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SEM I

3 HOURS)

(100 marks)

N.B. (1) Attempt all questions. (2) Draw labeled diagrams wherever necessary.

Q1. A. Define the following terms:

(5)

1. **Teichoic acid** Polymers of glycerol or ribitol joined by phosphates; they are found in the cell walls of gram-positive bacteria.
2. **Microtubules** small cylinders made up of tubulin protein and present in cytoplasm, cilia and flagella of eukaryotic cells.
3. **Proteasome**- it is a huge cylindrical complex wherein protein structures that are misfolded in a eukaryotic cell are degraded.
4. **Phospholipid** a lipid containing a phosphate group.
5. **Epimer**

Ans: Two sugars that differ only in the configuration around one carbon atom are called **epimers**; eg. D-glucose and D-mannose or D-Glucose & D-Galactose.

Q I B. State whether the following statement is true or false:

(5)

1. Cyanophycin granules are reserves of amino acids. **true**
2. Carboxysomes participate in photosynthesis. **true**
3. Hopanoids are present in bacterial endospores. **False**
4. The eukaryotic ribosome has a sedimentation coefficient of 80S - **True**.
5. Glucose is non-reducing sugar. **False**

Q I C. Give one example for each of the following:

(5)

1. Bacteria possessing motility *E. coli*, *S. typhi*, *P. aeruginosa*.
2. Chemical responsible for heat resistance of bacterial endospore. **Ca -dipicolinate, SASPs**
3. Cytoskeletal elements in eukaryotes- **microtubules, microfilaments, intermediate filaments.**
4. Chemical agents used for room fumigation. Vaporized formaldehyde
5. Pentose **Ribose, Deoxyribose, Xylose, Xylulose, Ribulose**

Q I D. Select the correct alternatives and rewrite the statement.

(5)

1. **Gas vesicles** are responsible for providing buoyancy to bacteria.
2. **Lysozyme** is responsible for breaking down the peptidoglycan.
3. The rough endoplasmic reticulum is involved in the synthesis and transport of **Proteins**].
4. Lysosomes maintain an acidic environment by pumping **H<sup>+</sup>** into their interior.
5. Proteins have **peptide** bonds between amino acids.

Q II . Answer briefly any two of the following:

(20)

1. Explain the plasmids in bacteria, their types and significance.. **Prescott, 8<sup>th</sup> ed, pages 45-46**

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2. Discuss the structure and function of cilia and flagella in Eukaryotes (**Prescott 8<sup>th</sup> edition –page 95-96**).
3. Write a note on structure of RNA [Definition, constituents, nitrogenous base unique, ss nature, ds in tRNA, types of RNA, their function

**Q III. A. Answer briefly any three of the following:** (18)

1. Discuss the contribution of Winogradsky and Beijerinck in the field of microbial ecology.. **Prescott, 8<sup>th</sup> ed, page 11, Stanier , page 12-13**
2. Explain the scope of Medical Microbiology, immunology and public health microbiology.. **Elementary microbiology, Modi, pages-20, 21**
3. Discuss the chemotaxis and its significance in bacteria. **Prescott, 8<sup>th</sup> ed, pages 59-60**
4. Discuss the ultrastructure of cell wall of Gram negative bacteria.. **Prescott, 8<sup>th</sup> ed, pages 50-51**
5. Discuss the pili, fimbriae and their functions in bacteria. **Prescott, 8<sup>th</sup> ed, page 55**
6. Write a note on Nucleoid of bacteria and state how it differs from eukaryotic nucleus.. **Prescott, 8<sup>th</sup> ed, pages 44-45**

**III B. Do as directed any two of the following:** (2)

1. State the function of S- layer.. **Their biological roles include protecting the cell against ion and pH fluctuations, osmotic stress, enzymes, or predacious bacteria. The S-layer also helps maintain the shape and envelope rigidity of some cells, and it can promote cell adhesion to surfaces. Finally, the S-layer seems to protect some bacterial pathogens against host defenses, thus contributing to their virulence**
2. Name one unusual amino acid present in peptidoglycan. **meso- DAP, D-alanine, D-glutamic acid**
3. State the function of Ca- dipicolinate in endospore.. **Stabilizes spore's nucleic acids, heat resistance**
4. Name the scientist who pioneered the anti septic surgical practices.. **Joseph Lister**

