Name: _____ **Date:** _____

Invisible Engines, Massive Power: The 5th Grade Cell Design Challenge

Construct biological systems using 10 high-level challenges that move beyond naming parts to synthesizing how organelles collaborate to keep organisms alive.

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1. An architect is designing a 'Smart City' that functions exactly like a plant cell. If the city needs a specialized solar power plant that also produces sugar for the citizens, which organelle-inspired building must be included?

A. The Central Vacuole Tower
B. The Chloroplast Conservatory
C. The Mitochondria Generator
D. The Ribosome Factory

2. If a cell's Golgi Apparatus suddenly stopped functioning, the most immediate problem for the organism would be ___.

A. An inability to create genetic blueprints
B. The failure to produce any energy
C. An inability to package and ship proteins to their destinations
D. The immediate collapse of the cell wall

3. In a multicellular organism, a muscle cell would likely contain significantly more mitochondria than a skin cell because of its high demand for movement and energy.

A. True
B. False

4. Imagine a cell is a high-security library. If the DNA represents the rare books that never leave the 'Nucleus Room,' what represents the 'photocopies' sent out to the Ribosome workstations to build proteins?

A. Chlorophyll
B. RNA
C. Lipids
D. Cytoplasm

5. To maintain 'Homeostasis,' the Cell Membrane must be ___, meaning it only allows specific substances like oxygen to pass through while blocking harmful toxins.

A. Solidly rigid
B. Completely transparent
C. Selectively permeable
D. Inversely pressurized

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6. The primary difference between a cell's 'Excretion' and 'Secretion' is that excretion involves removing waste, while secretion involves releasing useful substances like hormones.

A. True
B. False

7. Which biological scenario best demonstrates the concept of 'Conductivity' at a cellular level?

A. A plant cell absorbing water through its roots
B. A white blood cell digesting a trapped bacterium
C. A nerve cell passing an electrical signal to a neighbor
D. A skin cell dividing to heal a minor scrape

8. In a drought, a plant wilts because its ___ loses water, causing the internal pressure against the cell wall to drop.

A. Mitochondria
B. Large Central Vacuole
C. Nuclear membrane
D. Rough Endoplasmic Reticulum

9. A scientist observes a cell under a microscope and notices a thick outer boundary and green oval-shaped structures. Which organism did this cell most likely come from?

A. A desert lizard
B. A deep-sea mushroom
C. A freshwater oak leaf
D. A mountain goat

10. If the Lysosomes in a cell were to rupture and release their contents into the cytoplasm, the cell would likely begin to digest itself.

A. True
B. False