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Biology Grade 11 — Chapter 6

Prokaryotes

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Independent practice MCQs from the supplied Class 11 Biology notes pack. Total: 50 questions.

A. Important / Main Topics

1. Who introduced the five-kingdom system in 1969?

(A) Robert H. Whittaker
(B) Carl Woese
(C) Lynn Margulis
(D) Anton van Leeuwenhoek

Correct Answer: A

Explanation: In 1969, American biologist Robert H. Whittaker introduced a five-kingdom system that included the fundamental distinction between prokaryotes and eukaryotes.

2. Which scientist identified that archaea have a separate evolutionary lineage from bacteria in 1977?

(A) Robert H. Whittaker
(B) Carl Woese
(C) Lynn Margulis
(D) Louis Pasteur

Correct Answer: B

Explanation: A significant milestone occurred in 1977 when Carl Woese identified that archaea have a separate evolutionary lineage from bacteria.

3. Which of the following is a unifying feature of Archaea?

(A) Presence of peptidoglycan in the cell wall
(B) Presence of unbranched carbon chains in membrane lipids
(C) Absence of peptidoglycan in the cell wall
(D) Presence of a well-organized nucleus

Correct Answer: C

Explanation: Absence of peptidoglycan in the cell wall — this correctly answers the question.

4. What are methane-producing archaea called?

(A) Halophiles
(B) Thermoacidophiles
(C) Cyanobacteria
(D) Methanogens

Correct Answer: D

Explanation: Methanogens are methane producers that survive in anaerobic settings such as swamps, marshes, and the intestinal tracts of animals.

5. Which group of archaea lives in salty environments?

(A) Halophiles
(B) Methanogens
(C) Thermoacidophiles
(D) Actinomycetes

Correct Answer: A

Explanation: Halophiles — this correctly answers the question.

6. What is the primary method of asexual reproduction in bacteria?

(A) Conjugation
(B) Binary fission

(C) Transduction
(D) Transformation

Correct Answer: B

Explanation: The primary method of asexual reproduction in bacteria is binary fission, where one cell divides into two identical daughter cells.

7. Which type of bacteria can survive harsh conditions by forming a thick, keratin-like coat?

(A) Cyanobacteria
(B) Actinomycetes
(C) Endospore-forming bacteria
(D) Proteobacteria

Correct Answer: C

Explanation: Endospore-forming bacteria — this correctly answers the question.

8. What is the cell wall of Gram-positive bacteria primarily composed of?

(A) A thin peptidoglycan layer with an outer membrane
(B) Cellulose
(C) Chitin
(D) A thick peptidoglycan layer

Correct Answer: D

Explanation: A thick peptidoglycan layer — this correctly answers the question.

9. Which of the following is a key feature of Gram-negative bacteria?

(A) Presence of an outer membrane containing lipopolysaccharides
(B) Presence of teichoic acid
(C) Thick peptidoglycan layer
(D) Absence of a periplasmic space

Correct Answer: A

Explanation: Presence of an outer membrane containing lipopolysaccharides — this correctly answers the question.

10. Which pigment is primarily responsible for the blue-green color of cyanobacteria?

(A) Chlorophyll a
(B) Phycocyanin
(C) Carotenoid
(D) Xanthophyll

Correct Answer: B

Explanation: Phycocyanin, a blue pigment, is the predominant phycobilin in cyanobacteria.

11. What is the shape of a spherical bacterium called?

(A) Bacillus
(B) Spirillum
(C) Coccus
(D) Vibrio

Correct Answer: C

Explanation: A coccus is a spherical bacterium. Cocci generally appear in groups like diplococci, streptococci, and staphylococci.

12. What is the region in a bacterial cell where the circular DNA is located called?

(A) Nucleus
(B) Plasmid
(C) Nucleolus
(D) Nucleoid

Correct Answer: D

Explanation: In prokaryotes, the genetic material is typically a single circular chromosome located in the nucleoid region.

13. Which type of bacteria are photosynthetic and produce oxygen?

(A) Cyanobacteria
(B) Green sulfur bacteria
(C) Purple bacteria
(D) Methanogens

Correct Answer: A

Explanation: Cyanobacteria are phototrophic bacteria that produce oxygen during photosynthesis.

14. What is the term for bacteria that can grow either in the presence or absence of oxygen?

(A) Aerobic bacteria
(B) Facultative bacteria
(C) Anaerobic bacteria
(D) Microaerophilic bacteria

Correct Answer: B

*Explanation: Facultative bacteria like *E. coli* can grow either in the presence or absence of oxygen.*

15. Which bacterial structure is used for attachment to surfaces and conjugation?

(A) Flagella
(B) Capsule
(C) Pili
(D) Endospore

Correct Answer: C

Explanation: Pili are hair-like structures on the bacterial surface that facilitate adhesion and are involved in conjugation.

