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BIOLOGY

(Theory)

Full Marks : 70

Time : 3 hours

The figures in the margin indicate full marks for the questions

General Instructions :

- (i) All questions are compulsory.
- (ii) This question paper consists of 5 (five) Sections—A, B, C, D and E, and 37 questions.
- (iii) Section—A consists of 12 questions (multiple-choice type) of which 10 questions are to be answered. Each question (Q. Nos. **1–12**) carries 1 mark.
- (iv) Section—B consists of 7 questions (very short-answer type) of which 5 questions are to be answered. Each question (Q. Nos. **13–19**) carries 1 mark and to be answered in one word/sentence.
- (v) Section—C consists of 5 questions (short-answer type—I) with internal choice. Each question (Q. Nos. **20–24**) carries 2 marks with alternatives to be answered in 20–30 words.
- (vi) Section—D consists of 10 questions (short-answer type—II) with internal choice. Each question (Q. Nos. **25–34**) carries 3 marks and to be answered in 30–40 words.
- (vii) Section—E consists of 3 questions (long-answer type) with internal choice. Each question (Q. Nos. **35–37**) carries 5 marks with alternatives to be answered in 60–80 words.

(2)

SECTION—A

Choose and write the correct answer of the following (any *ten*) :

1×10=10

1. The factor which is essential for genetic equilibrium of allele frequencies in a population is
 - (a) No mutation
 - (b) genetic drift
 - (c) gene flow
 - (d) genetic recombination
2. Which of the following cells are present in the egg apparatus?
 - (a) Antipodal cells
 - (b) Synergids
 - (c) Synergids and one egg cell
 - (d) Polar nuclei and one egg cell
3. The addition of adenylate residue at the 3' end of a template in an independent manner is called
 - (a) splicing
 - (b) tailing
 - (c) capping
 - (d) split gene
4. Down's syndrome is caused due to
 - (a) non-disjunction of chromosome number 21
 - (b) deletion of chromosome number 21
 - (c) non-disjunction of chromosome number 16
 - (d) deletion of chromosome number 16

5. The plant from which opioids are extracted is
- (a) *Erythroxylum coca*
 - (b) *Papaver somniferum*
 - (c) *Cannabis sativa*
 - (d) All of the above
6. The first isolated restriction endonuclease is
- (a) EcoRI
 - (b) Hind II
 - (c) Hind I
 - (d) EcoRII
7. What is the full form of GEAC?
- (a) Genome Engineering Action Committee
 - (b) Ground Environment Action Committee
 - (c) Genetic and Environment Approval Committee
 - (d) Genetic Engineering Appraisal Committee
8. Factors contributing to population growth are
- (a) natality and immigration
 - (b) natality and emigration
 - (c) mortality and emigration
 - (d) immigration and emigration
9. Which of the following is not a functional unit of the ecosystem?
- (a) Energy flow
 - (b) Decomposition
 - (c) Stratification
 - (d) Productivity

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- 10.** In incomplete dominance, the expected phenotypic and genotypic ratios are
- (a) 1 : 1 : 2 and 2 : 1 : 1
 - (b) 1 : 2 : 1 and 1 : 2 : 1
 - (c) 1 : 1 : 1 and 1 : 1 : 1
 - (d) 1 : 1 and 1 : 1
- 11.** In a grass family, the cotyledon is called
- (a) plumule
 - (b) radicle
 - (c) embryo
 - (d) scutellum
- 12.** A patient had undergone an organ transplant. To prevent rejection of the transplanted organ, which immuno-suppressive agent will be advised for use?
- (a) Cyclosporin-A produced from *Clostridium butylicum*
 - (b) Cyclosporin-A produced from *Trichoderma polysporum*
 - (c) Statins produced from *Monascus purpureus*
 - (d) Statins produced from *Streptococcus thermophilus*

SECTION—B

Answer the following questions in *one* word/sentence each
(any *five*) :

1×5=5

- 13.** Give two examples of terminal method of contraception.

$\frac{1}{2} + \frac{1}{2} = 1$

- 14.** What is splicing?

