ASSOCIATION OF TEACHERS IN BIOLOGICAL SCIENCES
National Standard Examination in Biology – 2024
Date of Examination: December 22, 2024
Time: 2:30 PM to 4:30 PM

Question Paper Code: 25

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 - 2024.
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 **15** printed pages in this 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 26, 2024.**

13. **The Answers/ Solutions to this Question Paper will be available on the website: www.iapt.org.in by Dec 24, 2024.** The score card may be downloaded after Dec 30, 2024.

14. **CERTIFICATES and AWARDS:**
Following certificates are awarded by IAPT/ATBS to students, successful in the National Standard Examination in Biology – 2024
    (i) "CENTRE TOP 10 %" To be downloaded from iapt.org.in after 30.01.25
    (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 – 2025 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 score above **Minimum Admissible Score (**MAS) will be displayed on the website: **www.iapt.org.in** by **Dec 28, 2024. 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 – 2025) shall be displayed on **www.iapt.org.in** by Dec 31, 2024.

ASSOCIATION OF TEACHERS IN BIOLOGICAL SCIENCES

NATIONAL STANDARD EXAMINATION IN BIOLOGY

(NSEB - 2024)

Time: 120 minute **Max. Marks: 216**

Attempt All Sixty Questions

A – 1

ONLY ONE OUT OF FOUR OPTIONS IS CORRECT. BUBBLE THE CORRECT OPTION.

1. Acrosomal reaction occurs in the:
   (a) Uterus (b) Epididymis (c) Fallopian Tube (d) Testis

2. Which among the following is **NOT** under the direct influence of Luteinising hormone?
   (a) Leydig Cells (b) Corpus Luteum (c) Kidney (d) Thyroid

3. If the following sequence of RNA is translated, it will form a peptide molecule of maximum _____ amino acids.

   5′ UUUGUAAUGCUGGAGAUGGUUCAGUACCAGUGACUCUAAUAG 3′

   (a) 3 (b) 8 (c) 6 (d) 9

4. The amount of tilt in the earth's rotation has no influence on:
   (a) Patterns of global climate (b) Season cycles
   (c) Periods of glacial expansion/retreat (d) Atmospheric concentrations of gases

5. Leaf discs were submerged in increasing concentrations of sodium bicarbonate in separate test tubes. The changes in the level of rising of leaf discs were compared with those where the discs were submerged in distilled water. Which of the following observations would be correct?
   (a) Leaf discs rise earlier than water
   (b) Leaf discs remain submerged
   (c) Leaf disc rise later than water
   (d) Leaf discs rise at the same time as in water

6. A test cross of F1 flies +a/+b produces the following offsprings:

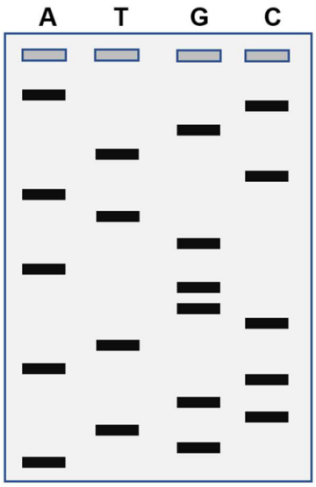
++/ab	7
ab/ab	7
+b/ab	43
a+/ab	43

   What will be the distance between two genes?

   (a) 43 cM (b) 36 cM (c) 14 cM (d) 7 cM

7. If the solute potential of a leaf cell is -4.5 MPa and its pressure potential is 0.9 MPa, find out the water potential of the cell.
   (a) − 5.4 MPa (b) − 3.6 MPa (c) 3.6 MPa (d) 5.4 MPa

8. Sanger sequencing is a technique used to determine the sequence of a piece of DNA. Four PCR reactions are set up, where a small fraction of any one dideoxynucleotide (ddATP or ddCTP or ddGTP or ddTTP) is added to deoxynucleotides (dATP, dCTP, dGTP and dTTP). Dideoxynucleotides that are incorporated do not allow the addition of another nucleotide in the subsequent cycle. After several cycles, the sample are run on a sequencing gel to obtain the sequence. For the gel shown here interpret the 5′ – 3′ sequence of the template:



