

Test 3 Study Guide: Photosynthesis, Respiration, and the Cell Membrane

Test Dates: December 13 (1st and 7th block) and 12 (6th block)

SOL: BIO.2d, 3d-e

Related Notes

- Photosynthesis
- Respiration
- Cell Membrane Structure
- Cell Membrane Transport
- Cell Membrane Summary
- Osmosis
- SA:V Ratio (Why Cells Are Small)

Related Assignments

- Photosynthesis Foldable
- Respiration Foldable
- Photosynthesis & Respiration Foldable
- Cell Membrane Mini Poster
- Membrane Transport Foldable
- Osmosis Foldable
- Photosynthesis Gizmo
- Energy Cycle Gizmo
- Osmosis Gizmo
- Spinach Lab
- Pea Germination Lab
- Surface Area : Volume Activity

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**

Cellular Respiration

- **Recognize the equation for cell respiration and identify the reactants and products.**
- **Describe the role of ATP in the storage and release of chemical energy in the cell.**
 - The breakdown of nutrient molecules enables all cells to store **energy** in specific chemicals that are used to carry out the life functions of the cell.
 - During **cell respiration**, eukaryotic cells "burn" organic molecules with **oxygen** in the **mitochondria**, which releases energy in the form of **ATP**, carbon dioxide, and water.
 - Cells release the chemical energy stored in the products of **photosynthesis (glucose)**. This energy is transported within the cell in the form of ATP. When cells need energy to do work, certain enzymes release the energy stored in the chemical bonds in ATP.

Photosynthesis

- **Explain how light is the initial source of energy for most communities.**
 - Plant cells and many microorganisms use **solar energy** to combine molecules of carbon dioxide and water into complex, energy-rich organic compounds and release oxygen into the environment.
- **Recognize the equations for photosynthesis and respiration and identify the reactants and products.**
 - The process of **photosynthesis** provides a vital connection between the sun and the energy needs of living systems. During photosynthesis, cells trap energy from sunlight with **chlorophyll**, found in **chloroplasts**, and use the energy, carbon dioxide, and water to produce energy-rich organic molecules (**glucose**) and oxygen. Photosynthesis involves an energy conversion in which **light energy** is converted to **chemical energy** in specialized cells. These cells are found in **autotrophs** such as **plants** and some **protists**.
- **Explain the interrelatedness of photosynthesis and cell respiration.**
 - Photosynthesis and cell respiration are complementary processes for cycling carbon dioxide and oxygen as well as transferring energy in ecosystems

Name _____ Block _____ Date _____

Test 3 Study Guide: Photosynthesis, Respiration, and the Cell Membrane

Part 1 – Photosynthesis and Cell Respiration

1. Write the chemical equation for photosynthesis.

2. Describe or define each of the following terms:

- Chloroplast _____
- Chlorophyll _____

3. Write the chemical equation for aerobic cellular respiration.

4. Complete the chart below:

Description	Process	ATP Production	Examples
Respiration that requires oxygen			N/A
Respiration that does not require oxygen			