16. A bacterium is observed to have a thick peptidoglycan layer and teichoic acid in its cell wall. How would this bacterium be classified in a Gram stain?

(A) Gram-negative
(B) Acid-fast
(C) Non-staining
(D) Gram-positive

Correct Answer: D

Explanation: Gram-positive bacteria have a thicker peptidoglycan layer and teichoic acid that protrudes outside the peptidoglycan layer.

17. What is the advantage of the branched carbon chains in the membrane lipids of archaea?

(A) They allow archaea to live in extreme environments like high temperatures and acidity.
(B) They make archaea more susceptible to antibiotics.
(C) They help archaea produce methane.
(D) They are the same as bacterial membrane lipids.

Correct Answer: A

Explanation: Archaea have special lipids in their membranes with branched carbon chains that help them live in extreme places like very hot or acidic environments.

18. During which phase of the bacterial growth curve is the rate of cell division equal to the rate of cell death?

(A) Lag phase
(B) Stationary phase
(C) Log phase
(D) Death phase

Correct Answer: B

Explanation: In the stationary phase, the growth rate is zero, and any increase in the number of cells is offset by the death of other cells, so the number of living cells remains constant.

19. Which type of genetic recombination in bacteria requires direct contact between a donor and recipient cell through a bridge-like connection?

(A) Transformation
(B) Transduction
(C) Conjugation
(D) Mutation

Correct Answer: C

Explanation: Conjugation involves the transfer of genetic material from one bacterium (donor) to another (recipient) through a bridge-like connection.

20. What is the function of the enzyme lysozyme in a bacteriophage infection?

(A) It synthesizes viral DNA.
(B) It degrades the viral genome.
(C) It helps in the assembly of new phages.
(D) It digests a portion of the bacterial cell wall to allow core tube penetration.

Correct Answer: D

Explanation: Lysozyme is released upon contraction of the tail and digests the host cell wall so that the core tube can penetrate into the host cell.

21. Why are cyanobacteria considered the most prominent photosynthetic bacteria?

(A) They are the only bacteria that produce oxygen during photosynthesis.
(B) They are the largest bacteria.
(C) They can fix nitrogen.
(D) They are the oldest bacteria.

Correct Answer: A

Explanation: They are the only bacteria that produce oxygen during photosynthesis. — this correctly answers the question.

22. What is the primary role of heterocysts in cyanobacteria?

(A) Photosynthesis
(B) Nitrogen fixation
(C) Reproduction
(D) Motility

Correct Answer: B

Explanation: Approximately one-third of cyanobacteria have the capability to fix atmospheric nitrogen, often occurring within heterocysts, specialized cells with thick walls and no nuclei.

23. Which process involves the uptake of free DNA from the environment by a bacterial cell?

(A) Conjugation
(B) Transduction
(C) Transformation
(D) Binary fission

Correct Answer: C

Explanation: Transformation is the absorption of DNA into a cell. When bacteria die, they release DNA fragments that can be taken up by a recipient cell.

24. A bacterial infection is treated with penicillin. Why does this antibiotic work?

(A) It inhibits protein synthesis by binding to 70S ribosomes.
(B) It destroys the bacterial DNA.
(C) It prevents the formation of the cell membrane.
(D) It targets the peptidoglycan cell wall, causing the bacterium to burst.

Correct Answer: D

Explanation: Penicillin targets the peptidoglycan cell wall, which is essential for bacterial survival. Human cells lack a cell wall, so they are unaffected.

25. Which of the following statements correctly describes the process of transduction?

(A) DNA is transferred by a bacteriophage from one bacterium to another.
(B) DNA is transferred through direct contact between two bacteria.

(C) Free DNA is taken up from the environment.
(D) A bacterium divides by binary fission.

Correct Answer: A

Explanation: Transduction is a genetic transfer process in bacteria facilitated by bacteriophages. During infection, phages inject their genetic material into bacteria.

B. Less Important / Secondary Topics

26. What is the function of the capsule in some bacteria?

(A) It aids in the adherence of bacteria to human tissues.
(B) It provides motility.
(C) It is the site of protein synthesis.
(D) It stores nutrients.

Correct Answer: A

Explanation: It aids in the adherence of bacteria to human tissues. — this correctly answers the question.

27. Which bacterial shape is described as a curved rod resembling a comma?

(A) Bacillus
(B) Vibrio
(C) Coccus
(D) Spirillum

Correct Answer: B

Explanation: Rod-shaped bacteria curved into a form resembling a comma are called Vibrio.