(a) 5′- AGTCGCATCGGAGTACTGCA– 3′
(b) 5′ -TCAGCGTAGCCTCATGACGT– 3′
(c) 5′ - TGCAGTACTCCGATGCGACT– 3′
(d) 5′ -ACGTCATGAGGCTACGCTGA– 3′

9. Which of the following best explains why genetic bottlenecks are the major factor for species being seriously endangered?
   i. The population size is reduced below effective size.
   ii. The chance survivors may not be representative of the original population in terms of variability.
   iii. The chance survivors may harbour higher frequency of harmful genes than their ancestors did.

   (a) (i) only (b) (ii) and (iii) only (c) (ii) only (d) (i), (ii) and (iii)

10. In the famous example showing change in the gene frequencies through Industrial melanism, the increase in the number of black peppered moth in soot covered area is due to:
    (a) Pre-existing mutation (b) Genetic drift
    (c) Genetic bottleneck effect (d) Migration

11. Why would life not be possible if cells were bound by a layer of completely water soluble molecules instead of by phospholipids?
    (a) Because excess of hydrogen ions formed by water soluble molecules will interfere with exchange across the membrane.
    (b) Because cells will not be able to maintain their contents and integrity.
    (c) Because water being a universal solvent will facilitate unnecessary chemical reaction.
    (d) Because the cell will lose water causing the death of the cell.

12. A certain protein digesting enzyme encoded by the genes of the AIDS virus is necessary for the virus to complete its replication in an infected person. Researchers have designed drugs that are useful in therapy for AIDS patients by targeting the structure of this enzyme. What is the most likely mechanism involved?
    (a) The enzyme is denatured by the action of the drug.
    (b) The drug binds to the product of the enzyme action.
    (c) The drug will act as a competitive inhibitor of the enzyme.
    (d) The drug impairs the synthesis of the enzyme.

13. Suppose that plant scientists grow one group of plant cells in isotonic water containing a radioactively labelled oxygen atom ($H_2{}^{18}O$) and grow a second group of plant cells in carbon dioxide containing two radioactively labelled oxygen atoms ($C^{18}O_2$). They shine light on the cells and capture and measure the oxygen released from each. Which statement holds true as a result?
    (a) Both the groups will release radioactive oxygen.
    (b) Group 2 will release radioactive oxygen.
    (c) Group 1 will release radioactive oxygen.
    (d) None of the groups will release radioactive oxygen.

14. Consider a series of experiments where isolated mitochondria were exposed to specific inhibitors of the electron transport system and following observations were made:
    1. When an inhibitor of NADH-coenzyme Q oxidoreductase was added, the rate of transmembrane proton pumping was decreased by 40%.
    2. When an inhibitor of Cytochrome c oxidase was added, the rate of transmembrane proton pumping was decreased by 20%.
    3. When an inhibitor of Coenzyme Q-cytochrome c oxidoreductase was added, the rate of transmembrane proton pumping was decreased by 40%.

    Select the option that shows the correct number of protons pumped by each respiratory complex respectively on the bases of these observations

    NADH □ Respiratory complex I □ Respiratory complex III □ Respiratory complex IV

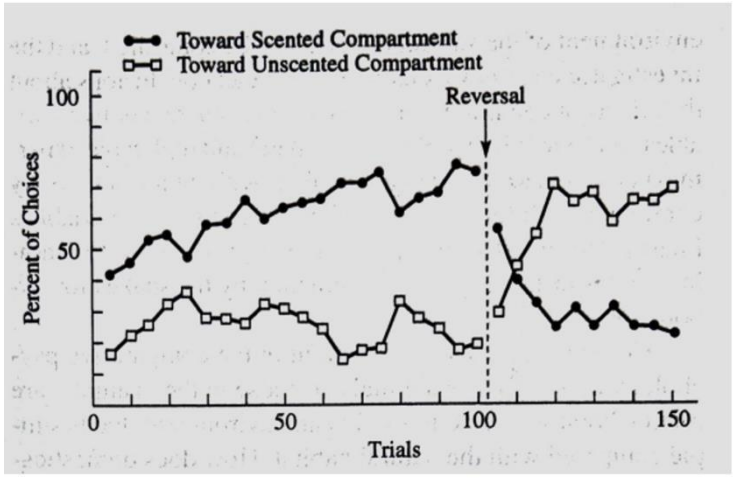
    (a) 2, 4, 4 (b) 4, 2, 4 (c) 4, 4, 2 (d) 2, 1, 2

