23

310359

ASSOCIATION OF TEACHERS IN BIOLOGICAL SCIENCES
National Standard Examination in Biology – 2025
Date of Examination: November 23, 2025
Time: 2:30 PM to 4:30 PM

Question Paper Code: 23

Student's Roll No:											

Write the Question Paper code (mentioned above) on YOUR OMR Answer Sheet (in the space provided), otherwise your Answer Sheet will NOT be evaluated. Note that the same Question Paper Code appears on each page of the Question Paper.

Instructions to Candidates:

1. Use of mobile phone, smart watch, and iPad during examination is STRICTLY PROHIBITED.
2. In addition to this Question Paper, you are given OMR Answer Sheet along with candidate's copy.
3. On the OMR sheet, make all the entries carefully in the space provided **ONLY** in **BLOCK CAPITALS** as well as by properly darkening the appropriate bubbles.
   Incomplete/ incorrect/ carelessly filled information may disqualify your candidature.
4. On the OMR Answer Sheet, use only **BLUE or BLACK BALL POINT PEN** for making entries and filling the bubbles.
5. Your **Eleven-digit roll number and date of birth** entered on the OMR Answer Sheet shall remain your login credentials means login id and password respectively for accessing your performance / result in National Standard Examination in Biology - 2025.
6. Question Paper has two parts. In part A-1 (Q. No.1 to 48) each question has four alternatives, out of which **only one** is correct. Choose the correct alternative and fill the appropriate bubble, as shown.

Q.No.12 

In part A-2 (Q. No. 49 to 60) each question has four alternatives out of which any number of alternative (s) (1, 2, 3, or 4) may be correct. You have to choose **all** correct alternative(s) and fill the appropriate bubble(s), as shown

Q.No.52 

7. Attempt all sixty questions. For **Part A-1,** each correct answer carries 3 marks whereas 1 mark will be deducted for each wrong answer. In **Part A-2,** you get 6 marks if all the correct alternatives are marked and no incorrect. No negative marks in this part.
8. Rough work may be done in the space provided. There are **20** printed pages in this question paper.
9. Use of **Non-programmable scientific** calculator is allowed.
10. No candidate should leave the examination hall before the completion of the examination.
11. After submitting Answer Paper, take away the Question Paper & Candidate's copy of OMR sheet for your future reference.

Please DO NOT make any mark other than filling the appropriate bubbles properly in the space provided on the OMR Answer Sheet.

OMR Answer Sheets are evaluated using machine, hence CHANGE OF ENTRY IS NOT ALLOWED. Scratching or overwriting may result in a wrong score.

DO NOT WRITE ON THE BACK SIDE OF THE OMR ANSWER SHEET.

Instructions to Candidates (Continued) :
You may read the following instructions after submitting the Answer Sheet.

12. **Comments/ Inquiries/ Grievances regarding this Question Paper, if any, can be shared on the Inquiry/ Grievance column on www.iapt.org.in on the specified format till Dec 1, 2025.**

13. **The Answers/ Solutions to this Question Paper will be available on the website: www.iapt.org.in by Nov 29, 2025.** The score card may be downloaded after Dec 24, 2025.

14. **CERTIFICATES and AWARDS:**
Following certificates are awarded by IAPT/ATBS to students, successful in the National Standard Examination in Biology – 2025
    (i) "CENTRE TOP 10 %" To be downloaded from iapt.org.in after 30.01.26
    (ii) "STATE TOP 1 %" Will be dispatched to the examinee
    (iii) "NATIONAL TOP 1 %" Will be dispatched to the examinee
    (iv) "GOLD MEDAL & MERIT CERTIFICATE" to all students who attend OCSC – 2026 at HBCSE Mumbai
    Certificate for centre toppers shall be uploaded on iapt.org.in

15. List of students (with centre number and roll number only) having a score equal and above **Minimum Admissible Score (**MAS) will be displayed on the website: **www.iapt.org.in** by **Dec 25, 2025. See the MAS clause** on the student's brochure on the web.

16. List of students eligible to appear for Indian National Biology Olympiad (INBO – 2026) shall be displayed on **www.iapt.org.in** by Dec 30, 2025.

