

PART - A

BOTANY

(Maximum : 30 Scores)

Time : 1 Hour

I. Answer any 3 questions from 1 to 5. Each carries 1 score.

(3 × 1 = 3)

1. A genetic mechanism which prevents inbreeding depression in majority of angiospermic plants is _____.

- (a) Parthenogenesis
- (b) Parthenocarpy
- (c) Mutation
- (d) Self-Incompatibility

2. Given below are the steps carried out to construct a recombinant DNA.

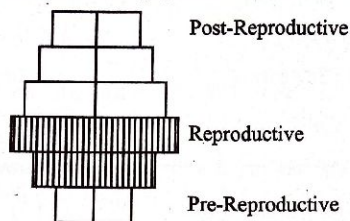
- (i) Isolation of genetic material
- (ii) Insertion of recombinant DNA in the host cell /organism
- (iii) Obtaining the foreign gene product
- (iv) Amplification of gene of interest
- (v) Downstream processing.

Which one of the following gives the correct sequences of these steps ?

- (a) (i) (iii) (iv) (ii) (v)
- (b) (i) (iv) (ii) (iii) (v)
- (c) (ii) (i) (iii) (iv) (v)
- (d) (ii) (iv) (v) (iii) (i)

3. Name the Indian crop variety for which in 1997, an American company got patent right through the US Patent and Trademark Office.

4. The status of human population reflected in the human age pyramid given below is



- (a) Declining population
 (b) Stable population
 (c) Expanding population
 (d) Extinct population.
5. If 10,000 Joules of energy is available at the producer level, how much energy would typically be available to the tertiary consumer ?

II. Answer any 9 questions from 6 to 16. Each question carries 2 scores. (9 × 2 = 18)

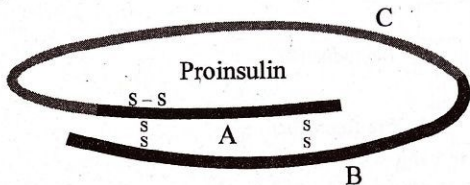
6. Some flowers selected for artificial hybridisation do not require emasculation but bagging is essential for them. Give reason.
7. Name the organic materials from which the exine and intine of an angiosperm pollen grain are made up of. Explain which property of exine that protects pollen grain.
8. DNA cannot pass through cell membrane of bacteria, why ? How is a bacterial cell made competent to take up foreign DNA ?
9. Match the following :

Column I

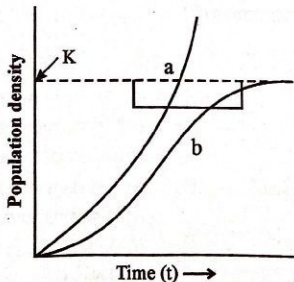
Column II

- | | |
|------------------------------|---|
| I. DNA Ligase | - A. Remove nucleotide from ends of DNA |
| II. Exonucleases | - B. Extends Primer on a DNA template |
| III. Taq Polymerase | - C. Cut DNA at Specific Position |
| IV. Restriction Endonuclease | - D. Joins the DNA fragments |

10. Insulin in the human body is secreted by pancreas as prohormone/proinsulin. The schematic polypeptide structure of proinsulin is given below. The proinsulin needs to undergo processing before it becomes functional in the body. Observe figure and answer the questions that follows.



- (a) State the changes the Proinsulin undergoes at the time of processing to become functional.
- (b) How are the two Polypeptide of a functional insulin chemical held together ?
11. Why does the insecticidal protein produced by *Bacillus thuringiensis* not kill the bacterium, but kills the cotton bollworms ? Explain.
12. State the various defence mechanisms that the following organisms have to evolve to protect themselves from predators :
- (a) Frogs
- (b) Monarch butterfly
13. Study the graph which is given below and answer the questions that follows :



- (I) Which one of the two curves is considered as more realistic one for most of the animal population ? And why ?

- (II) The curve 'b' is described by the following equation :

$$dN/dt = rN \left(\frac{K-N}{K} \right)$$

What does 'K' stands for this equation ?

14. Identify the following interactions :

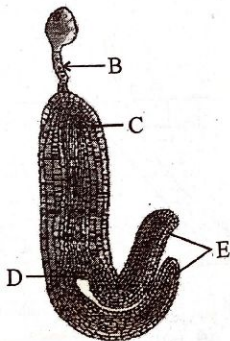
- (a) Barnacles on whale
- (b) Mycorrhiza
- (c) Abingdon tortoise and goats
- (d) Ticks and dogs

15. Ecological pyramids give important information about the ecological systems, but do have some limitations. List two limitations of ecological pyramids.

16. Detritus are the raw materials for decomposition. There are several steps involved in this decomposition process. Name and explain the processes in which earth worm and bacteria carry on detritus.

III. Answer any 3 questions from 17 to 20. Each question carries 3 scores. (3 × 3 = 9)

17. (a) Identify the figure given below.
(b) and also identify the parts B, C, D, E.
(c) State the function of 'E'.



18. (a) Simple stirred-tank bioreactor are used to produce large quantities of recombinant proteins, stirring the contents and mixing it with oxygen.

Write any four other features of stirred-tank bioreactor.

- (b) After downstream processing, the product of biosynthetic stage cannot be marketed directly, why ? Give one reason.
19. (a) What are transgenic animals ?
- (b) Name the transgenic animals those having the largest number amongst all the existing transgenic animals.
- (c) Mention any three purposes for which these animals are produced.
20. (a) What is primary productivity of an ecosystem and how is it expressed ?
- (b) State the equation that represents it.
- (c) Rate of formation of new organic matter by consumer is called _____.