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15. Name one substance which is used for cancer immunotherapy.
16. What are biodiversity hotspots?
17. Colonies of what colour will be formed if the recombinant DNA fails to get inserted into the gene coding for -galactosidase?
18. DNA fragments separated by gel electrophoresis can be visualized only after staining.
(a) Name the compound used for staining DNA.
(b) Name the light used for visualization. $\frac{1}{2} + \frac{1}{2} = 1$
19. A female suffering from Turner's syndrome has 45 chromosomes. She will have—
(a) how many autosomes;
(b) how many X-chromosome(s)? $\frac{1}{2} + \frac{1}{2} = 1$

SECTION—C

20. (a) What is microsporogenesis? What would be the ploidy of the cells of the tetrad? $1 + 1 = 2$
Or
(b) These cells are responsible for the secretion of androgen. Name these cells and mention the function of their secretion. $1 + 1 = 2$
21. Define alleles. Where are the two alleles of a gene pair located? $1 + 1 = 2$
22. What is the role of a vector in genetic engineering? Name the first artificial cloning vector. $1 + 1 = 2$
23. Differentiate between convergent and divergent evolution. 2

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24. (a) Draw a well-labelled diagram of an antibody molecule. 2

Or

(b) Name any two microbes used in the following :
 $\frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2} = 2$

(i) Household products

(ii) Industrial products

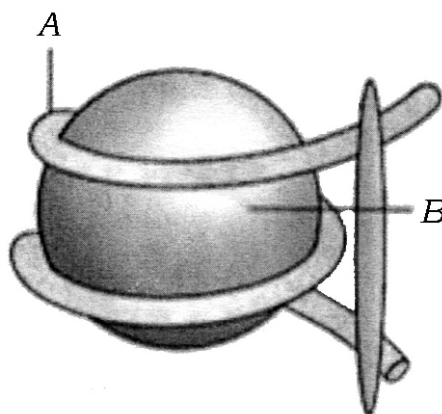
SECTION—D

Answer the following questions : $3 \times 10 = 30$

25. When is amniocentesis performed in humans? How is it misused? $1\frac{1}{2} + 1\frac{1}{2} = 3$

26. What is triple fusion? Where does it take place? Name the nuclei involved in triple fusion. $1 + 1 + 1 = 3$

27. (a) Study the diagram given below and answer the following questions :



(i) Name the diagram.

(ii) Identify the Part A and Part B. $1 + 1 + 1 = 3$

Or

(b) Draw the structure of a mature ovum and label it. 3

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28. Two water samples A and B were collected. The BOD of sample A and sample B were recorded as 300 mg/L and 500 mg/L respectively. Give the full form of BOD. Which sample of water is more polluted? Give reasons. 1+1+1=3

29. ADA is a genetic disorder due to the absence of an enzyme.

(a) Name the enzyme that is absent.

(b) How can this disorder be corrected? 1+2=3

30. (a) The immune system of a person is suppressed.

(i) Name the disease the person is suffering from.

(ii) What is the causative organism?

(iii) Write one mode of prevention for the disease.

1+1+1=3

Or

(b) What are transgenic animals? Give two applications of transgenic animals.

1+2=3

31. Work out a cross showing marriage between a haemophilic man (X^hY) and a carrier woman (X^hX). Write the phenotypes of their children. $1\frac{1}{2}+1\frac{1}{2}=3$

32. Describe the role of microbes in secondary treatment of sewage. 3

33. (a) What is pollination? What are the characteristics of flowers pollinated by insects? 1+2=3

Or

(b) Describe adaptive radiation with the help of an example. 3

34. Define HGP. Write its salient features. 1+2=3

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SECTION—E

35. (a) (i) What is menstrual cycle?
(ii) Explain the different phases of menstrual cycle. 1+4=5

Or

- (b) What is population? Explain the different types of negative interactions in a population. 1+4=5

36. (a) (i) State Mendel's law of dominance.
(ii) Explain with the help of a suitable cross.
(iii) Give the scientific name of the plant Mendel used for his experiment. 1+3+1=5

Or

- (b) Differentiate between *in situ* and *ex situ* conservation. Describe why we should conserve biodiversity. 2+3=5

37. (a) (i) Write the full form of PCR.
(ii) With the help of a diagram, explain the mechanism involved in PCR. 1+4=5

Or

- (b) What is an operon? Explain the regulation of gene expression in *lac* operon with suitable diagrams. 1+4=5