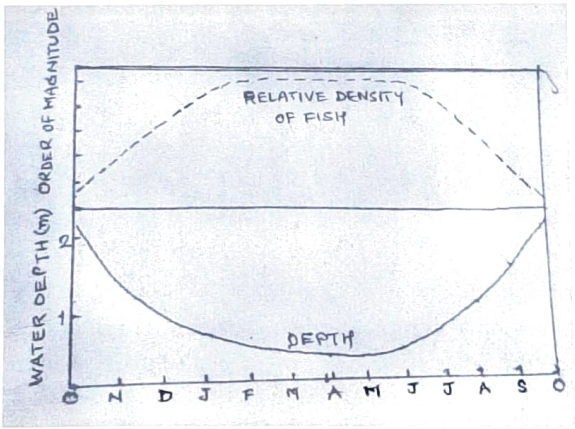
4. Which of the following cells show least telomerase activity?

(a) Sperm cells
(b) Embryonic stem cells
(c) Carcinoma cells
(d) Mature adipose cell

5. A researcher is attempting to amplify a specific gene fragment using PCR. The designed primer pair has a high GC content (~60%) and, upon analysis, exhibits regions of self-complementarity near the 3′ termini. When the PCR is run under standard cycling conditions, gel electrophoresis reveals only a faint band corresponding to the expected amplicon, but a dominant, sharp band appears at a size roughly twice the length of the individual primers. Which of the following best explains this observation?

(a) The 3′ self-complementarity in the forward primer alone leads to intra-molecular hairpin formation that completely sequesters the primer, resulting in inefficient target binding.
(b) The complementary 3′ ends of the forward and reverse primers facilitate dimerization, producing a primer-dimer that is preferentially amplified over the target sequence.
(c) The high GC content increases the melting temperature so dramatically that only non-specific, off-target binding occurs at the lower annealing temperature, yielding spurious short products.
(d) The primers undergo self-extension during the elongation phase due to internal priming on partially complementary regions within themselves, creating a consistent artifact of double-primer length.

6. In a tropical lake, the depth as well as expanse of the water goes on reducing as the summer progresses. This causes the ecological density of fish to increase, dropping again in monsoon as water fills in. A bird species feeds on these fish. The bird needs to incubate its eggs for one month and then feed the nestlings for another four months. The accompanying figure depicts changes in depth and fish density from October to October. What should be the ideal duration in which the bird needs to lay eggs?

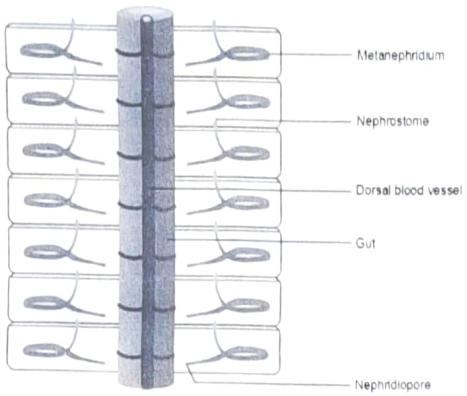


(a) November- December
(b) January- February
(c) March- April
(d) May- June

7. Which of the following statements best describes the role of the origin of replication (*ori*) in a recombinant plasmid used for bacterial transformation?

(a) The *ori* is responsible for the antibiotic resistance of the plasmid.
(b) The *ori* ensures the plasmid is integrated into the bacterial chromosome.
(c) The *ori* allows the plasmid to replicate independently within the bacterial cell.
(d) The *ori* is involved in the transcription of the inserted gene.

18. Dorsal view of 7 segments of earthworm is shown in the figure. The correct pathway of excretion in this animal is



(a) Metanephridium → Nephrostome → Gut → Nephridiopore
(b) Nephridiopore → Metanephridium → Gut → Exterior
(c) Coelom → Nephrostome → Nephridiopore → Exterior
(d) Dorsal blood vessel → Gut → Nephrostome → Nephridiopore → Exterior

19. For plants to survive in environments with high salinity, salt tolerance is a crucial adaptation. Salt tolerance involves various physiological and biochemical adaptations that help plants to manage the stress caused by excess salt. Understanding these mechanisms is essential for developing salt-tolerant crops and improving agricultural productivity in saline soils. Which of the following statements best describes a key mechanism of salt tolerance in plants?

