What is a Eukaryotic Cell and Its Structure?

Worksheet

A eukaryotic cell has a nucleus (DNA) and specialized organelles (mitochondria, ER, Golgi). This compartmentalization allows advanced metabolism and complex organism development.

Questions

1. What is the main difference between a eukaryotic and prokaryotic cell?

A) Size
B) Presence of nucleus & organelles
C) Ability to reproduce
D) Cell membrane

2. Which organelle produces most of the cell's ATP?

A) Nucleus
B) Ribosome
C) Mitochondrion
D) Golgi apparatus

3. What is made on rough endoplasmic reticulum?

A) Carbohydrates
B) Proteins for export
C) Lipids for membranes
D) ATP energy

4. A cell has a large vacuole. This cell is likely a

A) Prokaryotic cell
B) Plant cell
C) Bacterial cell
D) Mitochondrion

5. How does the mitochondrion's compartmentalization (outer + inner membrane) enable efficient ATP production?

6. A cell needs to secrete a hormone protein. Trace its path through organelles.

7. A liver cell must detoxify alcohol. Which organelle is especially large in liver cells, and why?

8. Define: What is a eukaryotic cell?

9. Define: What is the main function of the nucleus?

10. Define: What do mitochondria do?

Answer Key

1. B) Presence of nucleus & organelles - Eukaryotic cells have a nucleus & organelles; prokaryotic cells do not. This is the defining difference.

2. C) Mitochondrion - Mitochondria are the powerhouse - they perform cellular respiration to generate ATP.

3. B) Proteins for export - Rough ER has ribosomes, which synthesize proteins destined for export or membrane insertion.

4. B) Plant cell - Large vacuoles are typical of plant cells, where they store water, nutrients & waste.

5. Inner membrane has electron transport chain & ATP synthase enzyme. Outer membrane creates separate matrix space with high H+ concentration. Proton gradient drives ATP synthesis. More membrane area = more ATP. Without compartmentalization, gradient collapses - less ATP.

6. Ribosome (on rough ER) synthesizes the protein. ER transport vesicle Golgi apparatus (modifies & packages). Golgi vesicle secretory vesicle cell membrane exocytosis released. Without this pathway, protein stays in cytoplasm; no hormone signal.

7. Liver cells have enlarged smooth ER (detoxification zone). Alcohol metabolized by smooth ER enzymes less toxic byproducts mitochondria handles energy. Small smooth ER = poor detoxification = alcohol damage. Enlarged smooth ER = efficient detoxification = liver health.

8. A cell with a nucleus and membrane-bound organelles, found in animals, plants and fungi. More complex than prokaryotic cells.

9. Stores and controls DNA; regulates gene expression to direct cell activities.

10. Break down glucose & fatty acids to produce ATP (chemical energy) for the cell.