

CLASS XII – BIOLOGY

SET – 6

Section – A (1×16 = 16 Marks)

Q1–12: MCQs

1. In monosporic embryo sac development, how many nuclei are present at maturity?

- A. 4
- B. 6
- C. 8
- D. 16

2. Capacitation of sperm occurs in:

- A. Testis
- B. Epididymis
- C. Uterus
- D. Fallopian tube

3. Which enzyme removes RNA primer during DNA replication?

- A. DNA polymerase I
- B. Primase
- C. Helicase
- D. Ligase

4. The operator in lac operon is the binding site for:

- A. RNA polymerase
- B. Repressor protein
- C. Ribosome
- D. tRNA

5. When allele frequencies remain constant across generations, population is in:

- A. Mutation
- B. Genetic drift
- C. Hardy–Weinberg equilibrium
- D. Isolation

6. A codon consists of:

- A. Two nucleotides
- B. Three nucleotides
- C. Four nucleotides
- D. One nucleotide

7. If $p = 0.8$, $q = 0.2$, frequency of homozygous dominant individuals will be:

- A. 0.64
- B. 0.16
- C. 0.32
- D. 0.48

8. RNA interference is an example of:

- A. Gene amplification
- B. Gene silencing
- C. Mutation
- D. Recombination

9. AIDS virus primarily attacks:

- A. B cells
- B. RBCs
- C. Helper T cells
- D. Neutrophils

10. Primary treatment of sewage mainly removes:

- A. Dissolved nutrients
- B. Suspended solids
- C. Microbes
- D. Heavy metals

11. Biomagnification refers to:

- A. Increase in biomass
- B. Increase in productivity
- C. Increase in toxin concentration along food chain
- D. Increase in oxygen

12. Taq polymerase is thermostable because it is obtained from:

- A. Marine bacteria
- B. Soil bacteria
- C. Thermophilic bacteria
- D. Pathogenic bacteria

Q13–16: Assertion–Reason

13.

Assertion: Ovulation occurs due to LH surge.

Reason: LH stimulates rupture of Graafian follicle.

14.

Assertion: Inbreeding increases risk of genetic disorders.

Reason: It increases homozygosity of deleterious alleles.

15.

Assertion: Energy flow in ecosystem is unidirectional.

Reason: Energy is lost as heat at each trophic level.

16.

Assertion: Transgenic animals are used to produce therapeutic proteins.

Reason: They express inserted foreign genes.

(Options same as previous sets)

Section – B (2×5 = 10 Marks)

17. Attempt either A or B

A. Explain significance of pollen–pistil interaction.

OR

B. What are barrier methods of contraception? Mention advantages.

18. Describe semi-conservative mode of DNA replication with experiment support.

19. A population of 5000 individuals shows 125 affected recessive individuals.

Calculate:

(i) Frequency of recessive allele

(ii) Frequency of carriers

20. Attempt either A or B

A. Explain cloning vector and its essential features.

OR

B. What is PCR? Explain its three steps.

21. Attempt either A or B

A. If producers fix 100,000 kcal energy, calculate energy at secondary consumer level.

OR

B. Differentiate between r-strategists and K-strategists.

Section – C (3×7 = 21 Marks)

22. Explain events of fertilisation and implantation in humans.

23. Advanced Probability Problem

In a cross $AaBb \times AaBb$ (independent assortment),

- (i) Phenotypic ratio
- (ii) Probability of offspring with genotype $aabb$
- (iii) Probability of at least one dominant trait

24. Explain adaptive radiation with Darwin's finches example.

25. Describe steps of recombinant DNA technology.

26. Explain process of secondary sewage treatment and role of activated sludge.

27. Differentiate between primary and secondary immune response with graph explanation.

28. Explain exponential growth with equation and derive doubling time formula.

Section – D (4×2 = 8 Marks)

29. Case Study – Sex-Linked Inheritance

A normal woman whose father was haemophilic marries a normal man.

- A. What is genotype of woman?
- B. Probability of haemophilic son?
- C. Probability of carrier daughter?
- D. Why are males more affected?

30. Case Study – Environmental Issue

Excess fertilizers are used in agricultural land near a lake.

- A. What ecological process will occur?
- B. Define BOD.
- C. How will aquatic life be affected?
- D. Suggest one preventive measure.

Section – E (5×3 = 15 Marks)

31.

- A. Explain transcription in prokaryotes with diagram.
- B. What is role of sigma factor?

OR

Explain translation with initiation, elongation and termination steps.

32.

- A. Explain Ti plasmid and its role in gene transfer.
- B. What are restriction enzymes?
- C. Explain RNA interference in nematode resistance.

OR

Explain gel electrophoresis with principle and diagram.

33.

Justify with examples:

- A. Competitive exclusion principle
- B. Resource partitioning
- C. Keystone species
- D. 10% Law
- E. Ecological succession

OR

Explain latitudinal gradient of biodiversity and its ecological significance.