15. Three types of mutations are listed below:
    i. Chromosomal mutation ii. Point mutation iii. Frameshift mutation

    Which of the following statement is correct?

    (a) i & iii both describe the same phenomenon.
    (b) iii will always lead to colour blindness.
    (c) In ii only one base pair gets altered leading to disorder.
    (d) ii will either show deletion or addition of base pairs and is a type of chromosomal mutation.

16. The given graph shows the choice behaviour of Garter snakes when prey is presented with an air borne odour. The location of the snake's head as being towards the scented or unscented side of the test apparatus is shown. After the first hundred trials the position of the lemon extract (scented) was reversed.



Choice behaviour of garter snake for air borne odour

The conclusion of this study is:

(a) Snakes are more attracted to lemon extract.
(b) More snakes orient towards the unscented side.
(c) Snakes remain indiscriminate for air borne scents
(d) Snakes learn to dissociate scents not related to the prey.

17. What is the role of inducer in lac operon?
    (a) It inactivates the repressor protein
    (b) It activates the repressor protein
    (c) It activates the promoter
    (d) It inactivates the promoter

18. Observe the sequence of events that occur during cell cycle and arrange them in the correct order.
    i. Division of centromeres
    ii. Centrioles separate and move to opposite poles
    iii. DNA replication occurs
    iv. DNA unwinding
    v. Centromeres line up along the equatorial plate

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

19. Which one of the following sequences shows the trend from mutually beneficial to detrimental interactions?
    (a) Protocooperation → Obligatory symbiosis → Competition → Parasitism
    (b) Commensalism → Amensalism → Facultative Symbiosis → Predation
    (c) Obligatory symbiosis → Commensalism → Amensalism → Competition
    (d) Facultative symbiosis → Amensalism → Predation → Parasitism

20. Which of the following mutations, resulting in an error in the mRNA just after the start codon is likely to have the largest change in the polypeptide formed?
    (a) a deletion of a codon
    (b) a deletion of 2 nucleotides
    (c) a substitution of the third nucleotide in an ACC codon
    (d) a substitution of the first nucleotide of a GGG codon

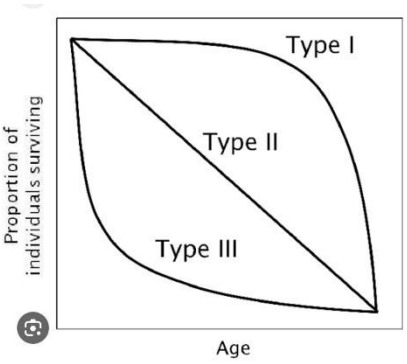
21. DNA of a hypothetical species 'X' has the following characters:
    I - It follows a typical B-DNA (Watson-Crick) structure.
    II- Every 50 years, one helical turn in the DNA gets saturated by mutation.
    III- The length of the DNA is 34000 Å.
    After how many years and mutational events from the day of its origin, DNA of this species will stop to mutate?

    (a) 680 years, 400 mutational events
    (b) 5×10^5 years, 800 mutational events
    (c) 50,000 years, 2000 mutational events
    (d) 50,000 years, 10000 mutational events

22. Based on evolutionary changes, spot the option from the following that is in the right order of "no change (living fossils)", "gradual change" and "rapid change" respectively :
    (a) Horseshoe crab, Gingko leaves, House finch
    (b) Gingko leaves, Trilobites, House finch
    (c) Horseshoe crab, Gingko leaves, Trilobites
    (d) House finch, Gingko leaves, Horseshoe crab

23. In which of the following scenario, can genetic drift lead to fastest increase in harmful alleles from one generation to the next?
    (a) Large changes in small populations
    (b) Large changes in large populations
    (c) Small changes in small populations
    (d) Small changes in large populations

24. The diagram shows three types of survivorship curve of populations. Which of the following statement is true when the three curves are compared?



(a) In type II Curve, mortality is low initially and then it increases markedly.
(b) Population exhibiting type III curve has a greater proportion of surviving young individuals.
(c) Population exhibiting type III curve has high infantile mortality.
(d) Populations exhibiting type I and type III curve have greater proportion of young individuals.

25. In recent years, DNA sequences (nucleotide sequence) of Mitochondrial DNA and Y-chromosomes are considered for the study of human evolution, mainly because;
(a) their structure is known in greater detail.
(b) they can be studied from the samples of fossil remains.
(c) they are small and therefore, easy to study.
(d) they are uniparental in origin and do not take part in recombination.

26. Arun used bundle sheath cells from sugarcane plant to study light reaction. He failed to observe the splitting of water even after correctly following the experimental setup of Hill's reaction. What is the possible reason for the observed failure?
(a) The reaction system lacked a reducing agent.
(b) Succulents do not exhibit light reaction.
(c) The cells chosen were inappropriate as they lack grana.
(d) He should have added carboxylate in the water of the setup.

27. If the calorific value of a lipid molecule is 1200 Kcal and yields 50 ATPs on oxidation, then what will be the % efficiency of energy storage (in terms of ATPs)?
(a) 60% (b) 30% (c) 40% (d) 50%

28. Which of the following will not give respiratory quotient close to 1?
(a) Dextrin (b) Starch (c) Amylose (d) Inulin

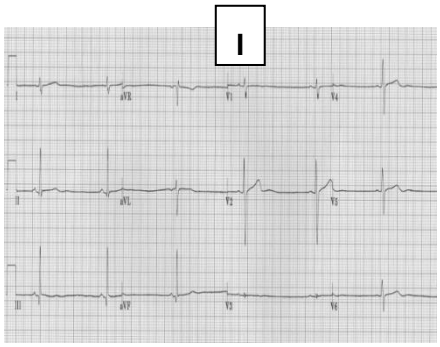
29. The same gene in different tissues shows different expression patterns because of-
(a) differential charges (b) differential amount of cytosine bases
(c) the lack of histone tails (d) the differential methylation of bases

30. Which of the following cell types, when compared, have a greater number of mitochondria?
(a) Human epidermal cells (b) Cells of the dormant seeds
(c) Leaf cells involved in photosynthesis (d) Bark cells

31. From the two types of barnacles, an ecologist removed *Balanus balanoides* from the lower strata of rocks along the coast of Scotland and found *Chthamalus stellatus* population spreading into that area. Which of the following statements is true?
(a) Balanus fails to survive at a greater height on the rocks
(b) Competitive exclusion makes the realized niche of *Chthamalus* much larger than its fundamental niche
(c) Competitive exclusion makes the realized niche of *Chthamalus* much smaller than its fundamental niche
(d) *Chthamalus* is best adapted to grow densely on the lower strata of rocks

32. The nuclear membrane disappears during cell division. After completion of cell division, it re-appears during the interphase. Which of the following contributes towards formation of the nuclear membrane?
    (a) Mitochondria (b) Endoplasmic reticulum
    (c) Golgi bodies (d) Centrioles

33. Normal cardiogram consists of PQRST complex. Following are the electrocardiograms of two individuals, "I" and "II" following a specific task:



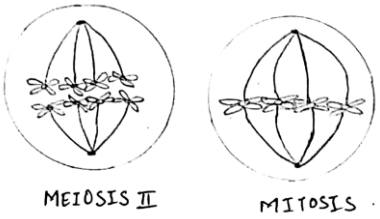
From the above, we conclude that:

(a) I is a trained athlete and II is not
(b) I is undergoing cardiac treatment and II is not
(c) I is on a cardiac treatment and II is an athlete
(d) Both I and II are athletes, but II is under cardiac treatment.