5. Describe the role of ATP in the cell: _____

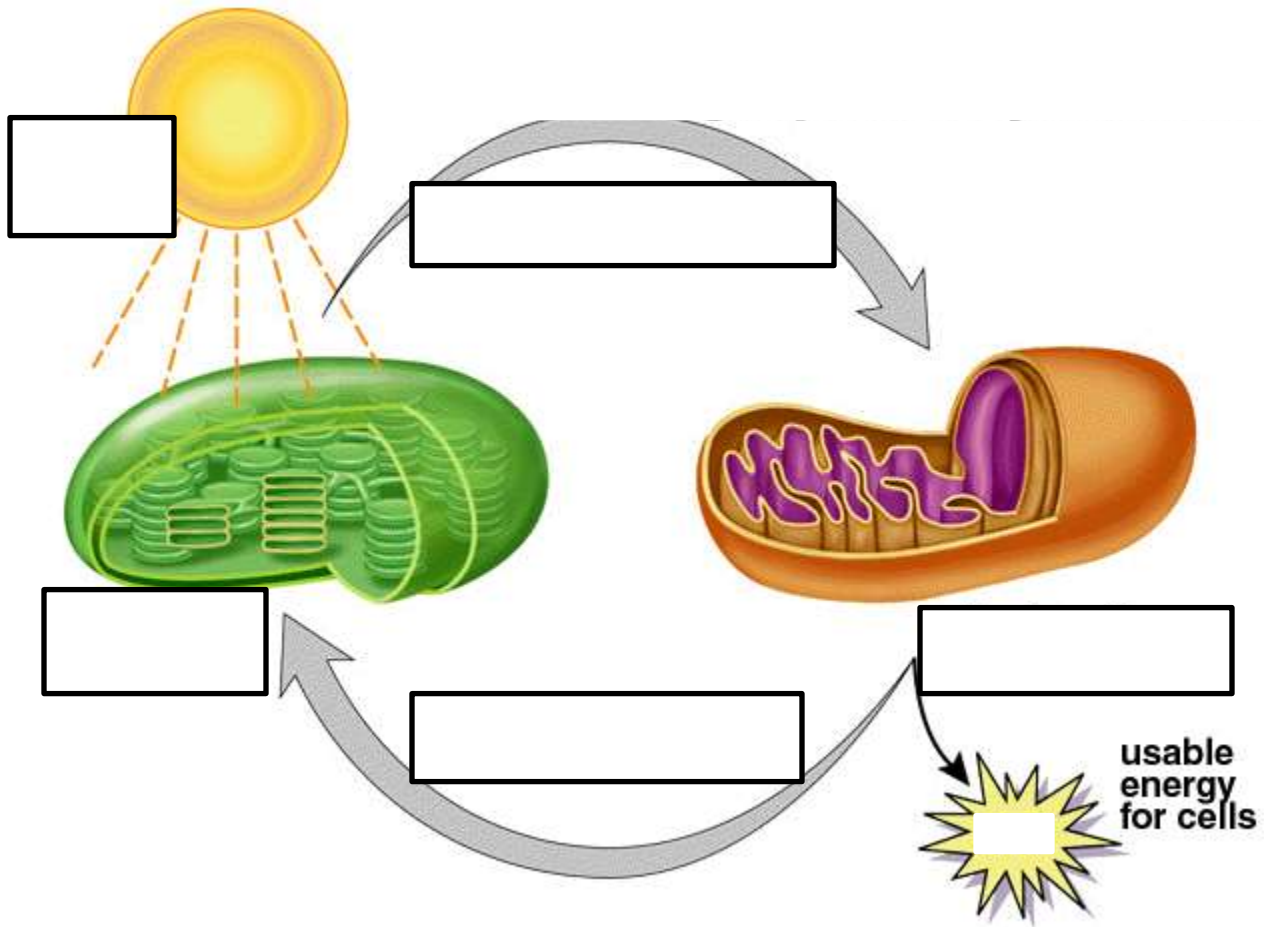
6. Complete the chart below:

Description	Process	Reactants	Products	Organelle	Type of organism
Convert light energy to food					
Convert food (glucose) to ATP					

7. Describe two ways that heterotrophs (such as animals and fungi) rely on autotrophs (like plants) for survival.

- I. _____
- II. _____

8. Complete the diagram below by filling in the boxes:



Part 2 – The Cell Membrane

9. Describe the main function of the cell membrane: _____

10. Define “homeostasis” and describe an example:

III. Definition: _____

IV. Example: _____

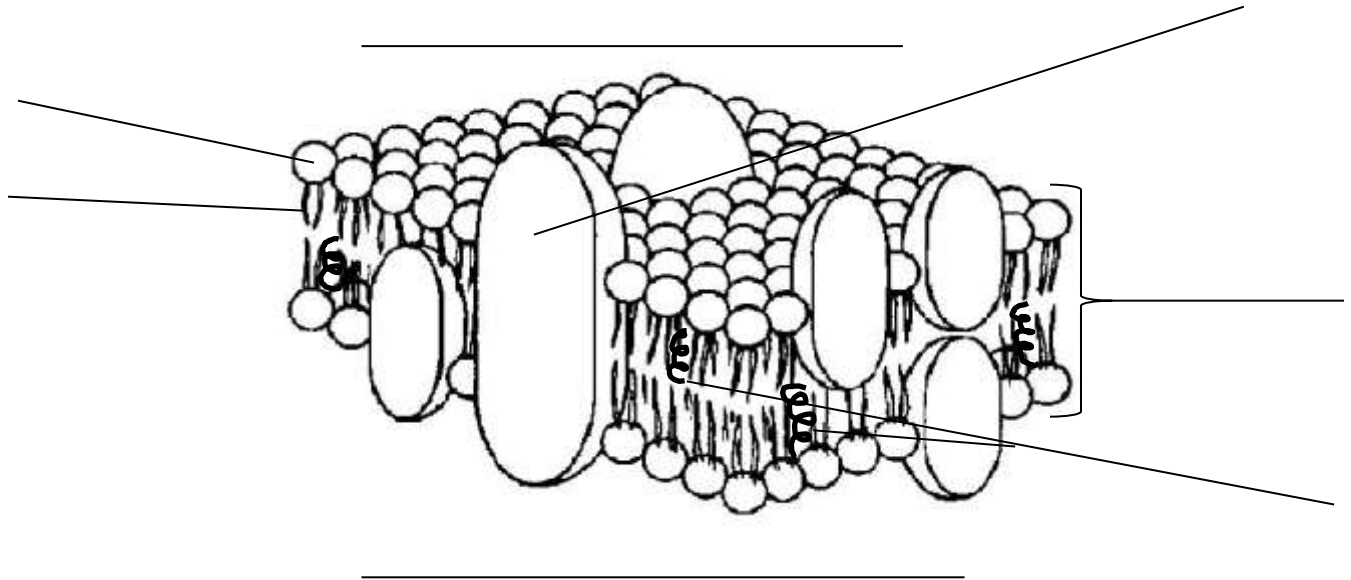
11. The cell membrane is selectively permeable. Describe what this property means. _____

