Name: _____ **Date:** _____

Answer Key: Blueprint Sabotage: 7th Grade Advanced Cell Operations Quiz

Deconstruct cellular malfunctions and predict how organelle failure cascades through biological systems in this high-level formative assessment.

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1. A researcher treats a plant cell with a chemical that specifically inhibits the formation of the middle lamella during cytokinesis. What is the most likely structural consequence for the tissue?

Answer: C) Adjacent cells will fail to adhere to one another properly.

The middle lamella is a pectin-rich layer that cements the cell walls of adjacent plant cells together; its absence prevents proper tissue adhesion.

2. In a specialized secretory cell, such as a plasma B-cell producing antibodies, the _____ must be highly developed to manage the folding and transport of massive protein loads.

Answer: A) Rough Endoplasmic Reticulum

The Rough ER is studded with ribosomes and is the primary site for the synthesis and folding of proteins destined for secretion.

3. If a cell's lysosomes were to suddenly rupture and release their contents into the cytoplasm, the change in pH would likely neutralize the enzymes before they could cause significant damage.

Answer: A) True

Lysosomal enzymes (acid hydrolases) require an acidic environment to function; the neutral pH of the cytosol typically inactivates them if a few leak out.

4. Which scenario best illustrates the concept of 'conductivity' at a cellular level using specific organelle interaction?

Answer: B) Voltage-gated ion channels in the membrane creating an action potential.

Conductivity refers to the ability to transmit electrical impulses, which is achieved through the movement of ions across the cell membrane.

5. Anthrax toxin works by disrupting the communication between the cell membrane and the rest of the cell. This specifically targets the process of _____, preventing the cell from taking in necessary nutrients.

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Answer: A) Metabolic absorption

Metabolic absorption is the process by which cells take in substances from their environment to be used for energy or building blocks.

6. Cyanide binds to an enzyme in the electron transport chain. Trace the logic: which organelle is directly compromised, and which cellular function ceases first?

Answer: B) Mitochondria; Respiration

Mitochondria are the site of aerobic respiration; inhibiting the electron transport chain halts ATP production via respiration.

7. The presence of a massive central vacuole in a plant cell is primarily an adaptation for excretion of toxic metabolic byproducts into the soil.

Answer: B) False

The large central vacuole is primarily for maintaining turgor pressure and storing nutrients/water, though it can store waste internally, it does not excrete it into the soil.

8. During the synthesis of a complex glycoprotein, a sugar chain is added to a protein. If this sugar 'tag' is incorrect, the _____ will fail to sort the protein to its correct destination.

Answer: B) Golgi apparatus

The Golgi apparatus is the 'post office' of the cell, responsible for modifying, sorting, and packaging proteins based on molecular tags.

9. A cell is in a state of 'autophagy' where it begins to digest its own damaged mitochondria. Which organelle provides the enzymes necessary for this internal recycling?

Answer: C) Lysosome

Lysosomes contain hydrolytic enzymes that break down worn-out organelles and cellular debris during autophagy.

10. In highly active muscle tissue, you would expect to find a significantly higher density of mitochondria compared to inactive adipose (fat) tissue.

Answer: A) True

Form follows function: muscle cells require vast amounts of ATP for movement, necessitating more mitochondria for respiration than storage-focused fat cells.

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