free in the cytoplasm and on the rough endoplasmic reticulum. Ribosomes are composed mainly of RNA (rRNA). They are the centers of protein synthesis in the cell and consists of large and small subunits that join with mRNA and tRNA to make proteins from directions provided by \_\_\_\_\_\_\_\_\_\_\_\_ (a molecule contained in the nucleus) .



**(A, P) Endoplasmic reticulum**-is a membrane-bound system of channels or tubes through which materials are transported within the cell. The membranes of the ER may also serve as sites of biochemical reactions. There are two types smooth and rough.

 **Rough ER**- has \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and is found mainly in cells involved in protein synthesis. **Smooth ER** which has no ribosomes, is found mainly in cells involved in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. The ER forms vesicles for transport of proteins to other areas within the cell or to the golgi apparatus.

**(A, P)** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is made up of a series of membrane-enclosed sacs, and it is usually found near the nucleus. This organelle is associated with the sorting and packaging of various cellular products. Produces transport vesicles (packages that move material inside or export material outside the cell). The active transport process that transports and releases materials outside the cell is called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**EXAMINE THE DIAGRAM BELOW, EXPLAIN THE PATH A NEWLY FORMED POLYPEPTIDE/PROTEIN LEAVING A RIBOSOME MAY TAKE AS IT IS MODIFIED OR PACKAGED BEFORE USE WITHIN THE CELL OR OUTSIDE THE CELL:**

1. **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**- are “packages” or sacs, of digestive enzymes. They keep the enzymes separated from the rest of the cell contents until they

 are needed.

**(A, P) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**: are membrane-enclosed structures that are generally filled with water containing various dissolved substances. In animal cells they are usually small, and in \_\_\_\_\_\_\_\_\_\_\_ they are usually large. The **Turgor pressure** created by large water-filled vacuoles pushing against cell walls in plant cells helps to maintain the rigid structure of the plant.

**(A) Centrioles**-are small organelles found just outside the nucleus in animal cells. **Centrioles**, assist with separating chromosomes during animal\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

centrioless

**(P) \_\_\_\_\_\_\_ \_\_\_\_\_\_\_**- structure found outside the cell membrane of plant cells. It’s made up mostly of cellulose (polysaccharide), and it provides support for the cell.

 **(A, P) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_-** is a filamentous network of proteins that are associated with the processes that maintain and change cell shape and produce cell movements in animal and bacteria cells. In plants, it is responsible for maintaining structures within the plant cell, rather than whole cell movement. **The main types of filaments that** make it up are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (threadlike proteins) and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (tubes made of protein).

1. *Use the following structure letters to label the structures indicated in the eukaryotic plant and animal cells.*

Plant Cell

1. Cell membrane



1. Nucleus
2. Nucleolus
3. Chromosome
4. Cell Wall

AB. Centriole

Animal Cell

AC. Mitochondria

AD. Lysosome

AE. Endoplasmic reticulum

BC. Golgi Apparatus

BD. Vacuole

BE. Chloroplast

1. *Fill in the names of the structures whose functions are listed below. Use the list of structures above for help.*

|  |  |
| --- | --- |
| **Structure** | **Function** |
|  | Cellular Respiration  |
|  | Protein Synthesis |
|  | Contains the hereditary information |
|  | Storage of water, undigested food, and/or waste |
|  | Active in movement of the chromosomes during cell division |
|  | Storage of digestive enzymes |
|  | Transport within the cytoplasm |
|  | Packages secretions |



**Phospholipid bilayer:**

The cell membrane is made of a lipid bilayer (two layers of phospholipids). Phospholipids

have two parts, a polar head and a non-polar tail. Phospholipids are arranged with tails

facing \_\_\_\_\_\_\_\_\_\_\_ of the membrane & \_\_\_\_\_\_\_\_\_\_\_\_\_facing out. The bilayer is flexible

and if disturbed will reorient itself given the polar nature of the phospholipids.

* *Watch this animation on the bilayer to see it in action.* [*Cell membrane model (fluid mosaic)*](http://www.youtube.com/watch?v=Qqsf_UJcfBc)

**Cellular Transport**

The cell membrane is semipermeable, some substances can pass through it freely,

while others cannot. The movement of substances that can pass freely through the membrane depends on the concentration gradient of the substance, size of the substance and polarity of the substance.