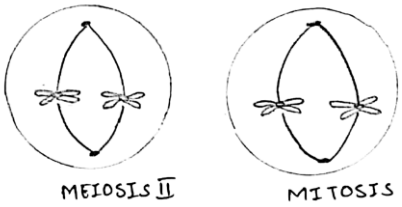
34. The red fox has 17 pairs of large, long chromosomes. The arctic fox has 26 pairs of shorter smaller chromosomes. What will be the number of chromosomes in somatic tissue of hybrid between these two foxes?
    (a) 43 pairs (b) 43 chromosomes (c) 17 pairs (d) 34 chromosomes

35. If an organism having 2n = 4 chromosomes, then which diagram is appropriately showing metaphase in the meiosis II and mitosis respectively?

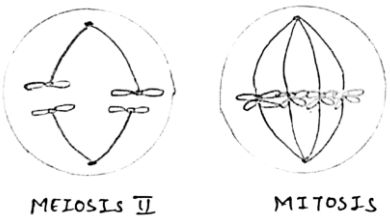
(a)



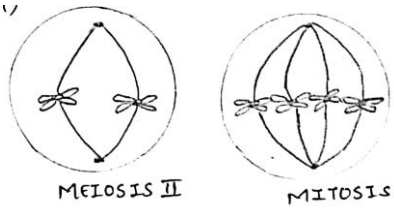
(b)



(c)



(d)

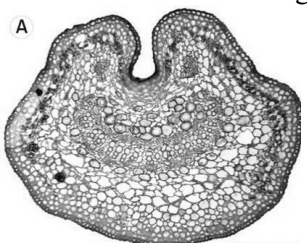


36. During which phase of the life cycle of a normal rat is the thymus gland maximally active?
    (a) During senescence (b) During lactation (c) Just after birth (d) At sexual maturity

37. Which part/region of the brain acts as the epicentre of regulation of circadian rhythms as well as biological clock in humans?
    (a) Pituitary gland
    (b) Pineal gland
    (c) Medulla Oblongata
    (d) Suprachiasmatic nucleus.

38. Why is blastocyst is not rejected by uterus of pregnant female?
    (a) Because blastocyst is not foreign to body.
    (b) Blastocyst gets firmly attached to the wall of uterus.
    (c) Blastocyst releases signal molecules which have immunosuppressive effect.
    (d) Blastocyst gets converted into trophoblast which is not rejected by the uterus.

39. A student prepared a transverse section of a piece of a plant axis and observed that it has a C-shaped opened arch of endarch collateral vascular bundles with secondary growth as shown in the figure. This indicates that the section is of-
    (a) A dicot stem at the node
    (b) A phylloclade
    (c) A dicot root with root branching
    (d) A dicot petiole.

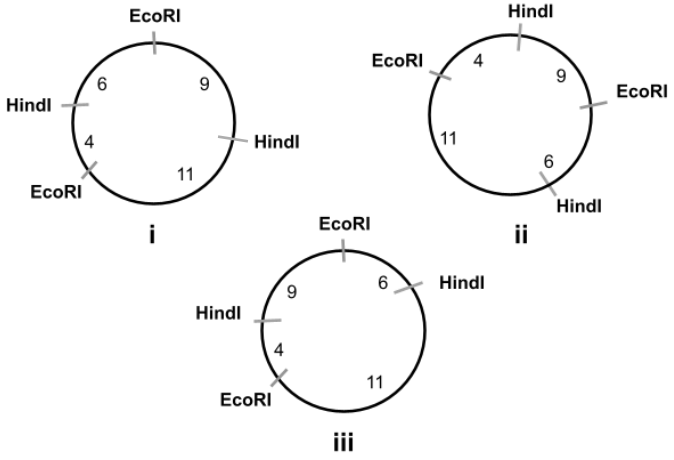


40. Some plants were kept under 15 hours of daylight and 9 hours of night. These plants started producing flowers. However, in some of them, night was interrupted by a brief flash of light resulting in the failure of flowering to take place. These plants can be classified as ;
    (a) LDP (Long Day Plants)
    (b) DNP (Day Neutral Plants)
    (c) SDP (Short Day Plants)
    (d) Dark-adapted plants

