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SEM I (2018-19)

3 HOURS)

(100 marks)

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

**Q I A. Define the following terms:** (5)

1. Hopanoids- Lipids found in bacterial membranes that are similar in structure and function to the sterols found in eucaryotic membranes
2. Lysosome –a spherical membranous eukaryotic organelle that contains hydrolytic enzymes and are responsible for intracellular digestion.
3. Lipid raft – it is a microdomain in plasma membrane which is enriched in cholesterol and lipids with many saturated fatty acids and is involved in many cellular processes.
4. Micelles – Micelles are lipid molecules that arrange themselves in a spherical form in aqueous solutions. The formation of a micelle is a response to the amphipathic nature of fatty acids, meaning that they contain both hydrophilic regions (polar head groups) as well as hydrophobic regions (the long hydrophobic chain).
5. Enantiomers - Stereoisomers which are mirror images of each other are called enantiomers

**Q I B. State whether the following statement is true or false:** (5)

1. The lipids present in cell membrane are amphipathic - True
2. Peptidoglycan is present in both eukaryotes and prokaryotes - False
3. Prokaryotic and eukaryotic ribosomes have same sedimentation coefficient FALSE
4. The stack of cisternae in golgi apparatus has a definite polarity TRUE.
5. Proteins are high molecular weight compounds . True

**Q I C. Give one example for each of the following:** (5)

1. Bacteria possessing carboxysomes - cyanobacteria and other CO<sub>2</sub>-fixing bacteria
2. Bacteria showing presence of metachromatic granules - .. *Corynebacterium diphtheria*, *Spirillum volutans*, *Lactobacillus species*
3. Gram positive cocci in chains- *Streptococcus pyogenes*, *S.lactis*, *Enterococcus faecalis*
4. Components of cell wall of Fungi – cellulose, chitin or glucan.
5. Sulphur containing amino acid - Methionine, Cysteine

**Q I D. Select the correct alternatives and rewrite the statement.** (5)

1. teichoic acid is present only in Gram positive cell walls.
2. The bacteria possessing Col plasmid produce colicin.
3. Cells selectively digest and recycle cytoplasmic components by a process called autophagy.
4. The IS: 12035 is a BIS standard on “safety in laboratories “.
5. Nucleic acids are polymers of nucleotides.

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**Q II . Answer briefly any two of the following:**

**( 20)**

1. Discuss the various stages of endospore formation with the help of a diagram.  
**Prescott, 8<sup>th</sup> ed, pages 61,62,63**
2. With help of a diagram discuss the structure of mitochondria and chloroplast and give their function in a cell (**Prescott 8<sup>th</sup> edition –page 88-91**).
3. What are monosaccharides? Write their general properties. List their types.
  - Ans: The simplest of the carbohydrates, the monosaccharides, are either aldehydes or ketones with two or more hydroxyl groups; the six-carbon monosaccharides glucose and fructose have five hydroxyl groups.
  - Monosaccharides are colorless, crystalline solids that are freely soluble in water but insoluble in nonpolar solvents. Most have a sweet taste.
  - If the carbonyl group is at an end of the carbon chain (that is, in an aldehyde group) the monosaccharide is an **aldose**; if the carbonyl group is at any other position (in a ketone group) the monosaccharide is a **ketose**.
  - The simplest monosaccharides are the two three-carbon trioses: glyceraldehyde, an aldotriose, and dihydroxyacetone, a ketotriose. Monosaccharides with four, five, six, and seven carbon atoms in their backbones are called, respectively, tetroses, pentoses, hexoses, and heptoses.
  - The hexoses, which include the aldohexose D-glucose and the ketohexose D-fructose are the most common monosaccharides in nature. The aldopentoses D-ribose and 2-deoxy-D-ribose are components of nucleotides and nucleic acids**Pg -239- 242 Lehninger 4<sup>th</sup> edn**

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

**(18)**

1. Explain the mechanism of flagellar movement. **Prescott, 8<sup>th</sup> ed, pages 57,58**
2. Discuss the scope of food microbiology and Agricultural microbiology **Elementary microbiology , Modi, pages 21, 22**
3. Discuss the contribution of Louis Pasteur to the field of Microbiology. **Stanier, pages 4,5,7**
4. Discuss the following- Carboxysomes and gas vesicles in bacteria. **Prescott, 8<sup>th</sup> ed, page43**
5. Diagrammatically explain the Fluid Mosaic model of cell membrane. **Prescott, 8<sup>th</sup> ed, pages 38,39**
6. Differentiate between : Prokaryotes and Eukaryotes **Prescott, 8 th ed. Page 80**

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

**( 2)**

1. State the function of magnetosomes. **Aquatic magnetotactic bacteria use these inclusions to orient themselves in Earth's magnetic field.**
2. Name one organism for which virulence depends on presence of capsule. ***Klebsiella pneumoniae, Streptococcus pneumonia, Bacillus anthracis***
3. State the advantage of possessing the R- factor. **Resistance to antibiotic, transfer of resistance plasmid during conjugation**
4. Name the scientist who discovered the causative agent of anthrax. **Robert Koch**

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

**(18)**

1. Discuss the similarities and differences in the structure of cilia and flagella in eukaryotes (**Prescott 8<sup>th</sup> edition –page 95-96**).
2. Explain the structure and function of a eukaryotic nucleus (**Prescott 8<sup>th</sup> edition –page 91-92**).

