

Test 4 Study Guide: Cell Transport and Division

Date of Test: February 15 (3rd block) and 16 (4th, 6th, and 8th block)

SOL: BIO.3d, e; 5a

Online Resources:

- www.solpass.org/high.html (practice BIO SOL Review 9, 12)
- www.bozemanscience.com/biology-main-page/ (Cell Membranes, Osmosis Demo, The Cell Membrane, Transport Across the Cell Membranes, Water Potential, Why Are Cells Small, Mitosis, Phases of Mitosis, Meiosis, Cell Division, Diploid vs Haploid, Cancer – What is it?)

Cell Membrane Structure and Function

- **Describe how the selective permeability of the cell membrane affects the life of a cell.**
 - The **fluid mosaic model** of a membrane emphasizes the arrangement and function of a **bilayer of phospholipids, transport proteins, and cholesterol**.
- **Describe processes associated with movement across the membrane for diffusion, facilitated diffusion, osmosis, and active transport.**
 - **Homeostasis** of a cell is maintained by the **plasma membrane** comprised of a variety of organic molecules. The membrane controls the movement of material in and out of the cell, communication between cells, and the recognition of cells to facilitate multiple metabolic functions.
 - **Diffusion** occurs in cells when substances (oxygen, carbon dioxide, salts, sugars, amino acids) that are dissolved in water move from an area of higher **concentration** to an area of lower concentration.
 - **Facilitated diffusion** occurs in cells when larger substances are moved from an area of higher concentration to an area of lower concentration with the assistance of a **carrier protein** without the use of energy.
 - **Active transport** refers to the movement of solid or liquid particles into and out of a cell with an input of energy.
- **Describe the relationship between a cell's external solute concentration and its effect on the cell's internal solute concentration.**
 - **Osmosis** refers to the movement of water molecules through a **semi-permeable** membrane from an area of greater water concentration or pressure (lower **solute** concentration) to an area of lesser water concentration or pressure (higher solute concentration).

Cell Surface Area : Volume Ratio

- **Compare the efficiency of the ability of a cell to transport material based on surface area to volume ratios (SA:V).**
 - **As cells increase in size, surface area to volume ratios decrease**, making cells unable to obtain nutrients or remove wastes. To reduce the effects of this, cells divide to stay small or change shape to increase surface area or reduce volume.
 - **SA:V ratio should be high so diffusion will be fast**
 - **Homeostasis** of a cell is maintained by the plasma membrane comprised of a variety of organic molecules. The membrane controls the movement of material in and out of the cell, communication between cells, and the recognition of cells to facilitate multiple metabolic functions.

Cell Specialization

- **Describe the importance of cell specialization in the development of multicellular organisms.**
 - The many body cells of an organism can be **specialized** to perform **different functions**, even though they are all **descended from a single cell** and contain **essentially the same genetic information**.

Cell Division

- Create a diagram to model the stages of mitosis and explain the processes occurring at each stage.
- Describe the importance of cell specialization in the development of multicellular organisms.
 - All living cells come from other living cells. A typical cell goes through a process of growth, development, and reproduction called the **cell cycle**.
 - **Interphase (Gap 1, Synthesis, Gap 2); Mitosis (Prophase, Metaphase, Anaphase, Telophase); Cytokinesis**
 - **Mitosis** produces two **genetically identical, diploid cells**. During mitosis, the **nucleus** of the cell divides, forming two nuclei with identical genetic information. Mitosis is referred to in the following stages: **prophase, metaphase, anaphase, and telophase**.
 - **Mitosis** refers to division of the **nuclear material**. **Cytokinesis** is the division of the **cytoplasm** and organelles.
 - The many body cells of an organism can be **specialized** to perform different functions, even though they are all descended from a single cell and contain essentially the same genetic information.

Meiosis and Sexual Reproduction

- Create a diagram to model the stages of meiosis and explain the processes occurring at each stage.
 - Prophase 1 (**Crossing Over** of homologous chromosomes)
 - Metaphase 1 (**Independent Assortment** of homologous chromosomes)
 - Anaphase 1 (**Segregation** of homologous chromosomes)
 - Telophase 1 (1st cell division)
 - Prophase 2, Metaphase 2, Anaphase 2 (Separation of sister chromatids), Telophase 2 (2nd cell division)
- Compare and contrast the process of mitosis and meiosis and determine under which conditions each process will occur.
 - Many organisms are capable of combining genetic information from two parents to produce offspring.
 - **Sex cells** are produced through **meiosis**. This allows **sexually reproducing** organisms to produce **genetically differing offspring**, and **maintain their number of chromosomes**.
 - Meiosis occurs in sexual reproduction when a **diploid germ cell** produces **four haploid daughter cells** that can mature to become **gametes (sperm or egg)**.
 - The **sorting and recombination** of genes in sexual reproduction results in a great variety of gene combinations in the offspring of any two parents.

Parents: By signing below, you indicate that you are aware of the upcoming test. To the best of your knowledge, your child has prepared for this test by carefully studying materials from class, using the online resources listed, and/or reading the textbook, as well as completing all homework assignments related to this topic. (5 bonus points)

Child's Name (Print) _____

Parent's Signature _____ Date _____