(a) Plants increase the uptake of sodium ions to enhance growth under high salinity.
(b) Plants produce osmoprotectants to stabilize proteins and membranes under salt stress.
(c) Plants reduce the production of potassium ions to avoid toxicity in saline environments.
(d) Plants enhance photosynthesis to counter the effects of salt stress by increased ETS activity.

20. Muscle function in obese runners can be significantly different from that in non-obese runners due to various factors. These factors can affect the overall performance. Which of the following statements best describes the muscle functions namely muscle strength (ability to exert force) and muscle endurance (ability to sustain the force) in obese runners compared to non-obese runners?

(a) Obese runners have higher muscle endurance but lower muscle strength compared to non-obese runners.
(b) Obese runners have lower muscle endurance and lower muscle strength compared to non-obese runners.
(c) Obese runners have higher muscle strength but lower muscle endurance compared to non-obese runners.
(d) Obese runners have similar muscle strength and endurance compared to non-obese runners.

21. Heart of fish is two-chambered with one atrium and one ventricle. The fish's respiratory system involves gills for oxygen exchange. Which of the following statement best describes the flow of blood through the heart of a fish?

(a) Blood flows from the ventricle to the atrium, then to the gills.
(b) Blood flows from the atrium to the ventricle, then to the gills.
(c) Blood flows from the gills to the atrium, then to the ventricle.
(d) Blood flows from the gills to the ventricle, then to the atrium.

22. Which of the following mechanisms is primarily responsible for the osmotic regulation in catadromous fishes like eels, when they migrate from freshwater and transition into seawater?

(a) Increased production of dilute urine.
(b) Active uptake of salts through the gills.
(c) Drinking of seawater and active excretion of salts.
(d) Decreased permeability of the skin.

23. Which of the following statements best describes the role of restriction enzymes in the process of DNA amplification using primers?

(a) Restriction enzymes are used to synthesize primers that bind to specific DNA sequences.
(b) Restriction enzymes cut the DNA at specific sites, allowing primers to bind and initiate replication.
(c) Restriction enzymes are responsible for the elongation of primers during DNA synthesis.
(d) Restriction enzymes modify the primers to enhance their binding affinity to the target DNA.

24. In chemosynthetic bacteria, the electron transport system is crucial for energy production. Which of the following statements accurately describes the mechanism by which the electron transport system contributes to ATP synthesis?

(a) The electron transport system directly phosphorylates ADP to ATP without the involvement of a proton gradient.
(b) The electron transport system generates a proton gradient across the bacterial membrane, which drives ATP synthesis through chemiosmosis.
(c) The electron transport system uses chemical energy from organic molecules to excite electrons, which are then transferred to oxygen to produce ATP.
(d) The electron transport system incorporates carbon dioxide into organic molecules, which are then used to generate ATP.

25. In a small population of beetles, the frequency of a particular allele (A) is 0.6, and the frequency of the alternative allele (a) is 0.4. Due to genetic drift, what is the most likely outcome for the allele frequencies after several generations?

(a) The frequency of allele A will increase to 1.0, and allele a will be lost.
(b) The frequency of allele a will increase to 1.0, and allele A will be lost.
(c) The frequencies of alleles A and a will change and lead to loss of one allele that is less fit.
(d) The frequencies of alleles A and a will fluctuate randomly and may lead to loss of either allele.

26. The antibodies secreted by B-cells upon stimulation are classified according to the amino acid sequence of the

(a) light chain
(b) heavy chain
(c) both light and heavy chain
(d) hinge region

27. The r and K selections are two contrasting strategies in the reproductive ecology of organisms. The r-selected species are characterized by high reproductive rates while K-selected species have lower reproductive rates. Which of the following characteristics is most likely to be observed in a K-selected species?

