What are Prokaryotic and Eukaryotic Cells?

Worksheet

A prokaryotic cell is a simple cell without a nucleus or membrane-bound organelles (found in bacteria and archaea), while a eukaryotic cell has a true nucleus and organelles like mitochondria and the ER (found in plants, animals, fungi, and protists).

Questions

1. What is the main structural feature that defines a eukaryotic cell?

A) Presence of a cell wall
B) A true, membrane-bound nucleus
C) Ability to move
D) Presence of ribosomes

2. Which of these organisms has prokaryotic cells?

A) Human
B) Mushroom
C) Bacterium
D) Oak tree

3. Where is the DNA located in a prokaryotic cell?

A) Inside a membrane-bound nucleus
B) In the nucleoid region, not membrane-bound
C) In the mitochondria only
D) It has no DNA

4. Which is generally true about eukaryotic cells compared to prokaryotic cells?

A) They are always smaller
B) They lack organelles
C) They are typically larger and more complex
D) They have no DNA

5. Under a microscope, you see a cell with no visible nucleus and a diameter of about 2 micrometers. Classify it and explain why.

6. A biologist compares E. coli (bacterium) and a human liver cell. List the key structural differences.

7. Mitochondria are thought to have evolved from ancient prokaryotic cells engulfed by a larger cell (endosymbiotic theory). What evidence supports this?

8. Define: What defines a prokaryotic cell?

9. Define: What defines a eukaryotic cell?

10. Define: Which organisms have prokaryotic cells?

Answer Key

1. B) A true, membrane-bound nucleus - A membrane-enclosed nucleus is the defining feature separating eukaryotic from prokaryotic cells.

2. C) Bacterium - Bacteria (and archaea) are the only organisms with prokaryotic cells; the others are eukaryotes.

3. B) In the nucleoid region, not membrane-bound - Prokaryotic DNA is concentrated in the nucleoid, a region without a surrounding membrane.

4. C) They are typically larger and more complex - Eukaryotic cells are typically 10-100 micrometers, larger and more compartmentalized than the 1-10 micrometer prokaryotic cells.

5. Absence of a visible nucleus rules out a eukaryotic cell Size of 2 micrometers matches typical prokaryotic cell size (1-10 micrometers) The cell is therefore prokaryotic - likely a bacterium Its DNA would be located in the nucleoid region, not enclosed by a membrane

6. E. coli has no nucleus; its DNA is a single circular chromosome in the nucleoid The liver cell has a true nucleus enclosing multiple linear chromosomes E. coli lacks mitochondria and ER; the liver cell has both, plus a Golgi apparatus E. coli (~1-2 micrometers) is much smaller than the liver cell (~20-30 micrometers)

7. Mitochondria have their own circular DNA, similar to prokaryotic DNA Mitochondria have their own ribosomes, similar in size to bacterial ribosomes Mitochondria are surrounded by a double membrane, consistent with engulfment by a host cell Mitochondria reproduce independently by binary fission, like prokaryotic cells

8. A cell without a true nucleus or membrane-bound organelles; DNA sits in the nucleoid region.

9. A cell with a true, membrane-enclosed nucleus and membrane-bound organelles like mitochondria.

10. Bacteria and archaea.