12. The cell membrane is described by the “fluid mosaic model.” This name refers to 2 properties of the cell membrane.

V. “Fluid” suggests the membrane is always _____

VI. “Mosaic” refers to the membrane being made of _____

13. Label the diagram below:



14. Describe the functions of each of the following:

VII. Transport proteins _____

VIII. Cholesterol _____

15. Label and describe the parts of a phospholipid using the terms below:

Attracted to water	Fatty acid tail	Hydrophilic	Hydrophobic	Nonpolar	Phosphate head	Polar	Repelled by water
--------------------	-----------------	-------------	-------------	----------	----------------	-------	-------------------



16. Explain why the phospholipids arrange themselves in a lipid bilayer within the cell membrane.

17. Complete the chart below:

Type of transport	Requires energy?	Up or down concentration gradient?	Results in dynamic equilibrium?
Passive			
Active			

18. Passive transport is driven by diffusion, which results in dynamic equilibrium across the membrane.

Define the following terms:

IX. Diffusion _____

X. Dynamic equilibrium _____

19. Complete the chart below:

Type of transport	Passive or active?	Requires energy?	Up or down concentration gradient?	Results in dynamic equilibrium?	Requires transport proteins?	Type(s) of molecules moving across the membrane?
Simple diffusion						
Facilitated diffusion						
Osmosis						

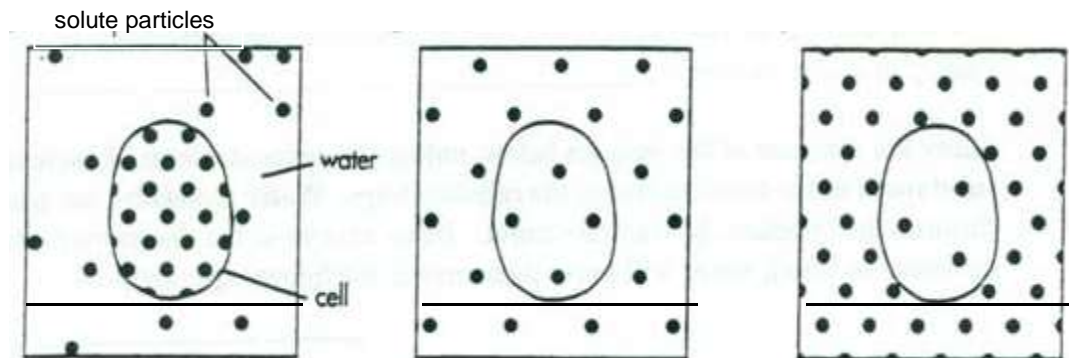
20. For each of the following diagrams:

- Draw an arrow to show the direction of osmosis (diffusion of water)
- Write if the cell will expand, shrink, or stay the same size
- Label the environment as hypertonic, hypotonic, or isotonic

What direction will water diffuse?

The cell will:

Environment



is:

- Cells remain small because large cells require too much _____ and do not maintain _____ as easily.

21. Cells benefit from a _____ surface area (SA) and a _____ volume (V) because they can diffuse substances _____.

22. Rank the following cells from most (1) to least (3) efficient:

