Roll No. ☐☐☐☐☐☐☐☐

Q.P. Code 57/4/1

BIOLOGY (THEORY)

CBSE Class XII Board Examination 2025

Time allowed: 3 hours **Maximum Marks: 70**

General Instructions:

1. The paper has 33 questions in five sections (A to E); all of them must be answered.
2. Section A: Q1–16, multiple choice (Q13–16 Assertion-Reason), 1 mark each.
3. Section B: Q17–21, very short answer, 2 marks each.
4. Section C: Q22–28, short answer, 3 marks each.
5. Section D: Q29–30, case-based, 4 marks each, with an internal choice in one sub-part.
6. Section E: Q31–33, long answer, 5 marks each.
7. There is no overall choice, but Sections B, D and E have internal choices (OR) – answer only one alternative. Draw neat, labelled diagrams wherever needed.

SECTION A

Q1–16 are multiple choice questions of 1 mark each; Q13–16 are Assertion-Reason.

1. When chromatin is seen in its extended 'beads-on-string' form, what do the 'beads' stand for? **1**

(A) Linker DNA
(B) Histone proteins
(C) Nucleosomes
(D) NHC proteins

2. Read these statements about the accessory ducts of the human male reproductive system: **1**
(i) Seminiferous tubules open into the rete testis, which then opens into the vas deferens.
(ii) The vasa efferentia leave the testis and open into the epididymis.
(iii) The epididymis leads to the vas deferens, which ascends into the abdomen.
(iv) The vas deferens receives a duct from the prostate gland and opens into the urethra as the ejaculatory duct.
(v) The urethra starts from the urinary bladder and runs through the penis to its external opening, the urethral meatus.
Which option lists only the true statements?

(A) (i), (ii), (iv)
(B) (ii), (iii), (v)
(C) (ii), (iv), (v)
(D) (i), (iii), (iv)

3. During DNA replication, the enzyme DNA-dependent DNA polymerase uses which of the following as its substrate? **1**

(A) Deoxyribonucleotide triphosphate
(B) Deoxyribonucleoside triphosphate
(C) Ribonucleotide triphosphate
(D) Ribonucleoside triphosphate

4. Pedigree described in words: a normal father and a normal mother have a haemophilic son and a normal daughter. The daughter marries a normal man and they have a haemophilic son (the grandson). What type of inheritance does this pedigree show? **1**

(A) Autosome linked dominant trait
(B) Sex-linked dominant trait
(C) Autosomal recessive trait
(D) Sex-linked recessive trait

5. In which of these human diseases does the body's own defence system attack its own cells? **1**

(A) Thalassemia
(B) Phenylketonuria
(C) Filariasis
(D) Rheumatoid arthritis

6. Which statements are true for a typical dicot embryo? **1**

(i) It has an embryonal axis and a scutellum.

(ii) The part of the embryonal axis above the level of the cotyledons is the epicotyl.

(iii) The part of the embryonal axis below the level of the cotyledons is the coleorhiza.

(iv) The lower end of the embryo has the radicle covered by a root cap.

(A) (i) and (ii) **(B)** (i) and (iii)

(C) (iii) and (iv) **(D)** (ii) and (iv)

7. In human evolution, about 15 million years ago, which primates walked like gorillas and chimpanzees? **1**

(A) Australopithecine and Neanderthal **(B)** Dryopithecus and Ramapithecus

(C) Homo erectus and Homo sapiens **(D)** Homo habilis and Homo erectus

8. The coding strand of a structural gene being transcribed has the triplet TAC. Using the codon list – AUC: Isoleucine, AUG: Methionine, UAC: Tyrosine, GUA: Valine – which amino acid will be attached to the 3′ end of the tRNA that reads this codon during translation? **1**

(A) Isoleucine **(B)** Methionine

(C) Tyrosine **(D)** Valine

9. Which technique, based on antigen–antibody interaction, is used for early detection of a disease? **1**

(A) RNAi **(B)** EST

(C) PCR **(D)** ELISA

10. In the Meselson–Stahl experiment proving semi-conservative DNA replication, which centrifuge tube correctly shows the DNA bands after 40 minutes of growth of ^{15}N-labelled E. coli in ^{14}N medium? (Tubes described in words.) **1**

(A) Two bands: one at the light (^{14}N) position and one at the hybrid (intermediate) position

(B) A single band at the bottom (heavy ^{15}N position)

(C) Two bands, one at the extreme top end and one at the extreme bottom end (light and heavy)

(D) A single band in the middle (hybrid position)

11. The bioactive molecule cyclosporin A is obtained from: **1**

(A) Propionibacterium sharmanii **(B)** Monascus purpureus

(C) Trichoderma polysporum **(D)** Aspergillus niger

12. In pea, inflated pod shape is dominant over constricted pod shape. What phenotypic ratio is expected in the offspring when two plants, both heterozygous for inflated pods, are crossed? **1**

(A) 1 : 0 **(B)** 1 : 1

(C) 2 : 1 **(D)** 3 : 1

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13. Assertion (A): Healthy, virus-free plants can be raised from a virus-infected plant by growing parts of it in vitro (tissue culture). **1**

Reason (R): When a plant is infected with a virus, its roots and stems remain free of the virus.

(A) Both (A) and (R) are true and (R) is the correct explanation of (A).

(B) Both (A) and (R) are true, but (R) is not the correct explanation of (A).

(C) (A) is true, but (R) is false.

(D) (A) is false, but (R) is true.

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14. Assertion (A): A person infected with malaria gets chills and high fever that recur every three to four days. **1**

Reason (R): The parasite attacks red blood cells, which rupture and release haemozoin.

(A) Both A and R are true and R is the correct explanation of A.

(B) Both A and R are true but R is not the correct explanation of A.

(C) A is true but R is false.

(D) A is false but R is true.

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15. Assertion (A): 'Saheli', an oral contraceptive pill, stops ovulation and increases phagocytosis of sperms. **1**

Reason (R): Saheli is a non-steroidal preparation.

(A) Both A and R are true and R is the correct explanation of A.

(B) Both A and R are true but R is not the correct explanation of A.

(C) A is true but R is false.

(D) A is false but R is true.

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16. Assertion (A): ABO blood grouping in humans is an example of multiple allelism. **1**

Reason (R): In ABO blood grouping, more than two genes in a population control the same character.

(A) Both A and R are true and R is the correct explanation of A.

(B) Both A and R are true but R is not the correct explanation of A.

(C) A is true but R is false.

(D) A is false but R is true.

SECTION B

Q17–21 are very short answer questions of 2 marks each.

17. Explain how a person's immunity would be affected if the thymus gland degenerates (atrophies) early in life. **2**

OR

(i) What are interferons? How do they help in providing immunity?
(ii) To which type of innate immunity barrier do interferons belong?

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18. An mRNA (start codon not shown) is translated, in theory, in two reading frames: **2**
(a) Reading frame 1 – translation begins at the first nucleotide of 5′ CUCGCUUGCCGAUCAAGGGUUA 3′.
(b) Reading frame 2 – translation begins at the second nucleotide of 5′ GUGGCACUCAGUCCUUAAUGGCG 3′.
How many amino acids will be coded in case (a) and in case (b)? Justify.

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19. Explain the term MTP. What was the main reason for the Government of India to legalise MTP? **2**

OR

Name any two sexually transmitted infections (STIs) that can occur in a human female, and state two of their early symptoms.

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20. A flow diagram of recombinant DNA technology: Step 1 – vector (plasmid) DNA cut with EcoRI is mixed with alien DNA cut with EcoRI and joined by 'Enzyme A'; Step 2 – recombinant DNA molecule; Step 3 – transfer of recombinant DNA into the host E. coli; Step 4 – replication of the recombinant DNA in E. coli. **2**
(a) Name Enzyme A used in Step 1 to join the cut plasmid and alien DNA.
(b) What is the technical term for Step 3?
(c) Why is the same restriction enzyme EcoRI used to cut both the vector and the alien DNA?

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21. Explain why the association between sea anemone and clownfish is a classic example of commensalism. **2**

OR

Draw (indicating trophic levels) and describe the pyramid of biomass in a sea where a standing crop of 40 phytoplankton supports 90 zooplankton, which in turn support 120 small fishes.

SECTION C

Q22–28 are short answer questions of 3 marks each.

22. Describe how the placenta forms in a human female after the blastocyst is implanted in the endometrium. **3**

23. Mendel carried out hybridisation experiments on garden pea for seven years and proposed the laws of inheritance. **3**

(a) Give two reasons for his success.

(b) State the law of independent assortment that he proposed from dihybrid crosses.

24. A single DNA strand is drawn as a 'stick' diagram running 5′ → 3′: sugars are vertical lines carrying bases A, T and G (in that order from 5′ to 3′); a phosphate (P) is attached at the 5′ end by a slanting line labelled (a); slanting lines between the 3′ end of one sugar and the 5′ end of the next, one of them labelled (b), link the nucleotides; the 3′ end ends in OH. **3**

(a) Name the covalent bonds shown as (a) and (b).

(b) How many purines are present in this strand?

(c) Draw the chemical structure of this polynucleotide chain.

25. Explain the biological (secondary) treatment that the primary effluent undergoes in the large aeration tanks of a sewage treatment plant. **3**

26. A flower adapted for the most common kind of abiotic pollination is shown (described in words): it has large, exposed feathery stigmas, versatile anthers on long filaments, a small ovary and tiny petals. **3**

(a) Name the mode of abiotic pollination used by this plant.

(b) Why does the flower need large, exposed feathery stigmas?

(c) Give two important adaptations of the pollen grains of such flowers.

(d) Why are the petals small and non-green?

27. A wildlife report found that the biggest threat to tigers in the Mudumalai Tiger Reserve (MTR) was Lantana camara, an attractive flowering shrub from tropical America that has spread over about 40% of India's tiger range. A Lantana removal drive by the Tamil Nadu forest department helped revive the reserve and reduced human–wildlife conflict. MTR has 25 species of grasses and legumes. **3**

(a) How did removing Lantana help restore the MTR?

(b) Why is the invasion of Lantana camara a matter of concern for MTR?

28. List one advantage and two disadvantages of the green revolution. **3**

SECTION D

Q29–30 are case-based questions of 4 marks each, with an internal choice in one sub-part.

29. *Molecular similarities give strong evidence of evolutionary relationships. A table lists the number of amino acid differences between the haemoglobin of humans and that of other animals: macaque 8, dog 32, bird 45, frog 67, lamprey 125.* **4**

(a) Is the relationship between (i) humans and macaque, (ii) humans and frog, an example of divergent or convergent evolution? (1)

(b) What do the biochemical similarities in haemoglobin suggest about the relationship between humans, frog and lamprey? (1)

(c) (i) Of lampreys and macaques, which is more closely related to humans in evolution, and why? (2)

OR

(c) (ii) Of frogs and dogs, which is more closely related to humans in evolution, and why? (2)

30. *A UNODC report estimated about 5,00,000 drug-related deaths in 2019, 17.5% more than in 2009. More than half were due to liver diseases caused by hepatitis B, and about a quarter to overdoses. Opioids used non-medically cause the most severe harm – about two-thirds of direct drug-related deaths worldwide.* **4**

(a) Why are opioid users more likely to get liver disease due to hepatitis B? (1)

(b) What is meant by a direct drug-related disease (death)? (1)

(c) (i) Name the plant (scientific name) from which opioids are obtained, and the part from which they are extracted. (2)

OR

(c) (ii) State two common warning signs of drug abuse among young people. (2)

SECTION E

Q31–33 are long answer questions of 5 marks each.

31. (i) Explain how double fertilisation takes place in a flowering plant. **5**
(ii) What is the fate of the products of double fertilisation?

OR

(i) Describe the structure of testicular lobules in the human male. Name the two types of cells in seminiferous tubules and give their roles.
(ii) Describe the role of the hypothalamic hormone GnRH in spermatogenesis.

32. Name and explain the biotechnological method by which infection of tobacco roots by the nematode Meloidogyne incognita is prevented using Agrobacterium vectors and RNA interference. **5**

OR

Explain how a gene of interest is amplified by the polymerase chain reaction (PCR).

33. (i) Describe the growth curve of a natural population of any species that has limited resources. **5**
(ii) Give the equation of this growth.
(iii) Name the growth curve and draw its graph.

OR

(i) Explain the species–area relationship in a natural region and predict the shape of the graph when species richness is plotted against area for many taxa.
(ii) Show the species richness – area relationship as a graph.
(iii) Give the equation of the species–area relationship on a logarithmic scale.

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Questions restated from the CBSE Class XII Board Examination 2025 (set 57/4/1) for practice. Reading passages and map items are described, not reproduced.