(a) Long life span and early maturity
(b) Short lifespan and rapid population growth
(c) High parental investment and low offspring mortality
(d) Opportunistic reproduction and high dispersal ability

28. The efficiency and regulation of gene expression in an operon are significantly influenced by the promoter's strength and its interaction with regulatory proteins. Which of the following statements is the correct description of the role of the promoter in the regulation of the *trp* operon in *Escherichia coli*?

(a) The promoter of the *trp* operon is always active, leading to continuous transcription of the operon genes regardless of tryptophan levels.
(b) The promoter of the *trp* operon is only active in the presence of tryptophan, leading to the transcription of the operon genes.
(c) The promoter of the *trp* operon is repressed by the *trp* repressor protein in the presence of tryptophan, preventing transcription of the operon genes.
(d) The promoter of the *trp* operon is activated by the *trp* repressor protein in the absence of tryptophan, leading to the transcription of the operon genes.

29. In a routine medical check-up, it was found that Ms. Prishali's maternal grandmother is a carrier of the recessive allele for haemophilia. Her maternal grandfather does not have haemophilia. Prishali is not haemophilic and is married. Her husband does not have haemophilia. If Prishali gets two children: a son and a daughter, which of the following statements is correct?

(a) The son has a 0.5 probability of having haemophilia, while the daughter has a 0.5 probability of being a carrier.
(b) The son has a 0.125 probability of being haemophilic, while the daughter has a 0.125 probability of being a carrier.
(c) The son has a 0.25 probability of having haemophilia, while the daughter has a 0.25 probability of being a carrier.
(d) The son has a 0.75 probability of being haemophilic, while the daughter has a 0.25 probability of having haemophilia.

30. Origin of life on primordial earth began with the earliest replicators like

(a) short RNA-like molecules
(b) long RNA-like molecules
(c) short DNA-like molecules
(d) long DNA-like molecules

31. In a population of eusocial insects, how would kin selection influence the allocation of resources among offspring, considering the varying degrees of relatedness within the colony?

(a) Kin selection leads to equal resource allocation among all offspring, regardless of relatedness.
(b) Kin selection causes workers to allocate more resources to offspring that are less related to them to increase genetic diversity.
(c) Kin selection results in preferential resource allocation to offspring with the highest genetic relatedness to the queen.
(d) Kin selection promotes random resource allocation to avoid favouritism and maintain colony harmony.

32. The length of Loop of Henle (LH) in nephron plays a crucial role in regulation of water in mammals. While considering beaver, otter, camel and hippopotamus, which of the following would be a correct depiction of the trend in the length of LH?

(a) Camel > Otter > Hippopotamus > Beaver
(b) Otter > Hippopotamus > Camel
(c) Camel > Hippopotamus > Beaver
(d) Beaver > Camel > Hippopotamus > Otter

33. In animals, many embryonic cells are capable of crawling over a substrate using

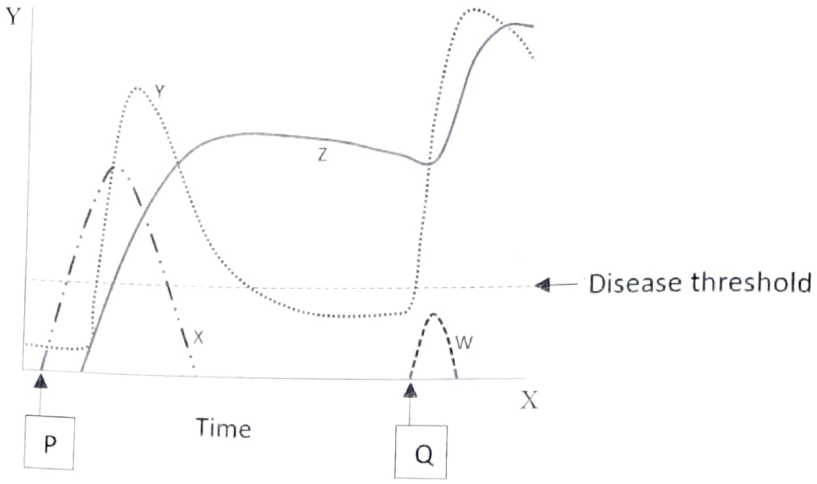
(a) extracellular matrix
(b) integrins
(c) pseudopodia
(d) lamellipodia

A – 2

ANY NUMBER OF OPTIONS (4, 3, 2 or 1) MAY BE CORRECT

MARKS WILL BE AWARDED ONLY IF ALL THE CORRECT OPTIONS ARE BUBBLED AND NO INCORRECT.