41. In a hypothetical situation, a restriction enzyme EcoRI cleaves double stranded DNA at the sequence 5' GAATTC 3' and another restriction enzyme, HindI cleaves at 5' AAGCTT 3'. A 30 kb circular plasmid is digested with each enzyme individually and then in combination, and the fragment lengths are determined by Gel Electrophoresis. Following observations were made:

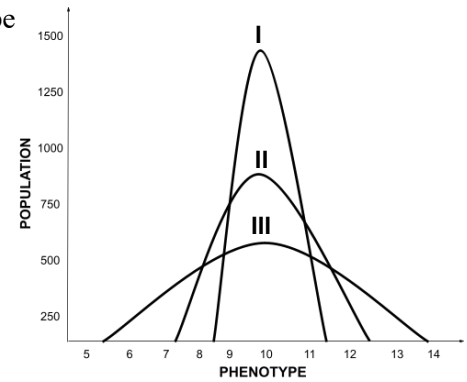
Enzyme(s)	**Fragment Length (kb)**
EcoRI	13, 17
HindI	15, 15
EcoRI + HindI	4, 6, 9, 11

Which of the Restriction map(s) given below is/are compatible with the data?



(a) (i) only
(b) (ii) only
(c) (ii) and (iii)
(d) (i) and (iii)

42. The graph below shows the approximate distribution of a phenotype among three populations of women I, II and III. Which of the statement(s) is/are true regarding the given graphs.



i. Value of variance is in the order **I < II < III**.
ii. A small variance value implies that distribution is clustered near the mean.
iii. Area under each curve represents all individuals having the same phenotypic trait.

(a) i only (b) i, and ii only (c) iii only (d) i, ii, and iii

43. Kidneys are the important organs of excretion in higher organisms like humans. Apart from excretion, they produce hormones to regulate few body functions. Which of the following sequence is correct regarding regulation of blood pressure by kidney?
    (a) Blood pressure decreases → Kidneys produce renin → Renin converts angiotensinogen to angiotensin → Angiotensin constricts arterioles → Blood pressure increases.
    (b) Blood pressure increases → Kidney produces renin → Angiotensin and renin constricts arterioles → Blood pressure decreases.
    (c) Blood pressure decreases → Kidney produces angiotensinogen → arterial endothelium secretes renin → Renin-angiotensin system constricts arteriole → Blood pressure increases.
    (d) Angiotensin constricts arterioles → Blood pressure increases → Kidney produces renin → Renin dilates arterioles → Blood pressure decreases.

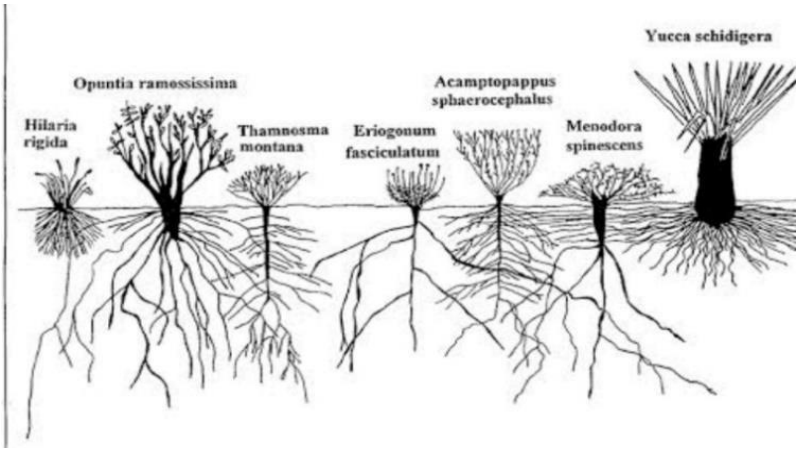
44. A person was suffering from Hypoxemia and having difficulty in breathing. What would be the correct sequence of events, starting from kidneys, that will result in relieving this problem?
    (i) Blood Oxygen level Increases (ii) Bone Marrow activated
    (iii) Release of more RBCs in blood (iv) Release of Erythropoietin

