Section-A

1. One of the designed drug is good for treatment of breast cancer patients in whom one specific gene, Her-2 Neu, is overexpressed, name it. (1)

2. In the following equation, write the oxygen material balance.

\[ xC_kH_bO_c + yO_2 + zNH_3 \rightarrow C_dH_eO_iN_g + mH_2O + nCO_2 + pC_sH_uO_vN_w \] (1)

R/4 [P.T.O.]
3. In population genetics:
   \[ p + q = 1 \]
   What does ‘p’ represent? \( \text{(1)} \)

4. One of the three types of DNA is zig-zag in appearance, name it. \( \text{(1)} \)

5. What is the configuration of naturally occurring sugars? \( \text{(1)} \)

Section-B

6. Discuss the role played by SDS in separation of proteins with identical charge:
   mass ratio? Describe the basis of separation of molecules in gel permeation
   chromatography. \( \text{(1+1=2)} \)

7. (a) There is a disorder which involves a type of late onset of deterioration of the
   central nervous system name it. \( \text{(1+1=2)} \)
   (b) There is a disorder which is a form of dwarfism with normal trunk size but short
   arms and legs, name it. \( \text{(1+1=2)} \)

8. 'Proline gives yellow colour in ninhydrin test whereas other amino acids give blue
   colour.' Justify the statement. \( \text{(2)} \)

9. Name a ketohexose and aldohexose sugar. \( \text{(1+1=2)} \)

10. Discuss any two culture based counting methods. \( \text{(2)} \)

11. Construct a map of a chromosome, given the following map distances between
    individual pair of genes:
    - p-c 9 units
    - s-c 12 units
    - s-p 3 units
    - r-c 18 units
    - r-s 9 units

12. Give the function of the following:
    (a) Nuclear pores
    (b) Lysosomes

13. Differentiate between:
    (a) sensory and motor neurons
    (b) allopatric and sympatric speciation.

14. Do microbes possess an immune system? If not, what kind of defense mechanisms do
    they have? \( \text{(2)} \)

15. 'DNA replication is semi-discontinuous.' Justify the statement. \( \text{(2)} \)
Section-C

16. Why is there sudden excitement about biotechnology? How has genomics made its presence felt? (1 + 2 = 3)

17. Discuss the following techniques of separating molecules:
   (a) Electrophoresis
   (b) Isoelectric focusing. (1½ + 1½ = 3)

18. Define reducing sugar and non reducing sugar. Give one example of each. Give the test which is used to distinguish them. (1 + 1 + 1 = 3)

19. If one strand of DNA is:
   (a) 3' AATGCGCATGCTACGTACG 5'
   (b) 5' CTATCGAATTGCCTAAACCT 3'
   (c) 5' ACCCGTAGTGTCAGTGGC 3'
   Give the sequence of the other strand of DNA in each case. (1 + 1 + 1 = 3)

20. Give schematic representation of the working of an ecosystem. (3)

21. Name the following:
   (a) Tumour suppressor gene
   (b) Enzyme that synthesizes RNA primer
   (c) Genes which promote cell division. (1 + 1 + 1 = 3)

22. Describe chromosome painting? Discuss its applications. (1 + 2 = 3)

23. Differentiate between DNA and RNA. (1 + 2 = 3)

24. "Inheritance of flower colour in four o'clock plant does not follow Mendelian inheritance." Justify the statement. Make cross for Mendelian inheritance and inheritance of flower colour in four O' clock plant to support your answer. (3)

   OR

   Discuss Mendel's law of Independent Assortment. Also make a cross to explain it. (3)

25. What is the principle used in phase-contrast microscopy? Name a stain that binds to basic amino acids of proteins. What is cryoelectron microscopy? (1 + 1 + 1 = 3)

Section-D

26. Discuss immune system in human beings. Describe CMI response in human beings. (4 + 1 + 5)

   OR

   How do organisms regulate water and why do they need to do so? (3 + 2 = 5)

[3] [3] [P.T.O.]
27. Discuss in detail lac operon model. Discuss the two types of genes involved in regulation of cell cycle. (3+2=5)

OR

Differentiate between:
(a) Genes and Pseudogenes
(b) Sense strand and Anti-sense strand
(c) Introns and Exons
(d) Helicases and DNA ligase
(e) Transcription and Translation.

28. (a) If mother is the carrier and father is affected by 'Haemophilia', what will be the genotype and phenotype of the female progeny?
(b) Give the type of mutation occurring in the following:

\[
\begin{align*}
\text{abcdef} &\rightarrow \text{abcdcef} \\
\text{abcdef} &\rightarrow \text{abcdbcdef}
\end{align*}
\]