28. How do obligate anaerobic bacteria differ from facultative bacteria?

(A) Obligate anaerobes require oxygen; facultative bacteria do not.
(B) Obligate anaerobes are photosynthetic; facultative bacteria are not.
(C) Obligate anaerobes cannot grow in the presence of oxygen; facultative bacteria can grow with or without oxygen.
(D) Obligate anaerobes are larger than facultative bacteria.

Correct Answer: C

*Explanation: Anaerobic bacteria like *Spirochaeta* do not require oxygen. Facultative bacteria like *E. coli* can grow with or without oxygen.*

29. Which of the following is a method of bacterial control that involves the use of steam under pressure?

(A) Pasteurization
(B) Refrigeration
(C) Freezing
(D) Autoclaving (Sterilization)

Correct Answer: D

Explanation: Autoclaving (Sterilization) — this correctly answers the question.

30. What is the role of the basal body in a bacterial flagellum?

(A) It produces rotatory motion.
(B) It connects the flagellum to the cell membrane.
(C) It is the propeller that causes the cell to spin.
(D) It synthesizes proteins.

Correct Answer: A

Explanation: The basal body originates just beneath the cell membrane and is a complex structure that produces rotatory motion.

31. In the Gram stain, what color do Gram-positive bacteria appear?

(A) Pink
(B) Purple
(C) Green

(D) Colorless

Correct Answer: B

Explanation: Purple — this correctly answers the question.

32. What is the function of the enzyme catalase in bacteria?

(A) It synthesizes ATP.
(B) It fixes nitrogen.
(C) It breaks down hydrogen peroxide into water and oxygen.
(D) It repairs DNA.

Correct Answer: C

Explanation: Peroxisomes contain catalase, which breaks down hydrogen peroxide (a toxic molecule) into water and oxygen.

33. Which of the following is a bacterial disease transmitted by contaminated water?

(A) Tetanus
(B) Tuberculosis
(C) Anthrax
(D) Typhoid

Correct Answer: D

*Explanation: Typhoid is caused by *Salmonella typhi* and is prevented mainly by public health measures that ensure a clean water supply.*

34. What is the primary characteristic of eubacteria?

(A) They have a thick peptidoglycan cell wall.
(B) They have a true nucleus.
(C) They have 80S ribosomes.
(D) They lack a cell membrane.

Correct Answer: A

Explanation: Eubacteria are prokaryotes, and their cell walls contain peptidoglycan.

35. Which of the following is an example of a bacterium that causes food poisoning?

(A) *Lactobacillus*
(B) *Clostridium botulinum*
(C) *Rhizobium*
(D) *Nitrosomonas*

Correct Answer: B

*Explanation: *Clostridium botulinum* is a bacterium that causes food poisoning (botulism) and makes several different toxins.*

36. A new antibiotic is found to be effective against Gram-negative bacteria but not Gram-positive bacteria. What is the most likely explanation?

(A) The antibiotic targets the thick peptidoglycan layer unique to Gram-negative bacteria.
(B) The antibiotic targets the outer membrane of Gram-negative bacteria.
(C) The antibiotic cannot penetrate the thick peptidoglycan layer of Gram-positive bacteria.
(D) The antibiotic targets the teichoic acid in Gram-positive bacteria.

Correct Answer: C

Explanation: Gram-positive bacteria have a notably thicker peptidoglycan layer that may prevent the penetration of certain antibiotics.

37. What would happen to a bacterial cell if its gene for DNA polymerase were mutated and non-functional?

(A) The cell would be unable to synthesize proteins.
(B) The cell would be unable to fix nitrogen.
(C) The cell would be unable to move.
(D) The cell would be unable to replicate its DNA and divide.

Correct Answer: D

Explanation: DNA polymerase is essential for DNA replication. Without it, the cell cannot replicate its DNA and divide.

38. Why is the presence of introns in some archaeal genes considered evidence for their closer relationship to eukaryotes?

(A) Introns are only found in eukaryotes and archaea, not in bacteria.
(B) Introns are only found in bacteria.
(C) Introns are absent in all organisms.
(D) Introns are found in all prokaryotes.

Correct Answer: A

Explanation: Introns (noncoding parts of genes) are present in some archaeal genes and in eukaryotic genes, but are absent in eubacteria.

39. If a patient is infected with a bacterium that produces an endotoxin, what is the most likely source of this toxin?

(A) The peptidoglycan layer
(B) The lipopolysaccharide (LPS) in the outer membrane
(C) The teichoic acid in the cell wall
(D) The flagella

Correct Answer: B

Explanation: Endotoxins are often lipopolysaccharides (LPS) found in the outer membrane of Gram-negative bacteria.

40. A bacterium is placed in a hypertonic solution. What will happen to the bacterial cell?

(A) It will swell and burst.
(B) It will remain unchanged.
(C) It will lose water and undergo plasmolysis.
(D) It will actively pump out water.

