

Keystone practice questions #1
Molecules, Cells

- 1.) Which characteristic is shared by **all** prokaryotes and eukaryotes?
 - A. Ability to store hereditary information
 - B. Use of organelles to control cell processes
 - C. Use of cellular respiration for energy release
 - D. Ability to move in response to environmental stimuli

- 2.) Living organisms can be classified as prokaryotes or eukaryotes. Which two structures are common to both prokaryotic and eukaryotic cells?
 - A. Cell wall and nucleus
 - B. Cell wall and chloroplast
 - C. Plasma membrane and nucleus
 - D. Plasma membrane and cytoplasm

- 3.) Prokaryotic cells are generally much smaller than eukaryotic cells. answer on a separate pg.

Part A: Identify a structural difference between prokaryotic cells and eukaryotic cells that is directly related to their difference in size.

Part B: Based on structural difference, explain why prokaryotic cells can be much smaller than eukaryotic cells.

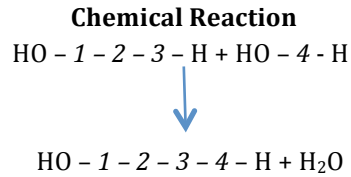
Part C: Describe one similarity between prokaryotic cells and eukaryotic cells that is independent of size.

- 4.) Alveoli are microscopic air sacs in the lungs of mammals. Which statement **best** describes how the structure of the alveoli allows the lungs to function properly?
 - A. They increase the amount of energy transferred from the lungs to the blood.
 - B. They increase the flexibility of the lungs as they expand during inhalation.
 - C. They increase the volume of the lungs, allowing more oxygen to be inhaled.
 - D. They increase the surface area of the lungs, allowing efficient gas exchange.

- 5.) Which statement **best** describes an effect of the low density of frozen water in a lake?
 - A. When water freezes, it contracts, decreasing the water level in a lake.
 - B. Water in a lake freezes from the bottom up, killing most aquatic organisms.
 - C. When water in a lake freezes, it floats, providing insulation for organisms below.
 - D. Water removes thermal energy from the land around a lake, causing the lake to freeze.

- 6.) Which statement correctly describes how carbon's ability to form four bonds makes it uniquely suited to form macromolecules?
 - A. It forms short, simple carbon chains.
 - B. It forms large, complex, diverse molecules.
 - C. It forms covalent bonds with other carbon atoms.
 - D. It forms covalent bonds that can exist in a single plane.

7.) Use the diagram below to answer the question.



The diagram shows a reaction that forms a polymer from several monomers. What is this type of reaction called?

- A. Glycolysis
 - B. Hydrolysis
 - C. Photosynthesis
 - D. Dehydration synthesis
- 8.) Carbohydrates and proteins are two types of macromolecules, which functional characteristic of proteins distinguishes them from carbohydrates?
- A. Large amount of stores information
 - B. Ability to catalyze biochemical reactions
 - C. Efficient storage of usable chemical energy
 - D. Tendency to make cell membranes hydrophobic.
9. Proteins are a major part of every living cell and have many different functions within each cell. Carbohydrates also perform numerous roles in living things.

Part A: Describe the general composition of a protein molecule.

Part B: Describe how the structures of proteins differ from the structures of carbohydrates.

Part C: Describe how the functions of proteins differ from the functions of carbohydrates.

10. Substance A is converted to substance B in a metabolic reaction. Which statement **best** describes the role of an enzyme during this reaction?
- A.) It adjusts the pH of the reaction medium.
 - B.) It provides energy to carry out the reaction.
 - C.) It dissolves substance A in the reaction medium.
 - D.) It speeds up the reaction without being consumed.
11. A scientist observes that, when the pH of the environment surrounding an enzyme is changed, the rate the enzyme catalyzes a reaction greatly decreases. Which statement **best** describes how a change in pH can affect an enzyme?
- A.) A pH change can cause the enzyme to change its shape.
 - B.) A pH change can remove energy necessary to activate an enzyme.
 - C.) A pH change can add new molecules to the structure of the enzyme.
 - D.) A pH change can cause an enzyme to react with a different substrate.
12. 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?
- A. ATP to light
 - B. light to chemical
 - C. heat to electrical
 - D. chemical to chemical

13.) Photosynthesis and cellular respiration are two major processes of carbon cycling in living organisms. Which statement correctly describes one similarity between photosynthesis and cellular respiration?

- A) Both occur in animal and plant cells.
- B) Both include reactions that transform energy.
- C) Both convert light energy into chemical energy.
- D) Both synthesize organic molecules as end products.

14. A protein in a cell membrane changed its shape to move sodium and potassium ions against their concentration gradients. Which molecule was **most likely** used by the protein as an energy source?

- A.) ATP
- B.) ADP
- C.) catalase
- D.) amylase

15. 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?

- A.) Orientation of cholesterol in the plasma membrane.
- B.) Concentration gradient across the plasma membrane.
- C.) Configuration of phospholipids in the plasma membrane.
- D.) Location of receptors on the surface of the plasma membrane.

16. 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?

- A.) Sodium and potassium ions move by active transport, and glucose moves by osmosis.
- B.) Sodium and potassium ions move by active transport, and glucose moves by facilitated diffusion.
- C.) Sodium and potassium ions move by facilitated diffusion, and glucose moves by osmosis.
- D.) Sodium and potassium ions move by facilitated diffusion, and glucose moves by active transport.

17. Some animals can produce a potassium ion concentration inside their cells that is twenty times greater than that of their environment. This ion concentration gradient is maintained by the plasma membrane.

