What is a Prokaryotic Cell and Its Structure?

Worksheet

A prokaryotic cell lacks a nucleus and organelles, with DNA floating in the nucleoid region. Energy production happens at the cell membrane, making prokaryotes extremely efficient despite their simplicity.

Questions

1. How is a prokaryotic cell different from a eukaryotic cell?

A) Prokaryotes are larger
B) Prokaryotes lack a nucleus & organelles
C) Prokaryotes have more DNA
D) Prokaryotes reproduce faster

2. Where do prokaryotes generate ATP?

A) Mitochondria
B) Cell membrane
C) Nucleoid
D) Ribosome

3. What is the nucleoid?

A) A membrane-bound nucleus
B) A region of free-floating DNA
C) An energy-producing organelle
D) A waste disposal site

4. Why can penicillin kill bacteria but not human cells?

A) It's toxic only to prokaryotes
B) Bacteria have cell walls; humans don't
C) Humans have ribosomes
D) Bacteria can't move

5. A prokaryote has no mitochondria, yet it can move, reproduce and sense its environment. How does it generate energy?

6. Penicillin kills bacteria by breaking their cell wall. Why is this effective and why don't eukaryotic cells die?

7. A bacterium has a plasmid (extra DNA loop). What advantage does this give?

8. Define: What is a prokaryotic cell?

9. Define: Where is DNA located in prokaryotes?

10. Define: Do prokaryotes have mitochondria?

Answer Key

1. B) Prokaryotes lack a nucleus & organelles - The defining difference: prokaryotes have no nucleus or membrane-bound organelles; eukaryotes have both.

2. B) Cell membrane - Prokaryotes have no mitochondria. Energy production occurs at the cell membrane via respiratory enzymes.

3. B) A region of free-floating DNA - The nucleoid is a non-membrane-bound region where bacterial DNA coils up; it is not a true nucleus.

4. B) Bacteria have cell walls; humans don't - Penicillin targets peptidoglycan in bacterial cell walls. Eukaryotic cells have no cell wall, so penicillin doesn't harm them.

5. Energy production happens directly at the cell membrane (infoldings called mesosomes). Membrane-bound enzymes perform respiration, creating ATP without a separate organelle. Simplicity = efficiency. No compartmentalization overhead; energy production is immediate.

6. Bacteria have peptidoglycan cell walls; penicillin blocks cross-linking. Without cross-links, wall crumbles cell bursts bacteria dies. Eukaryotic cells have no cell wall (only membrane) - penicillin has no target in eukaryotes. This is selective toxicity: antibiotic targets prokaryotic-specific structures.

7. Plasmids often carry antibiotic resistance genes, virulence genes, or metabolic genes. If the environment has antibiotics, plasmid-carrying bacteria survive & reproduce faster. Plasmids can transfer between bacteria via pili horizontal gene transfer. Plasmid = rapid evolution & adaptation.

8. A simple cell without a nucleus or membrane-bound organelles. Found in bacteria & archaea.

9. In the nucleoid region, a non-membrane-bound area where DNA floats freely.

10. No. Energy production occurs at the cell membrane, not in a separate organelle.