General Instructions:

(i) All questions are compulsory.

(ii) This question paper consists of four Sections A, B, C and D. Section A contains 8 questions of one mark each, Section B is of 10 questions of two marks each, Section C is of 9 questions of three marks each and Section D is of 3 questions of five marks each.

(iii) There is no overall choice. However, an internal choice has been provided in one question of 2 marks, one question of 3 marks and all the three questions of 5 marks weightage. A student has to attempt only one of the alternatives in such questions.

(iv) Wherever necessary, the diagrams drawn should be neat and properly labelled.

Section A

1. Which types of gametes are found in cladophora and Fucus.

2. The diploid number of chromosomes in an angiospermic plant is 16. What will be the number of chromosomes in the endosperm and antipodal cell?

3. Name the disorder with the following chromosome complement
   (i) 22 pairs of autosomes + XXY
   (ii) 22 pairs of autosomes + 21st chromosome + XY

4. Name the parts ‘X’ and ‘Y’ of the transcription unit given below:

5. How large holes are produced in Swiss Cheese?

6. Conventional method like serum and urine analysis are not effective for early diagnosis when the concentration of pathogens is very low. However some biotechnological techniques can serve the purpose and diagnose the pathogen before symptoms appear in the patients. Suggest two such techniques.
7. State Allen's rule.

8. What was the phenomenon observed by Alexander von Humboldt?

Section B

9. Differentiate between spermiogenesis and spermiation.

10. In the given figure, label A and B and give the functions:

11. You are given a tall plant. How will you find out its genotype?

12. Observe the process of hybridisation given below and fill in the blanks.

   ![Diagram of Tomato Cell and Potato Cell]

   (i) __________
   (ii) __________
   (iii) __________
   (iv) __________

13. How does addition of a small amount of curd to fresh milk help in the formation of curd? What is the nutritional value that gets added to curd?

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

15. (a) A patient had suffered myocardial infarction and clots were found in his blood vessels. Name a clot buster that can be used to digest the clots and the microorganism from which it is extracted?
(b) Radha had just undergone a kidney transplant. A bioactive molecular drug in administered to oppose kidney rejection by the body. What is the bioactive molecule?
Name the microbe from which this is extracted?

16. Give reasons for the following:
(a) Leguminous plants are cultivated as green manure
(b) Antibody mediated immunity is called humoral immunity

OR
Fill in the blanks in the different columns of the table given below, to identify the nos 1 to 4

<table>
<thead>
<tr>
<th>Name of disease</th>
<th>Causative organism</th>
<th>Symptoms</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Pneumonia</td>
<td>Streptococcus</td>
<td>(1)</td>
</tr>
<tr>
<td>2. Typhoid</td>
<td>(2) High fever, weakness headache, stomach pain</td>
<td></td>
</tr>
<tr>
<td>3. Rhinoviruses</td>
<td>Nasal Congestion, and discharge sore throat cough, headache</td>
<td></td>
</tr>
<tr>
<td>4. Ascariasis</td>
<td>Ascaris</td>
<td>(4)</td>
</tr>
</tbody>
</table>

17. How will you measure population density in following cases?
(a) fish in a lake
(b) tiger census in a national park

18. What is Polyblend? How is it useful?

Section-C

19. Draw a neat diagram of L.S. Maize grain and label any six parts.

20. A woman with 0 blood group marries a man with AB blood group
(i) work out all the possible phenotypes and genotypes of the progeny.
(ii) Discuss the kind of dominance in the parents and the progeny in this case.
21. Show diagrammatically the Hershey-Chase experiment under headings (i) Infection (ii) Blending and (iii) Centrifugation.

22. Charles Darwin during a sea voyage round the world in a sail ship (H.M.S Beagle), concluded that there has been gradual evolution of life forms.
   (i) What is his theory known as?
   (ii) Write the main points of his theory.
   (iii) Name a scientist who arrived at a similar conclusion like that of Charles Darwin.

23. The structure of an antibody molecule is shown below.
   (i) Label the parts A, B and C.
   (ii) Which cells produce these chemicals?
   (iii) State the function of this molecule.

   ![Antibody molecule diagram](image)

   (i) What group of chemicals does this structure represent?
   (ii) From which plant are these chemicals obtained?
   (iii) Which parts of the above plant are used to make hashish and ganja?
   (iv) In what ways are these chemicals consumed by people?
   (v) What are the effects of consuming these chemicals?
24. Give a diagrammatic representation of recombinant DNA technology.

25. Why cannot DNA pass through the cell membrane? How can the bacteria be made competent to take up a plasmid? Explain a method for introduction of alien DNA into a plant host cell. Name a pathogen that is used as a disarmed vector.

26. Study the figure of vector pBR322 given below in which foreign DNA is ligated at the Bam H1 site of tetracycline resistance gene.

![Diagram of pBR322 vector]

Answer the following questions:
(a) Mention the function of rop.
(b) What will be the selectable marker for this recombinant plasmid and why?
(c) Explain transformation.

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

![Forms A and B]

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

28. (a) Draw the Embryo sac of a flowering plants and label:
   (i) Central Cell (ii) Chalazal end (iii) Synergids

(b) Name the cell that develops into the embryo sac.

(c) Mention the role played by various cells of the embryo sac.

OR

(i) Name the techniques which are employed in following cases:
   (a) Transfer of an ovum collected from a donor into the fallopian tube of
       another female who cannot produce ova but can provide suitable
       environment for fertilisation and development.
   (b) Embryo is formed in laboratory in which sperm is directly injected into ovum.
   (c) Semen collected either from husband or a healthy donor is artificially
       introduced either into vagina or uterus.
   (d) Fertilization outside the body in almost similar conditions as that in the
       body, followed by embryo transfer

   (i) Differentiate between Vasectomy and Tubectomy.
   (ii) Give reasons

   (a) The second half of the menstrual cycle is called luteal phase as well as secretory phase.

   (b) Failure of testes to descend into scrotal sacs leads to sterility.

29. (a) Due to a transcription error, ATG of DNA formed UAG in mRNA. What would
   happen to the polypeptide chain during translation by this change mRNA?

(b) Thorns of Bougainvillea and spines of Opuntia are termed analogous organs. Why?

(c) What is adaptive radiation? Give two examples.

(d) Evolution of early forms of life occurred in water. Which animal is believed to
    have evolved into amphibian?

(e) Name the person who proposed that population tends to increase geometrically
    while food production supply increases arithmetically.

OR

(a) Draw the labelled diagram of lac operon (i) In absence of an inducer (ii) In
    presence of an inducer.

(b) The methods adopted for sequencing DNA involve two approaches. Explain.
30. (a) Fill up the missing links depicted as A, B, C and D in the given model of primary succession.

\[ \text{Phytoplankton} \rightarrow \square A \rightarrow \text{Submerged free floating stage} \downarrow \]
\[ \square D \leftarrow \square C \leftarrow \text{Marsh Meadow stage} \leftarrow \square B \]

(b) Orchid flower, Ophrys co-evolves to maintain resemblance of its petal to the female bee. Explain how and why it does so?

OR

Why is the sobriquet 'The Evil Quartet' used in context of biodiversity? Name the members of this quartet. Why do we grieve for the genes when a species is lost?