Chapter	2 Bacteria and Viruses	Class	1st Year	Subject	Biology

Give Short Answers of the Following Questions

1. Write about the structural components 0f a bacterial cell wall and their arrangement.

Ans. Structural components of a bacterial cell wall and their arrangement:

- The bacterial cell wall is composed of several layers, including the peptidoglycan layer, outer membrane (in Gram-negative bacteria), and teichoic acids (in Gram-positive bacteria).
- The peptidoglycan layers provide structural support and maintain the cell's shape.
- The outer membrane contains lipopolysaccharides and porins, which regulate the passage of molecules.
- The arrangement of these components varies between gram-positive and gram-negative bacteria.

2. Write the composition of the peptidogylcan layer in bacterial cell wall.

Ans. Composition of peptidogylcan layer:

- **The peptidogylcan layer is composed of glycan chains cross-linked by peptide bond.**
- The glycan chain are made up of N-acetylglucosamine and N-acetylmuramic acid.
- The peptide bonds are formed between the amino acids of adjacent glycan chain.
- The peptidoglycan layer provides structural support and maintains the cell's shape.

3. What are mesosomes? What are their functions?

Ans. Mesosomes:

- Mesosomes are invaginations of the bacterial cell membrane.
- They are thought to be involved in cellular processes such as DNA replication and cell division.
- Mesosomes may also play a role in the formation of septa during cell division.
- However, their exact function is still debated.

4. How can plasmids be used in genetic engineering?

Ans .Use of plasmid in genetic engineering:

- Plasmids are small, self replicating circular DNA molecules that can be used as vectors in genetic engineering.
- They can be engineered to carry foreign genes, allowing for the expression of new trait.
- Plasmids can be introduced into bacterial cells through transformation.
- They are commonly used in biotechnology applications.

5. Define sporulation?

Ans. Sporulation:

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- Sporulation is the process by which certain bacteria, such as bacillus and clostridium, from highly resistant spores.
- Spores are formed through a complex process involving the engulfment of the bacterial cell by a septum.
- Spores are highly resistant to heat, desiccation, and other environmental stresses.
- They can remain dormant periods.

6. What is the function of the bacterial capsule?

Ans. Function of bacterial capsule:

- The bacterial capsule is a layer of polysaccharides or proteins that surrounds the cell.
- It provides protection against desiccation, phagocytosis, and other environmental stresses.
- The capsule can also play a role in virulence and adherence of surfaces.
- It is a key virulence factor in many pathogenic bacteria.

7. Write the role of pili in bacterial cell. How do they differ from flagella?

Ans. Role of pili in bacterial cell:

- Pili are hair-like appendages that protrude from the bacterial cell surface.
- They play a role in attachment to surface, DNA transfer, and motility.

Differences from flagella:

- Pili are distinct from flagella, which are involved in motility.
- Pili are typically shorter and more rigid than flagella.

8. What are plasmids, and how do they contribute to enabling bacteria to resistant against unfavourable conditions?

Ans. Plasmids:

- Plasmids are small, self replicated circular DNA molecule that can carry genes conferring resistance of antibiotics or other stresses.
- They can be transferred between bacterial cells through conjugation.

Antibiotic Resistance Genes:

- Plasmids often carry genes that produce enzymes or proteins capable of breaking down antibiotics or pumping them out of the cell.
- This enables bacteria to survive in environments with high antibiotic concentration.

Toxin Production:

- Some plasmids encode genes for toxins that damage host tissues or inhibit competing microorganisms, increasing the bacterium's chance of survival under hostile conditions.

Heavy Metal Resistance:

- Plasmids can carry genes that allow bacteria to resist toxic metals like mercury or arsenic by converting them into less harmful forms or actively expelling them from cell.

9. Write about the role of endospores in bacterial survival.

Ans. Role of Endospores in Bacterial Survival:

- Endospores are highly resistant structures formed by certain bacteria.
- They provide protection against extreme temperatures, desiccation, and other environmental stresses.
- Endospores can remain dormant of extended periods, allowing bacteria to survive in hostile environments.
- They are a key factor of bacteria such as bacillus and clostridium.

10. What is the significance of lipoplysaccharides and lipoproteins in germ-negative bacteria?

Ans. Significance of Lipoplysaccharides and Lipoprotein in Germ-Negative:

- Lipoplysaccharides and lipoproteins are components of outer membrane of gram-negative bacteria.
- They play a role in structural integrity of the outer membrane.
- Lipoplysaccharides can also act as endotoxins, eliciting a strong immune response in hosts.
- They are a key virulence factor in many gram-negative pathogens.

11. How do spirochetes achieve motility?

Ans**. Mobility of Spirochetes Achieve Motility:**

- Spirochetes achieve motility through the rotation of their axial filaments.
- Axial filaments are internal flagella that run along the length of the cell.
- The rotation of the axial filaments causes the cell move in a corkscrew-like motion.
- This unique form of motility allows spirochetes to move through viscous environments.

12. Differentiate between twitching and gliding movements in bacterial motility.

Ans.

Twitching	Gliding
• Relies on ''type IV pili'', which extend, attach to surfaces, and retract to pull the bacterium forward in a jerky motion. • Short, jerky, and intermittent movements over solid surfaces (e.g. ''pseudomonas aeruginosa'').	• Involves ''secreted slime'', motor proteins, or specialized adhesion complexes that enable smooth, continuous movement along surfaces without flagella or pili. • Smooth, wave-like, and directional movement, often used for spreading colonies or hunting prey (e.g., Myxococcus Xanthus or cytophaga species).

13. How do bacteria without flagella achieve motility?

Ans. Bacterial Motility without Flagella:

- Some bacteria without flagella achieve motility through gliding or twitching movements.
- **Gliding Motility:** It involves the movement of the cell along a surface without use of flagella.
- **Twitching:** It involves the use of type IV pili to pull the cell forward.
- **Other mechanisms**, such as the use of appendages or changes in cell shape, can also contribute to motility in bacteria without flagella.

14. What is the difference between swimming motility and swarming motility in bacteria?

Ans.

Swimming motility	Swarming motility
• Swimming motility refers to the movements of individual bacterial cell through a liquid environment. • The distinction between swimming and swarming motility lies in the behavior of the cells and the environment in which they are moving.	• Swarming motility, on the other hand, involves the coordinated movement of a group of bacterial cells across a surface. • Swarming motility is often associated with the formation of a complex community or biofilm.