What are Bacteria and Viruses?

Worksheet

Bacteria are single-celled prokaryotic organisms with their own metabolism that reproduce by binary fission, doubling their population at a predictable rate. Viruses are non-living particles of genetic material in a protein coat that can only replicate by infecting and hijacking a living host cell.

Questions

1. How do bacteria typically reproduce?

A) Binary fission
B) By hijacking a host cell
C) Through photosynthesis only
D) They cannot reproduce

2. Why are viruses generally not considered fully living organisms?

A) They are too small to see
B) They lack their own metabolism and cannot reproduce without a host cell
C) They only exist in humans
D) They have no genetic material

3. A bacterial culture starts with 50 cells and has a generation time of 30 minutes. How many cells are there after 90 minutes?

A) 100 cells
B) 200 cells
C) 400 cells
D) 50 cells

4. Why are antibiotics ineffective against viral infections?

A) Viruses are too large
B) Viruses lack the cellular structures antibiotics target, like cell walls
C) Antibiotics only work on plants
D) Viruses are immune to all chemicals

5. A bacterial culture starts with 200 cells and has a generation time of 20 minutes. How many cells are present after 1 hour (60 minutes)?

6. E. coli has a generation time of about 20 minutes. Starting from a single cell, roughly how many cells exist after 3 hours (180 minutes)?

7. A virus infects a single host cell. Describe, in order, the basic steps of its replication cycle inside that cell.

8. Define: What is a prokaryote?

9. Define: What is binary fission?

10. Define: Why can't antibiotics treat viral infections?

Answer Key

1. A) Binary fission - Bacteria reproduce asexually through binary fission, splitting one cell into two.

2. B) They lack their own metabolism and cannot reproduce without a host cell - Viruses have no independent metabolism and depend entirely on a host cell's machinery to replicate.

3. C) 400 cells - Generations = 90/30 = 3; N = 50 2 = 50 8 = 400 cells.

4. B) Viruses lack the cellular structures antibiotics target, like cell walls - Antibiotics target bacterial structures (cell wall, ribosomes) that viruses simply don't have.

5. Use N = N 2^(t/g). Number of generations = t/g = 60/20 = 3. N = 200 2 = 200 8 = 1600 cells.

6. Number of generations = 180/20 = 9. N = 1 2 = 512 cells. This shows why bacterial infections can spread so fast without treatment.

7. The virus attaches to and enters the host cell. It releases its genetic material and hijacks the host's ribosomes and machinery. The host cell is forced to make many copies of the viral genome and proteins. New virus particles assemble and burst out (lyse) the host cell, going on to infect more cells.

8. A single-celled organism, like a bacterium, that has no membrane-bound nucleus.

9. The asexual process by which one bacterial cell divides into two identical daughter cells.

10. Antibiotics target structures like bacterial cell walls and ribosomes, which viruses don't have.