

Name: _____ Date: _____

Answer Key: What Makes a Cell Tick? Pulsing Organelles 10th Grade Quiz

Signal transduction, energetic coupling, and membrane selectivity — reinforcing how microscopic machinery governs macroscopic biological systems.

1. In a specialized pancreatic cell, newly synthesized insulin must be tagged with a carbohydrate sequence to ensure it is routed for extracellular secretion. Which organelle is primarily responsible for this modification and sorting process?

Answer: B) Golgi Apparatus

The Golgi apparatus acts as the 'shipping and receiving' center, adding molecular tags (like glycosylation) to proteins to ensure they reach their correct destination.

2. The intense metabolic demands of a hummingbirds' flight muscles require a significantly higher density of _____ per cell compared to the skin cells of the same organism.

Answer: C) Mitochondria

Mitochondria are the site of aerobic respiration; cells with high energy requirements for movement contain more of these organelles to produce ATP.

3. The fluid mosaic model describes the cell membrane as a static, rigid border that provides structural support similar to a cell wall.

Answer: B) False

The membrane is fluid, meaning phospholipids and proteins move laterally within the bilayer. It is dynamic, not a rigid or static wall.

4. If a pharmaceutical drug is designed to inhibit the formation of the spindle apparatus during mitosis, which cellular component is the drug directly targeting?

Answer: B) The Cytoskeleton (Microtubules)

Spindle fibers are composed of microtubules, part of the cytoskeleton, which reorganize the cell's structure to pull chromosomes apart during reproduction.

5. Apoptosis, or programmed cell death, involves the controlled release of enzymes from lysosomes to digest the cell from the inside out.

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Answer: A) True

Lysosomes contain hydrolytic enzymes; when a cell needs to be destroyed or recycled, these enzymes are utilized in a process called autolysis.

6. In the liver, high concentrations of _____ are necessary for the detoxification of lipid-soluble drugs and the synthesis of steroid hormones.

Answer: A) Smooth Endoplasmic Reticulum

Unlike the Rough ER which focuses on proteins, the Smooth ER specializes in lipid synthesis and metabolic detoxification.

7. Cystic Fibrosis is caused by a defect in a chloride ion channel protein. This breakdown in the cell's ability to regulate conductivity and ion flow occurs at which structural level?

Answer: C) Plasma Membrane

Ion channels are transmembrane proteins located in the plasma membrane that regulate the entry and exit of ions to maintain cellular homeostasis.

8. The theory of endosymbiosis suggests that mitochondria and chloroplasts were once free-living prokaryotes because they possess their own _____.

Answer: D) Circular DNA

The presence of independent circular DNA and ribosomes within mitochondria supports the theory that they evolved from engulfed bacteria.

9. Ribosomes are found only attached to the Rough Endoplasmic Reticulum and cannot function while floating freely in the cytoplasm.

Answer: B) False

Free ribosomes synthesize proteins that stay within the cytosol, whereas bound ribosomes synthesize proteins destined for secretion or membrane insertion.

10. A cell in the lining of the small intestine actively moves glucose against its concentration gradient. Which two components are most critical for this 'metabolic absorption'?

Answer: A) Membrane proteins and ATP

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Active transport requires carrier proteins within the membrane and energy (ATP) provided by the mitochondria to move substances against a gradient.