1. **Passive Transport**
	* Does not use energy
	* Moves from a high concentration to a low concentration

Examples:

* **Diffusion**: The movement of particles from regions of \_\_\_\_\_\_\_concentration to regions of \_\_\_\_\_\_\_ concentration
* **Facilitated Diffusion**: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ help ions and large, polar molecules diffuse through the membrane
* **Osmosis:** The diffusion of water across a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ membrane.



 **Osmotic conditions:**

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_– concentration of solute is the same on both sides of the membrane (dynamic equilibrium)

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**– the sol’n with a greater high concentration of solute & low H2O

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** – the solution with lesser concentration of solute & high H20

Cell shrinks

Cell stays same

Types of Solutions

1. **Active Transport**
	* Requires \_\_\_\_\_\_\_\_\_\_(usually from ATP)
	* Moves from a \_\_\_\_\_\_\_\_\_concentration to a \_\_\_\_\_\_\_\_ concentration

Examples:

* **Protein Pumps:** an integral protein that transports ions and small molecules against their concentration gradients (ex. sodium potassium ion pump)
* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**: The movement of a large substance **into** a cell by means of a vesicle
* **\_\_\_\_\_\_\_\_\_\_\_\_**: The movement of material **out** of a cell by means of a vesicle

 A

 B

1. **Circle the diagram** letter that shows **Endocytosis**? A or B
2. **Circle the diagram** letter that shows **Exocytosis**? A or B

**Sodium-potassium pump**: One of the most important carrier proteins in animal cells. In nerve cells the pump is used to generate gradients of both sodium and potassium ions. These gradients are used to propagate electrical signals that travel along nerves.

* *Watch this cool animation on the sodium-potassium pump, and take quiz*

<http://highered.mcgraw-hill.com/sites/9834092339/student_view0/chapter38/sodium-potassium_exchange_pump.html>

1. \_\_\_ 2. \_\_\_\_ 3. \_\_\_\_ 4. \_\_\_\_ 5. \_\_\_\_

**More Questions!**

1. What is passive transport?
2. The paramecium is a fresh water protozoan. The salt content of its cytoplasm is greater than that of the surrounding medium (solution).
3. Does water tend to enter or leave the paramecium? Is this process passive or active transport?
4. How does the paramecium expel water? Is this process passive or active transport? Explain. *(Possible extra credit question)*
5. Where does the energy for active transport come from and why is energy required for active transport?

**Practice Questions:**

1. Using a microscope, a student observes a small, green organelle in a plant cell. Which energy transformation **most likely** occurs first within the observed organelle?
	1. light energy to chemical energy
	2. heat to electrical
	3. chemical to chemical
2. Carbon dioxide and oxygen are molecules that can move freely across a plasma membrane. What determines the direction that carbon dioxide and oxygen molecules move?
	1. orientation of cholesterol in the plasma membrane
	2. they will move with the concentration gradient across the plasma membrane
	3. configuration of phospholipids in the plasma membrane
	4. location of receptors on the surface of the plasma membrane
3. A sodium-potassium pump within a cell membrane requires energy to move sodium and potassium ions into or out of a cell. The movement of glucose into or out of a cell does not require energy. Which statement **best** describes the movement of these materials across a cell membrane?
	1. Sodium and potassium ions move by active transport, and glucose moves by osmosis.
	2. Sodium and potassium ions move by active transport, and glucose moves by facilitated diffusion.
	3. Sodium and potassium ions move by facilitated diffusion, and glucose moves by osmosis.
	4. Sodium and potassium ions move by facilitated diffusion, and glucose moves by active transport.
4. The rough endoplasmic reticulum and Golgi apparatus work together in eukaryotic cells. What is one way that the rough endoplasmic reticulum assists the Golgi apparatus?
	1. It assembles nucleic acids from monomers.
	2. It breaks down old, damaged macromolecules.
	3. It packages new protein molecules into vesicles for transport to the Golgi.
	4. It determines which protein molecules to synthesize.

