

Virology & Bacteriology Practice Questions

Virology Practice Questions

Q1. An isolated novel virus is analyzed in the lab. It contains a single-stranded RNA genome that cannot be directly translated by host ribosomes upon cellular entry. The purified viral genomic RNA alone is injected into a host cell, but no viral replication occurs. Which enzyme must the intact virion carry for successful infection?

- A) DNA-dependent RNA polymerase
- B) Host-derived peptidyl transferase
- C) RNA-dependent RNA polymerase
- D) Reverse transcriptase with proofreading activity

Q2. Which of the following statements accurately contrasts the genetic replication and stability of typical dsDNA viruses with ssRNA (+) viruses?

- A) dsDNA viruses replicate in the cytoplasm and have high mutation rates
- B) ssRNA (+) viruses utilize host DNA proofreading enzymes during nuclear replication
- C) dsDNA viruses generally replicate in the nucleus with lower mutation rates due to proofreading, whereas ssRNA (+) viruses rely on error-prone RNA polymerases
- D) ssRNA (+) genomes must first be converted into negative-sense DNA intermediates before translation

Q3. Human Immunodeficiency Virus (HIV) infects CD4+ T-cells and macrophages, but fails to infect neurons. Meanwhile, Rabies virus specifically targets neuronal tissue. This specificity is a direct illustration of:

- A) Host tropism determined by icosahedral capsid symmetry
- B) Cellular tropism determined by viral surface protein interaction with host cell receptors
- C) Tissue tropism mediated exclusively by the lipid envelope
- D) Lysogenic conversion induced by bacteriophage integration

Q4. An Arenavirus genome analysis shows a single RNA strand where the 5' end codes for an early viral protein in positive-sense, while the 3' end codes for another protein in negative-sense. Which genomic strategy is utilized here?

- A) Segmented dsRNA replication
- B) Ambisense RNA genome expression
- C) Continuous dsDNA intermediate transcription
- D) Retroviral reverse transcription

Q5. Why are non-enveloped (naked) icosahedral viruses generally more resistant to harsh environmental conditions (like detergents and drying) compared to enveloped viruses?

- A) Naked viruses carry dipicolinic acid in their capsids
- B) The lipid envelope is fragile and easily disrupted, whereas the protein capsid is structurally stable
- C) Enveloped viruses lack capsomeres necessary for structural integrity
- D) Naked viruses possess multiple peptidoglycan layers outside their nucleocapsid

Bacteriology MCQ

Q1. A 45-year-old patient with an intravenous catheter develops a nosocomial infection. The causative bacterium forms a loose, unorganized carbohydrate outer layer that adheres to the prosthetic device. Which of the following best describes this structure?

- A) A polypeptide capsule with tight cell wall adherence
- B) A glycocalyx/slime layer providing loose host and surface adherence
- C) A rigid peptidoglycan layer containing teichoic acids
- D) An axial filament embedded in the outer membrane

Q2. During a laboratory experiment, a Gram-positive strain of *Bacillus anthracis* is treated with lysozyme. Under osmotic pressure, the bacterium loses its cell wall entirely. Which structure is formed, and why does Penicillin fail to act on it?

- A) Spheroplast; Penicillin cannot penetrate the remaining lipopolysaccharide layer
- B) Protoplast; Penicillin targets cell wall synthesis, which is absent in this form
- C) L-form; Penicillin is inactivated by the sterols present in its cell membrane
- D) Endospore; Penicillin is excluded by the thick protein spore coat

Q3. Which of the following structural components directly contributes to the extreme heat resistance and dehydration state of a mature bacterial endospore cortex?

- A) Collagen-like glycoproteins in the exosporium
- B) Over 80 distinct functional proteins in the spore coat
- C) Calcium paired with dipicolinic acid within the cortex membranes
- D) High concentrations of flagellin and pilin polymers

Q4. A motility assay reveals a bacterium moving towards a high concentration of glucose using multiple flagella distributed over its entire cell surface. How should this motility behavior and flagellar arrangement be classified?

- A) Positive phototaxis; Lophotrichous
- B) Negative chemotaxis; Amphotrichous
- C) Positive chemotaxis; Peritrichous
- D) Axial filament-mediated motility; Monotrichous

Q5. A strain of *Neisseria gonorrhoeae* undergoes a mutation that inhibits the expression of its pilin proteins (ordinary pili). What is the primary immediate clinical consequence for this bacterium in the human urinary tract?

- A) Loss of resistance against bacteriophages
- B) Inability to synthesize ATP via proton motive force
- C) Inability to adhere to urethral epithelial cells, leading to clearance by urine flow
- D) Failure to form a protective polypeptide capsule in vivo

Answer Key

1. C
2. C
3. B
4. B
5. B
6. B
7. B
8. C
9. C
10. C