

MODULE 1

1. Explain structure and function of plant and animal cell with labelled diagram.
2. Explain the difference b/w plant and animal cell.
3. Difference between prokaryotic and eukaryotic cells.
4. What are stem cells, explain their applications.
5. Explain the properties and functions of the following:
 - i. Carbohydrates
 - ii. Proteins
 - iii. Nucleic acid
 - iv. Vitamins
 - v. Hormones
6. Explain the classification, properties and functions, properties and functions of enzymes with an example. Discuss the role of lipids in biological systems.
7. What is a biomolecule? Explain the classification of biomolecules.

MODULE 2

1. What are bioplastics? Compare the properties of PLA and PHA as bioplastics.
2. Illustrates the properties and applications of PHA
3. With an example, explain the development of DNA vaccines.
4. Explain the importance of lipids and its application in cleaning agents.
5. Discuss the development of vaccine in COVID 19.
6. Explain the DNA fingerprinting in forensic applications. Discuss briefly about glucose oxidase used in biosensor.
7. Explain the role of carbohydrates in the production of cellulose-based water filters.
8. What are the key properties, advantages and limitations of cellulose - based water filter
9. Explain the role of lignolytic enzymes in bio-bleaching and their impact on paper industry.
10. Discuss the following:
 - i. Lipids as biodiesel.
 - ii. Plant based proteins.
 - iii. Protein as a food.
11. Describe the use of
 - i. Whey protein
 - ii. Meat analogues
 - iii. Plant based proteins as food with examples
12. With an example explain the development of vaccines for the treatment of rabies.

MODULE 3

1. Discuss about the human brain as a CPU system.
2. What is ECG? Discuss the various parts of ECG.
3. Describe kidney as filtration system.
4. Explain heart as pumping system. What are pacemakers? Briefly explain the various kinds of pacemakers.
5. Explain lungs as a purification system. Write a note on dialysis system on kidney.
6. Illustrate the engineering solutions available for Parkinson's disease.
7. Justify eye as a camera system. Explain architecture of rod and cone cells with diagram.

8. Write a short note on:
 - i. Cataract
 - ii. COPD and CKD
 - iii. Defibrillators
9. With neat diagram explain the working principle of Heart – Lung machine.
10. Explain in detail Brain as a CPU

MODULE 4

1. What is echolocation? Discuss the application of echolocation in sonography.
2. Explain the structure and design of Kingfisher's beak led to bullet trains.
3. Write a note on photosynthesis process. Explain photovoltaic cells and explain its applications.
4. What is lotus effect? Explain the mechanism and application of lotus leaf effect.
5. Illustrate the HBOCs and PFCs as human blood substitutes.
6. Explain how the structure of a shark skin reduces drag and how these properties have been applied to improve swim suit.
7. Explain the term GPS and aircrafts technology as bio inspired by bird fly.
8. Compare the uses of ultrasonography and sonars. Write a short note on bionic leaf.
9. Explain the following.
 - i. Bionic leaf
 - ii. Photovoltaic cells.
10. What is a lotus effect? Explain the mechanism and applications of lotus leaf effect.
11. Explain eye as a camera system.
12. Write a short note on spirometry and ventilators.
13. Write a note on bionic eye. What are the materials used in bionic eye?

MODULE 5

1. Explain the use of electrical tongue and electronic nose in food science. Compare electronic nose and tongue with their biological counterparts.
2. Explain advantages and limitations of bioimaging and AI for disease diagnosis.
3. Explain bioengineering solutions for muscular dystrophy and osteoporosis.
4. Explain most commonly used bioprinting and materials used in 3D bioprinting.
5. Write a short note on DNA origami and biocomputing. What are the different types of materials used for 3D printing of bone.
6. Explain advantages and limitations of biomining and bioremediation. Write a short note on self healing concrete.
7. Explain the removal of heavy metals by biomining and bioremediation via microbial surface absorption.
8. Explain how the muscular and skeletal systems work as natural scaffolds.
9. Write a note on bio printing techniques and materials.