*In many eukaryotic cells, DNA stored in the nucleus is transcribed into messenger RNA. The mRNA is then transported into the cytoplasm where ribosomes assist in their translation into proteins. Finally, these proteins are packaged and sorted in the Golgi apparatus for use in other parts of the cell or in preparation for secretion into other cells.*

1. Which of the following statements is supported by this description?
2. Various organelles within a cell interact with each other to carry out life processes.
3. Organelles within a cell act independently of each other at all times & don’t interact.
4. Some organelles are more important than other organelles within a cell.
5. Only up to three organelles may interact with each other at any given moment in time.
6. The cell membrane serves many functions. One of the cell membrane's functions is to help the cell maintain homeostasis. Which of the following statements best supports this claim?
7. The cell membrane contains a polar region and a nonpolar region.
8. The cell membrane contains proteins.
9. The cell membrane contains phospholipids.
10. The cell membrane regulates what goes in and out of the cell.

*In order for nerve cells and muscle cells to function properly, they require a high concentration of potassium ions inside the cells and a high concentration of sodium ions outside the cells.*

*To maintain this condition, cells utilize sodium-potassium pumps embedded within their cellular membranes to move the ions* ***against their concentration gradients****.*



1. Since sodium-potassium pumps require an input of energy to operate, they are an example of...
	1. passive transport.
	2. facilitated diffusion.
	3. filtration.
	4. active transport.
2. Most organisms are prokaryotic or eukaryotic. What is the main difference?
	1. Eukaryotes are living organisms whereas prokaryotes include some nonliving matter.
	2. Prokaryotes do not possess any means of locomotion and are thus unable to move.
	3. Prokaryotes do not possess a nucleus or any other membrane-bound organelles.
	4. Eukaryotes are found in all of the six major taxonomic kingdoms.

9.



*When a person inhales, oxygen fills tiny air sacs in the person's lungs. Next, the oxygen moves from these air sacs into small blood vessels that line the lungs, and then it moves into the bloodstream so that it can be transported around the body. Oxygen moves by random molecular motion from the air sacs of the lungs to the blood vessels because the concentration of oxygen in the air sacs is higher than the concentration of oxygen in the blood vessels.*

1. This movement of oxygen molecules from an area of higher concentration to an area of lower concentration is known as \_\_\_\_\_\_\_.
2. diffusion
3. osmosis
4. respiration
5. photosynthesis
6. Energy conversion within an animal cell would be severely limited by removal of the cell's
7. lysosomes.
8. plastids.
9. chloroplasts.
10. mitochondria.
11. Which do the cells of an E. coli bacterium and an elephant have in common?
12. Ribosomes to assemble proteins
13. Mitochondria to produce proteins
14. Chloroplasts found around the vacuole
15. Chromosomes located in the lysosome
16. Which is **not** an example of passive transport?
17. Carbon dioxide in a capillary crosses the alveoli membranes of the lungs.
18. Oxygen dissolved in the blood crosses the phospholipid portion of the membrane of a red blood cell
19. Glucose molecules are transported by a carrier protein until its concentration on

both sides of the membrane is equal

1. Sodium ions move from a lower to higher concentration through a protein channel until there is a higher concentration in extracellular fluid than the cytoplasm
2. What is one way that facilitated diffusion differs from simple diffusion?
3. Facilitated diffusion requires energy input
4. Facilitated diffusion requires membrane proteins
5. Facilitated diffusion requires a concentration gradient
6. Facilitated diffusion requires small, nonpolar molecules.
7. Which of the following is **not** involved in the transport of molecules by facilitated diffusion?
8. ATP
9. phospholipids
10. protein channels
11. concentration gradient

**Open-ended Question:**

1. Lysosomes contain enzymes. Explain the importance of enzymes in living organisms and at least 4 characteristics of all enzymes. **(\**expect to see this on the test*)**
2. Materials in cells may be transported by passive or active processes, both of which may involve concentration gradients, the phospholipid bilayer, and membrane proteins.

**Part A:** Compare the role of concentration gradients in passive and active transport.

**Part B:** Compare the role of the phospholipid bilayer in passive and active transport.

**Part C:** Compare the role of membrane proteins in passive and active transport.

1. **Go over the Osmosis ‘Gummy Bear’ lab!**
	1. At least one bear gained mass. What kind of solution was it in, hypotonic or hypertonic?
	2. Some bears lost mass. What kind of sol’n were they in? \_\_\_\_\_\_\_\_\_\_\_\_\_\_ Did the one that lost the most mass come from a more concentrated solution or less concentrated?