**Q IV. A. Answer briefly any three of the following:** (18)

1. Write a short note on biosafety cabinets and their use in laboratories (**Mackie and McCartney- 300-301**) IS-12035 pg 6-7.
2. note on Endoplasmic reticulum and its function (**Prescott 8<sup>th</sup> edition –page 84-86**).
3. Explain the structure of Golgi apparatus with help of a diagram and its significance (**Prescott 8<sup>th</sup> edition –page 85-86**).
4. There are many fundamental differences in eukaryotic and prokaryotic cells – Justify(**Prescott 8<sup>th</sup> edition –page 88-90**) .
5. Discuss the structure and significance of mitochondria in eukaryotic cell (**Prescott 8<sup>th</sup> edition –page 95-96**).
6. Write a short note on chloroplast (**Prescott 8<sup>th</sup> edition –page 90-91**).

**Q IV B. Do as directed any two of the following:** (2)

1. Give significance of nucleolus.  
Nucleolus plays a major role in ribosome synthesis

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2. Give significance of lipid raft.  
Lipid raft appear to participate in a variety of cellular processes like cell movement and signal transduction. They are also involved in the entry of viruses into host cell and assembly of virus.
3. functions of microtubules.
  - Maintain cell shape.
  - Involved in cell movement
  - Participate in intracellular transport processes.
4. Name the site of synthesis for non-secretory and non-membrane proteins.  
Free ribosomes.

**Q.V.A. Answer any three of the following**

**(18)**

1. How are lipids classified? Discuss the types briefly.

Ans: Pg 373-375 Lehninger.

- Based on their function: Structural and storage. Simple and complex lipids.
- Simple are fats and waxes
- Complex are phospholipids, glycolipids, steroids, prostaglandins
- cholesterol
- The fats and oils used almost universally as stored forms of energy in living organisms are derivatives of **fatty acids**.
- The simplest lipids constructed from fatty acids are the **triacylglycerols**, also referred to as triglycerides, fats, neutral fats. Triacylglycerols are composed of three fatty acids each in ester linkage with a single glycerol.

2. Explain amphoteric nature of amino acids give 2 examples of unusual.

**Structure of amino acid, charge, zwitterion, ornithine, citrulline, beta alanine, amino acids in peptidoglycan, intermediates in urea cycle.**

3. Draw the structure of water. How do polar solutes dissolve in it?

**Ans structure of water Pg 48 Lehninger 4<sup>th</sup> edn**

**Water forms hydrogen bonds with polar solutes. Pg 49 Lehninger 4<sup>th</sup> edn**

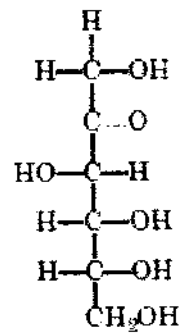
4. Write a short note on biological role of carbohydrates.
  - ✓ serve as storage forms of monosaccharides that are used as fuels; e.g. starch and glycogen.
  - ✓ (cellulose and chitin, for example) serve as structural elements in plant cell walls and animal exoskeletons.
  - ✓ The most important storage polysaccharides are starch in plant cells and glycogen in animal cells.
  - ✓ Source of energy, flavors, sweeteners,
  - ✓ Present in cell membrane-glycolipids and glycoproteins. Help in adhesion, cryoprotection.
  - ✓ Help in fat metabolism
5. Explain configuration, conformation & stereoisomerism : **Lehninger**
6. Discuss the primary and tertiary structure of protein. [**primary-linear, only peptide bond, has no biological role, cannot remain that way, tertiary structure-folded, has helical or sheet secondary structures, stable, has biological properties, held by number of weak interactions-hydrogen, van der waals, hydrophobic, disulphide, ionic interaction**]



V.B. Write the structural formula of any two

(02)

3. Write the structure of D-Fructose



Fructose

- 2 saturated fatty acid : palmitic, stearic, butyric, propionic, caproic, myristic
- 3 Uracil
4. alpha 1,6