    (a) i, ii, iii, iv (b) iv, iii, ii, i (c) iv, ii, iii, i (d) iii, ii, iv, i

45. In an experiment 50 gm of dry apricots were soaked in plain water for 6 hours. After 6 hours the apricots were wiped with a tissue and weighed. Their weight was 68.4 gm. These apricots were later soaked in salt solution for another 6 hours. What is the percentage of plain water absorbed by apricots initially in 6 hours and what will happen to the apricots when placed in salt water?
    (a) 0.684% of water absorbed and exosmosis will take place in salt solution.
    (b) 18.4% of water absorbed and endosmosis will take place in salt solution.
    (c) 36.8% of water absorbed and exosmosis will take place in salt solution.
    (d) 1.46% of water absorbed and exosmosis will take place in salt solution.

46. Few cells were cultured in artificial medium, having colchicine and allowed to divide. Microscopic preparation was done, and cells were observed under a light microscope. Which of the following observations is true in the context of the above information?
    (a) Cells were arrested at interphase and DNA replication did not take place.
    (b) Chromosomes were clearly visible with two sister chromatids in each cell.
    (c) Cells were dividing normally and slide showed various stages of mitosis.
    (d) Chromatin material did not undergo condensation.

47. The diagram below depicts the “above and below the water surface” architecture of some plants of Mojave Desert.



What does the root architecture of these plants indicate / suggest?

(a) Competition for the same water resource
(b) Amount of water required by each plant.
(c) Quality of water required by each plant
(d) Adaptation towards optimal uptake of available water.

48. Double fertilization is a distinctive feature of the angiosperm life cycle. In a mutant angiosperm in which only one of the two sperm cells from the pollen grain was functional, its observed that seed was developed after pollination. Which of the following statement is correct?

(a) The ovule will only form seeds that lack endosperm.
(b) Either a zygote will form without accompanying endosperm, or an endosperm will form without zygote.
(c) The ovule will remain unfertilised because both sperm cells are essential for fertilization of the egg cell.
(d) All seeds formed will have fertile embryo.

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. Which of the following statements are correct for hypothalamus?
    (a) It has direct connection with anterior pituitary.
    (b) It has direct connection with posterior pituitary.
    (c) It maintains BMR (Basal Metabolic Rate)
    (d) it acts as a thermostat.

50. Animals that move in large flocks like some birds (starlings) and large shoals like some fish (sardines) show very distinct escape behaviour when under attack by a predator. The flock / shoal movements can be visualized in distinct forms as shown below in "figure I". The top pane in "figure I" depicts the "wave event" while the lower pane depicts "explosion" and "blackening" respectively. The events are further depicted schematically in figure II with arrows showing the resultant movement of the flock / shoal.

