Name: _____ **Date:** _____

Answer Key: A Day in the Organelle Office: Advanced 7th Grade Cell Operations

Evaluate 10 complex scenarios where cellular efficiency depends on specialized organelle interactions rather than just identifying parts and pieces.

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1. A scientist treats a cell with a chemical that prevents the Golgi apparatus from functioning. Which immediate outcome would likely occur within the cell's transport system?

Answer: B) Proteins will be synthesized by ribosomes but remain improperly tagged and stuck.

The Golgi apparatus is the 'post office' that tags and packages proteins; without it, proteins created by ribosomes on the ER cannot be correctly routed to their final destinations.

2. True or False: In a scenario where a cell requires rapid energy for movement, the mitochondria and cell membrane must work together to maintain a specific ion gradient for ATP synthesis.

Answer: A) True

Cellular respiration in the mitochondria relies on ion gradients managed by membranes to produce ATP, which fuels the mechanical movement of the cell.

3. If a specialized liver cell is tasked with detoxifying a high volume of chemicals, it will likely exhibit a higher quantity of _____ compared to a standard skin cell.

Answer: C) Smooth Endoplasmic Reticulum

The Smooth ER is responsible for lipid synthesis and detoxification; cells involved in filtering toxins (like liver cells) require more of this organelle to function efficiently.

4. A patient has a condition where their white blood cells cannot break down engulfed pathogens. Which organelle is most likely malfunctioning in this scenario?

Answer: B) Lysosome

Lysosomes contain digestive enzymes. If they fail, the cell cannot perform 'excretion' of waste or destruction of foreign invaders like bacteria.

5. True or False: The cell membrane's role in conductivity is independent of the protein synthesis occurring in the Rough ER.

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Answer: B) False

False. The proteins that allow for conductivity (ion channels) are manufactured in the Rough ER. Without that synthesis, the membrane could not maintain electrical signals.

6. The process of metabolic absorption relies on the _____ to selectively allow nutrients to pass into the cytoplasm based on the cell's current homeostatic needs.

Answer: A) Cell Membrane

The cell membrane acts as a semi-permeable barrier that regulates the entry of nutrients, satisfying the function of metabolic absorption.

7. Compare the energy needs of a cardiac muscle cell to a dormant seed cell. How would the organelle composition reflect this difference?

Answer: B) The muscle cell would have a significantly higher density of mitochondria.

Muscle cells require constant energy for movement, necessitating more mitochondria for aerobic respiration than a dormant cell.

8. Within the nucleus, the regulation of _____ is the primary mechanism that controls a cell's ability to undergo reproduction and direct protein synthesis.

Answer: B) Gene Expression

The nucleus controls life functions through gene expression, which provides the 'instructions' for both building the cell and duplicating it.

9. True or False: Secretion by the Golgi apparatus is a form of active transport that requires the energy produced by the mitochondria.

Answer: A) True

Packaging and moving vesicles for secretion is an active biological process that consumes ATP generated by mitochondria.

10. Analyze the relationship between ribosomes and the Golgi apparatus. What happens if ribosomes increase their output without a corresponding increase in Golgi activity?

Answer: B) There will be a buildup of unprocessed proteins within the Endoplasmic Reticulum.

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If the 'factory' (ribosomes) produces more than the 'shipping center' (Golgi) can handle, a bottleneck occurs, leading to an accumulation of unfinished products in the ER.