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3. How would you carry out disposal of pathogenic cultures and decontaminate an operation theatre?

(IS:12035 - 1986 Indian Standard code of safety in microbiological laboratories document pg 9)

4. Enlist three types of cytoskeletal elements found in eukaryotic cell, explain any one (Prescott 8<sup>th</sup> edition -page 83-84).
5. Define Golgi apparatus, its faces and one function (Prescott 8<sup>th</sup> edition -page 85-86).
6. Endoplasmic reticulum and its role. (Prescott 8<sup>th</sup> edition -page 84-86).

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

(2)

1. Free ribosomes. Site for synthesis of nonsecretory and nonmembrane proteins
2. Give significance of lysosomes. *nucleolus : Ribosome synthesis*  
lysosomes are involved in intracellular digestion and contain the enzymes needed to digest all types of macromolecules
3. What are plastids.  
Plastids are cytoplasmic organelles of photosynthetic protists that possess pigments such as chlorophylls and carotenoids and are site of synthesis and storage of food reserves.
4. Foot-operated taps: to avoid contamination of taps with cultures used in lab, safety measures, to avoid lab infections, cross contamination.

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

(18)

1. What are lipids-heterogenous group of compounds including fats, oils, sterols, waxes and other related compounds. Explain simple lipids-discuss triacylglycerides and waxes
2. Discuss secondary and tertiary structure of protein.
  - **Secondary structure** refers to particularly stable arrangements of amino acid residues giving rise to recurring structural patterns. Only hydrogen and peptide bonds,
  - **Tertiary structure** describes all aspects of the three-dimensional folding of a polypeptide. Different weak interactions, extensive folding, stability and functional attributes.
3. structure of DNA
  - Nucleotides -building blocks of Nucleic acids. Deoxyribonucleotides - DNA
  - The successive nucleotides of both DNA and RNA are covalently linked through phosphate-group bridges, in which the 5'-phosphate group of one nucleotide unit is joined to the 3'-hydroxyl group of the next nucleotide, creating a **phosphodiester linkage**
  - Thus the covalent backbones of nucleic acids consist of alternating phosphate and pentose residues, and the nitrogenous bases may be regarded as side groups joined to the backbone at regular intervals.
  - **Double helix, polarity of strand, number of bases per turn, major groove and minor groove.**

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4. Discuss starch and glycogen with respect to their structure and their biological role.

Ans: Some homopolysaccharides serve as storage forms of monosaccharides that are used as fuels;

starch and glycogen The most important storage polysaccharides are starch in plant cells and glycogen in animal cells. Both polysaccharides occur intracellularly as large clusters or granules.

**Starch** contains two types of glucose polymer, amylose and amylopectin. The former consists of long, unbranched chains of D-glucose residues connected by ( $\alpha$ 1,4) linkages. Such chains vary in molecular weight from a few thousand to more than a million. Amylopectin also has a high molecular weight (up to 100 million) but unlike amylose is highly branched. The glycosidic linkages joining successive glucose residues in amylopectin chains are ( $\alpha$ 1,4); the branch points (occurring every 24 to 30 residues) are ( $\alpha$ 1,6) linkages.

**Glycogen** is the main storage polysaccharide of animal cells. Like amylopectin, glycogen is a polymer of ( $\alpha$ 1,4)-linked subunits of glucose, with ( $\alpha$ 1,6)-linked branches, but glycogen is more extensively branched (on average, every 8 to 12 residues) and more compact than starch. Glycogen is especially abundant in the liver, Each branch in glycogen ends with a nonreducing sugar unit, a glycogen molecule has as many nonreducing ends as it has branches, but only one reducing end. When glycogen is used as an energy source, glucose units are removed one at a time from the nonreducing ends. Degradative enzymes that act only at nonreducing ends can work simultaneously on the many branches, speeding the conversion of the polymer to monosaccharides

5. Justify the statement 'Macromolecules are the major constituents of cells'.

Ans: pg 16-17 Lehninger 4<sup>th</sup> edn

6. Draw structure of water , how do solutes dissolve in it.

Ans: Pg: 47-51 Lehninger 4<sup>th</sup> edn

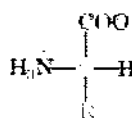
V.B. attempt any two

(02)

1. Give an example of a keto sugar.

Ans Fructose, Ribulose, Xylulose

2. Write the general formula of an



amino acid.

3. Sterol

4. dATP,dTTP,dGTP,dCTP