GENERAL INSTRUCTIONS:
1. The paper is divided into four Sections A, B, C and D.
2. Questions of Section A consist of one mark each, Section B of two marks each, Section C of 3 marks each and Section D consist of four marks each. There are a total of 30 questions.
3. All questions are compulsory.

SECTION–A

1. When compared, fresh juice appears to be turbid while bottled juice does not. What is the reason for this observation?

2. In making bacteria as a competent host for transformation with r-DNA, it is treated with a specific concentration of divalent cation like calcium. What is the role of calcium?

3. Mary Mallon, a cook along with her delicious food also spread typhoid to many people. How could she have done it without suffering or even knowing about the disease?

4. Name the enzyme involved in the continuous replication of the DNA strand. Mention the polarity of the template strand.

5. Name one autosomal dominant and one autosomal recessive Mendelian disorder in human beings.

6. Classify the following as examples of homology and analogy:
   (a) Eyes of octopus and mammals.
   (b) Thorns of Bougainvillea and spines of Opuntia.

7. What is meant by biofortification?

8. Name the source of smack. Mention one way in which it affects the human body.

SECTION–B

9. Why does a doctor administer tetanus antitoxin and not a tetanus vaccine to a child injured in a roadside accident with a bleeding wound?

P.T.O.
10. Following are the steps in a particular process. Name the process and fill in the steps that are given as blanks.

(i) Collection of Germplasm
(ii)  
(iii) Cross breeding / hybridized
(iv)  
(v) Testing release & commercialization of the new cultivator.

11. Fill in the blanks 1, 2, 3 and 4.

<table>
<thead>
<tr>
<th>Name of the crop</th>
<th>Name of the hybrid variety</th>
<th>Resistant to</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brassica</td>
<td>1</td>
<td>Aphids</td>
</tr>
<tr>
<td>Flat bean</td>
<td>Pusa sem</td>
<td>2</td>
</tr>
<tr>
<td>Okera Bhindi</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>

12. MOET is a programme for herd improvement. Expand this term and arrange the following steps in correct sequence.
(a) Produce 6-8 egg.
(b) A cow is administered hormones with FSH like activity.
(c) Mating the animal with an elite bull.
(d) Transferred to surrogate mothers.
(e) Fertilized eggs at 8-32 cell stages are recovered non-surgically.

13. (a) A bio-active molecule produced by a micro-organism acts by competitively inhibiting the enzyme responsible for cholesterol synthesis. Name the enzyme and the microbe out of which it is extracted?
(b) Radha has just undergone a kidney transplant. A bioactive molecular drug in administered to oppose kidney rejection by the body. What is the bioactive molecule? Also name the microbe from which this is extracted?

14. (i) Mention the number of primers required in each cycle of polymerase chain reaction (PCR). Write the role of primers and DNA polymerase in PCR.
(ii) Give the characteristic feature and the source organism of the DNA polymerase in PCR.

15. Each restriction enzyme cuts DNA at a specific base sequence. For example, EcoRI always cuts DNA at GAATTC

3'—GTAAGAATTCTTTAGAATTCCGCCATTATCGAATTCAGGATCCTTAAC—5'
5'—CATTCTTAAAGAATCTTTAAGGCCGGAATAGCTTAACTGAATG—3'
(a) How many times does EcoRI cut this long strand?
(b) How many small DNA pieces are formed from this long strand?
(c) These fragments show overhangs of single stranded DNA. What are they known as?
(d) Which enzyme is used to seal these fragments together?

16. A tRNA is charged with amino acid methionine.
   (a) At what end of the tRNA is the amino acid attached?
   (b) What is the mRNA codon for this amino acid?
   (c) What is the anti-codon on this tRNA molecule?
   (d) What does the secondary structure of this RNA look like?

17. A foreign DNA fragment is introduced into the plasmid at the 'Bam H-1' site of the tetracycline resistant gene in the vector 'pBR 322'.
   (a) How does it affect the recombinant plasmid?
   (b) What is this mechanism known as?
   (c) Mention its advantages?

18. The clinical gene therapy is given to a 4 year old patient for an enzyme which is crucial for the immune system to function.

   (A) Lymphocytes of the Patient.
   (B) .................................................................
   (C) Introduction of functional ADA cDNA into lymphocytes.
   (D) .................................................................

Observe the therapeutical flow chart and give the answer of the following:
   (a) Complete the missing steps (B) and (D).
   (b) Identify the disease to be cured.
   (c) Why is the above method not a complete solution to the problem?

SECTION-C

19. Why are grasshopper and drosophila said to show male heterogamety? Explain. What is female heterogamety. Site an example.

20. In pea plants allele for purple flower (P) is dominant to the allele for white flowers (p). The genotype of purple flower could be PP or Pp. How will you determine the correct genotype of purple flowered plant?
21. Fill in the spaces/blanks in the following flow chart.
   (i) Mosquito bites a healthy human and injects sporozoites.
   (ii) Sporozoites reach the __________ through __________
   (iii) Reproduces ______ burst the cells and release into blood
   (iv) Enter the ______
   (v) Reproduce asexually and release by bursting the cells release __________
   responsible for fever
   (vi) Some of them form _______ that are picked up by a mosquito when it bites.

22. Given below is the flow chart of a Sewage treatment. Fill in the blank spaces marked 'a' to 'f'.

   Sewage treatment is done in step, subjected to filtration and sedimentation, called... (a).

   Supermaste is shifted to separate tanks and air is pumped mechanically, called... (b).

   Microbes grow into masses, called... (c).

   There is reduction in... (d).

   Bacterial flocs are allowed to settle, the sedimentation is called... (e).

   After Secondary treatment, the water is released into... (f).

23. During his studies on genes in Drosophila that were sex linked T.H. Morgan found F2 population phenotypic ratios deviated from the expected 9:3:3:1. Give details of the conclusion he arrived at.

24. In a series of experiments with Streptococcus and mice F. Griffith concluded that R-strain bacteria had been transformed. Explain.

25. Fitness is the end result of the ability to adapt and get selected by nature. Use a suitable example to explain the same.
26. Why was hybridization carried out between the species of sugarcane grown in North India and that grown in South India? Write the scientific names of these two species of sugarcane?

27. In the figure, the structure of an antibody molecule is shown. Answer the following questions.
   (i) Label the parts A, B and C.
   (ii) Which cells produce these chemicals?
   (iii) State the function of these molecules.

28. In the given figure, Form (A) and Form (B) represent different forms of a proteinaceous hormone secreted by pancreas in mammals.

(a) What type of bonding is present between chains of this hormone?
(b) What are these form (A) and form (B). How these forms differ from each other?
(c) Explain how this hormone was produced by Eli Lilly, an American company, using rDNA technology.

29. What is somatic hybridisation? Describe the various steps in producing somatic hybrids from protoplasts. Mention any two uses of somatic hybridisation.

30. (a) Draw a labelled diagram of a typical biogas plant.
(b) How is slurry formed and digested in the biogas plant?
(c) What are the uses of spent slurry and biogas.