Part A: Identify the process in the cell membrane that produces this difference in concentration.

Part B: Explain the process that occurs as the cell produces the ion concentration gradient.

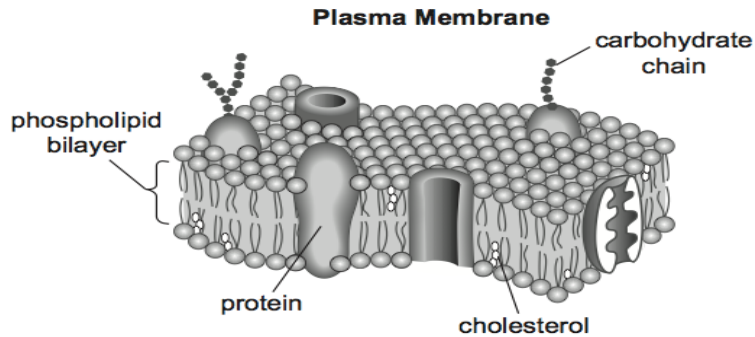
Part C: Compare the process of potassium ion transport to another mechanism that moves material across the plasma membrane.

18. 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?

- A.) It assembles nucleic acids from monomers.
- B.) It breaks down old damaged macromolecules.
- C.) It packages new protein molecules into vesicles.
- D.) It determines which protein molecules to synthesize.

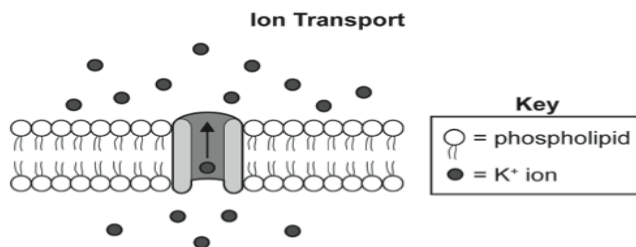
19. Which example is an activity that a fish **most likely** uses to maintain homeostasis within its body?

- A.) Using camouflage to avoid predators.
- B.) Feeding at night to regulate body temperature.
- C.) Moving to deeper water to regulate metabolic wastes.
- D.) Exchanging gases through its gills to regulate oxygen levels.



20. Which component of this membrane contains hydrophobic regions and acts as the primary barrier to most foreign substances?

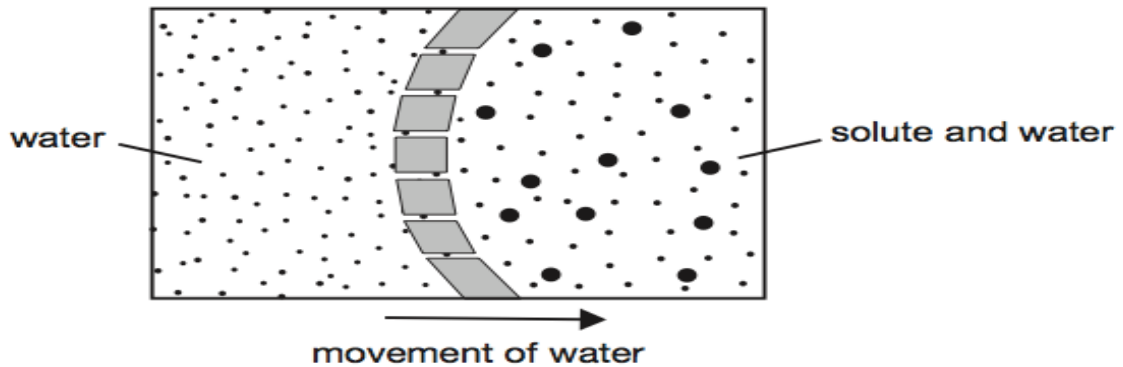
- A.) protein
- B.) cholesterol
- C.) carbohydrate chain
- D.) phospholipid bilayer



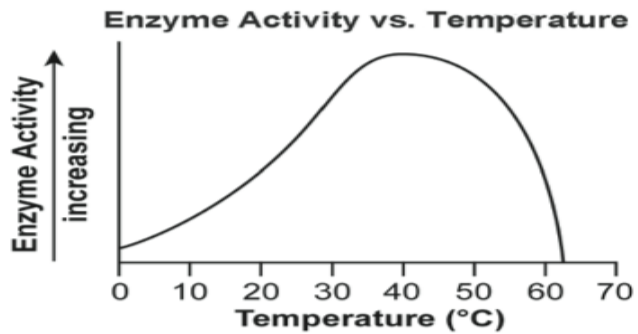
21. The diagram shows the movement of ions against a concentration gradient to an area of higher concentration. Which molecule provides the energy needed for this movement to occur in a cell?

- A.) ATP
- B.) mRNA
- C.) protein
- D.) lipid

Water Movement and the Cell Membrane



22. The relative concentration of solute inside and outside a cell can cause water molecules to move across the membrane. Which phrase would be an alternate title to the diagram?
- A.) Exocytosis in a cell
 - B.) Active Transport in a Cell
 - C.) Osmosis Across a Membrane
 - D.) Facilitated Diffusion Across a membrane



23. The graph shows how the activity of an enzyme changes at different temperatures. Which statement **best** describes what happens to the enzyme when the temperature of the reaction increases to 63°C?
- A.) The enzyme is used up and the reaction stops.
 - B.) The enzyme begins to decrease the rate of the reaction.
 - C.) The enzyme continues to increase the rate of the reaction.
 - D.) The enzyme changes shape and can no longer speed up the reaction.