Correct Answer: C

Explanation: It will lose water and undergo plasmolysis. — this correctly answers the question.

41. How does the structure of the bacterial flagellum differ from that of eukaryotic cilia and flagella?

(A) Bacterial flagella are made of tubulin; eukaryotic cilia and flagella are made of flagellin.
(B) Bacterial flagella use ATP; eukaryotic cilia use a proton motive force.
(C) Bacterial flagella are larger than eukaryotic cilia and flagella.
(D) Bacterial flagella are made of flagellin and lack microtubules; eukaryotic cilia and flagella are made of microtubules.

Correct Answer: D

Explanation: Bacterial flagella are composed of flagellin and lack microtubules, while eukaryotic flagella have a 9+2 microtubule arrangement.

42. A bacterium is exposed to a mutagen that damages its DNA. Which repair mechanism would be most critical for its survival?

(A) DNA repair enzymes (e.g., DNA polymerase with proofreading)
(B) Binary fission
(C) Conjugation
(D) Transformation

Correct Answer: A

Explanation: DNA repair enzymes, including DNA polymerase with proofreading.

43. Which of the following correctly describes the mechanism of action of penicillin?

(A) It inhibits protein synthesis by binding to the 30S ribosomal subunit.
(B) It inhibits cell wall synthesis by blocking peptidoglycan cross-linking.
(C) It disrupts the cell membrane.
(D) It inhibits DNA replication.

Correct Answer: B

Explanation: It inhibits cell wall synthesis by blocking peptidoglycan cross-linking. — this correctly answers the question.

44. If a bacterial cell is treated with an enzyme that degrades pili, which of the following processes would be most directly affected?

(A) Motility
(B) Binary fission
(C) Conjugation
(D) Protein synthesis

Correct Answer: C

Explanation: Pili are involved in the adhesion of bacteria to surfaces and are also involved in conjugation, which requires direct contact between cells.

45. What would be the most likely consequence of a mutation that prevents a bacterium from forming endospores?

(A) The bacterium would be unable to reproduce by binary fission.
(B) The bacterium would become more pathogenic.
(C) The bacterium would grow faster.
(D) The bacterium would be more susceptible to harsh environmental conditions.

Correct Answer: D

Explanation: Endospores are a survival strategy that allows bacteria to endure extreme conditions. Without the ability to form endospores, the bacterium would be more susceptible to environmental stress.

46. Which of the following is a key difference between archaea and bacteria in terms of their cell wall composition?

(A) Archaea lack peptidoglycan, while bacteria typically have it.
(B) Archaea have peptidoglycan, while bacteria do not.
(C) Both archaea and bacteria have peptidoglycan.
(D) Archaea have chitin, while bacteria have cellulose.

Correct Answer: A

Explanation: Archaea lack peptidoglycan, while bacteria typically have it. — this correctly answers the question.

47. Which of the following statements correctly describes the nitrogen cycle?

(A) Nitrogen gas is converted to ammonia by nitrifying bacteria.
(B) Nitrogen gas is converted to ammonium by nitrogen-fixing bacteria like *Rhizobium*.
(C) Ammonia is converted to nitrogen gas by decomposers.
(D) Nitrates are converted to ammonia by *Nitrosomonas*.

Correct Answer: B

*Explanation: Within the root nodules of legumes, nitrogen-fixing bacilli bacteria, like those from the genus *Rhizobium*, transform nitrogen gas into ammonium.*

48. A researcher isolates a new bacterium that grows optimally at 70°C. How would this bacterium be classified based on its temperature preference?

(A) Psychrophile
(B) Mesophile
(C) Thermophile
(D) Acidophile

Correct Answer: C

Explanation: Bacteria living in hot springs may have an optimum temperature of 70°C or higher. Such bacteria are called thermophiles.

49. What is the main difference between a lytic and a lysogenic cycle?

(A) In the lytic cycle, the host cell survives; in the lysogenic cycle, it dies.
(B) Lytic cycles involve RNA viruses; lysogenic cycles involve DNA viruses.
(C) Only the lytic cycle produces new virions.
(D) In the lysogenic cycle, the viral DNA integrates into the host genome; in the lytic cycle, it does not.

Correct Answer: D

Explanation: In the lysogenic cycle, the phage DNA integrates into the host chromosome as a prophage. In the lytic cycle, it replicates independently and lyses the host.

50. If a bacterium is treated with a chemical that blocks the function of the 70S ribosome, what would happen?

(A) Protein synthesis would stop.
(B) DNA replication would stop.
(C) The cell wall would break down.
(D) The cell would be unable to produce ATP.

Correct Answer: A

Explanation: 70S ribosomes are the site of protein synthesis in prokaryotes. Blocking their function would stop protein synthesis.