General Instructions:

(i) All questions are compulsory.
(ii) There is no overall choice. However, an internal choice has been provided in one question of three marks and two questions of five marks. You have to attempt only one of the choices in such questions. Question paper contains four sections – A, B, C and D.
(iii) Questions number 1 to 5 are very short answer questions, carrying 1 mark each.
(iv) Questions number 6 to 15 are very short answer questions, carrying 2 mark each.
(v) Questions number 16 to 25 are very short answer questions, carrying 3 mark each.
(vi) Questions number 26 to 28 are very short answer questions, carrying 5 mark each.
(vii) Use of calculators is not permitted. However, you may use log tables, if necessary.

SECTION – A

1. What is a nucleotide?
2. Indicate one disease caused by a mutant protein.
3. Haematoxylin-Eosin stain is commonly used to stain cells while studying them under a light microscope. Indicate which components of the cells are stained by the respective dyes.
4. Define Aneuploidy.
5. What do the following notations in a pedigree chart denote:

\[ \text{a)} \ \bigcirc \ \text{b)} \ \bigcirc \]

SECTION - B

6. Enlist any four bioethical issues in the field of biotechnology.
7. Differentiate between Glycolysis and TCA cycle. (any four differences)
8. What is the role of chlorophyll a molecule in the light reaction of photosynthesis?
9. Why is meiosis so important for the production of gametes or sex cells? How would the offspring of sexual reproduction be affected if sex cells underwent mitosis instead of meiosis?
10. Draw a neat and labeled diagram of the internal structure of an ovule.
11. Write short note on flow cytometry.
12. Explain what do you understand by the resolving power of a microscope?
14. What is Karyotype? How is an ideogram prepared?
15. Write short note on Q-banding and C-banding.
SECTION - C

16. What is a fermenter used for? Give the function of baffles and antifoams in a fermenter.

OR

Explain the effect of growth limiting substrate on growth of microorganisms. Support your answer with the help of a graphical representation showing the effect of substrate concentration on specific growth rate.

17. C4 plants ultimately use RUBISCO, yet have lower rate of photorespiration than C3 plants. Explain.

18. Give three reasons to explain the enormous catalytic power of enzymes.

19. Write short note on the three different forms of RNA present in a cell.

20. a) What is meant by glycosylation? Give an example.
   b) What are the functions of the pores present in the nuclear membrane?

21. a) Name five different classes of antibodies.
   b) Draw a neat and labeled diagram of an immunoglobulin molecule.

22. With the help of an experiment illustrate that DNA is the transforming agent in a cell.

23. What is gene interaction? Explain with the help of an example gene interaction where the phenotypic ratio deviate from Mendelian ratios.

24. State Mendel’s laws of inheritance.

25. What is meant by: a) Splicing  b) Capping  c) Polyadenelation

SECTION - D

26. a) Give two important characteristics of the stem cells. How embryonic stem cells differ from adult stem cells?
   b) Name any two of the several important functions of the proteins embedded in the plasma membrane.

27. Describe the mechanism of Translation in the synthesis of a polypeptide chain in a cell.

   OR

   a) List six prominent features of the genetic code
   b) Name and list the role of any two enzymes involved in DNA replication.

28. Define the following: a) Isoelectric focusing  b) Osmotic pressure  c) Density gradient Centrifugation  d) Ion Exchange Chromatography  e) Mass spectrometry

   OR

   a) What contributes to the surface hydrophobicity of proteins?
   b) Why hydrophobic interaction chromatography is generally carried out in the presence of high salt concentrations?