49. Adaptive immune responses following infection or vaccination are graphically shown below. X axis indicates time while Y-axis indicates titres (values) of respective parameters (W, X, Y and Z).



Mark the correct option(s):

(a) Y and Z most likely indicate T-cell and antibody response respectively.
(b) P and Q indicate vaccination and active infection respectively.
(c) Z indicates killer T cell response as a result of active infection.
(d) X and W indicate first and second infectious particle load of the same infective agent.

50. An animal is repeatedly exposed to a conditional neutral stimulus without any consequential unconditioned stimulus (US). If the same animal is later exposed to the conditional stimulus (CS) paired with an unconditional stimulus, there is slower rate of subsequent associative learning. This is latent inhibition. Which of the following factor(s) account for the manifestation of latent inhibition?

(a) Repeated non-reinforced exposure to the CS leads to habituation, reducing the animal's attention to the stimulus and thus lowering its associability when later paired with a US.
(b) Pre-exposure of the CS elicits a robust dopaminergic surge that oversaturates reward pathways, in turn diminishing synaptic plasticity required for new associative learning.
(c) Repeated CS presentations without the US result in diminished prediction error (difference between predicted and actual outcome) signals, thereby reducing the learning drive when the CS is eventually paired with the US.
(d) The continual exposure to the CS transforms it into a conditioned inhibitor that signals the non-occurrence of the US, actively blocking subsequent excitatory conditioning.

51. In a pond dug recently and filled with rain water, the water was assessed for various parameters, periodically during the development of the ecosystem. The likely observation(s) is/are

(a) day time net production exceeds night time respiration in initial stages.
(b) the gross production/ standing biomass (P/B) ratio would remain steady.
(c) entropy in the system, initially being low, would go on increasing.
(d) food chains would become progressively more complex.

58. Batesian and Müllerian mimicry are the two forms of mimicry where one species evolves to resemble the other. Batesian mimicry involves a harmless species mimicking a dangerous one, while Müllerian mimicry involves two or more dangerous species mimicking each other. Which of the following is/are correct statement(s) about these?

(a) Both types of the mimicry are the examples of coevolution.
(b) In Batesian mimicry, mimic will offer benefit to model and vice versa.
(c) Both the types are example of mutualistic relationships.
(d) Mullerian mimicry primarily benefits the prey by reducing predation pressure

59. Introduction of captive bred individuals into the wild is one of the conservation measures used for some species like the Bearded vulture (*Gypaetus barbatus*) which were wiped out from the European Apls. The problem with this conservation effort is not the size of the wild population; rather, it is the size of the captive population. Conservation biologists use effective population size (N_e) as a measure of the "genetic status" of a population which will sustain enough genetic variability in the captive birds to keep either the captive or the wild population thriving over the long term.
Which of the following measures would reduce the chance of the population losing its genetic variation due to genetic drift?

(a) Boosting the size of captive population of bearded vulture from its current level.
(b) Reduce the number of introduced birds per release to one per breeding season.
(c) Introduce male birds and female birds, alternately, after a "No-release" period in between.
(d) Recruiting additional founders into the captive population.

60. C_3 and C_4 plants represent two different pathways of carbon fixation during photosynthesis. C_4 plants, possess specialized leaf anatomy and biochemical pathways that allow them to thrive in intense sunlight, making them more resilient to climate stress. Which of the following statements best describe(s) the primary difference between C_3 and C_4 plants?

(a) C_3 plants use the Calvin cycle for carbon fixation, whereas C_4 plants use a different pathway to minimize photorespiration.
(b) C_3 plants have specialized leaf anatomy to reduce water loss, while C_4 plants do not.
(c) C_4 plants have a higher water-use efficiency compared to C_3 plants.
(d) C_4 plants can perform photosynthesis at lower carbon dioxide concentrations than C_3 plants.