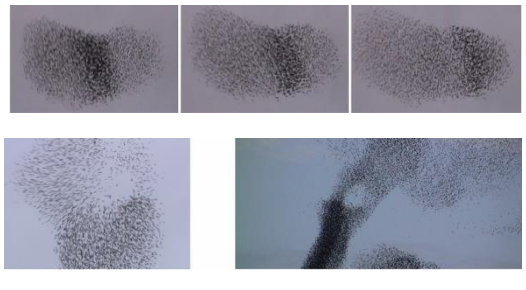


Figure I

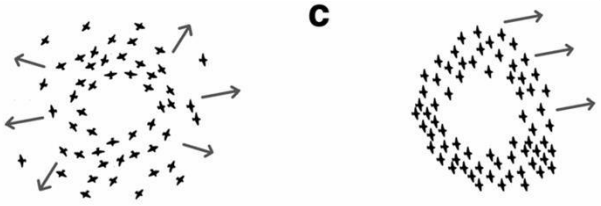


Figure II

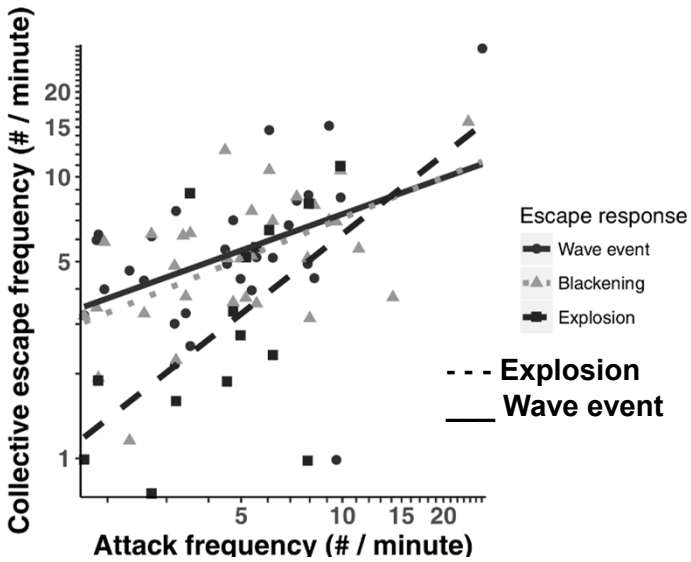


Figure III

A group of biologists analysed videos of flock movements of Starlings and evaluated three escape behaviours. Their observations are shown in the graph (figure III). Which of the following statements are true?

(a) When the predator is absent or not in the vicinity, the individuals in the flock will spread out with relatively large distances between individuals.
(b) Wave event appears to be the preferred escape strategy during high levels of predator threat.
(c) When the predator attacks, the flock exhibited wave event followed by explosion.
(d) Larger distance between individuals in the flock triggers predator attacks and this in turn influences the escape strategy.

51. Dr. X, a veterinarian, while treating an ailing Iguana administers different doses of the same drug, one particular dose while administering the drug through the anterior limb muscles and a different dose while administering through the tail muscles. This is because;
    (a) Reptiles have a hepatic portal system, so the drugs get absorbed faster when administered through the anterior muscles.
    (b) Reptiles have a renal portal system so "first pass effect" due to liver is not seen while administering through the tail.
    (c) Reptiles have a three chambered heart whereby mixed blood circulates through the body.
    (d) "First pass effect" due to liver is seen only when administered through the anterior muscles.

52. Which of the following statements about asexual reproduction are **true**?
    (a) Asexual reproduction enables animals living in isolation to produce offsprings without locating mates.
    (b) Asexual reproduction can create numerous offspring in a short amount of time which is ideal for colonizing a habitat rapidly.
    (c) Offsprings formed by asexual reproduction are genetically similar but physically dissimilar.
    (d) Asexual reproduction is most advantageous in stable, favourable environments because it perpetuates successful genotypes precisely.

53. In a particular form of cancer, it is observed that the cells from this cancer show rapid cell divisions and ability to invade surrounding tissues to form a new tumour. Given the context, choose the combination of statements that best represents the underlying cellular events.
    (a) There is a promotor or an enhancer that control a proto-oncogene, causing an increase in its expression.
    (b) Cells show anchorage dependence for tumour formation.
    (c) Cell cycles are unregulated in these cells.
    (d) Downregulation of a tumour suppressor gene, resulting in reduced apoptosis.

54. In angiosperms, the female gametophyte is also known as the embryo sac. Which of the following statements about the structure and development of the female gametophyte in angiosperms are true?
    (a) The embryo sac originates from the functional megaspore following three mitotic divisions.
    (b) The mature embryo sac is seven celled, and an eight nucleated structure.
    (c) The mature embryo sac is diploid in nature.
    (d) All angiosperms display the same pattern of embryo sac development and structure without any variation.

55. Which of these statements is correct for the deep sea (benthic) communities?
    (a) Most of the organisms in the benthic zone are aerobes.
    (b) They are adapted to continuous cold temperature.
    (c) The producers in the benthic zone are chemoautotrophs.
    (d) Most of the organisms in benthic zone form detritus food chain.

56. In mitosis the number of chromosomes in daughter cells depend on;
    (a) Splitting of centromere in anaphase.
    (b) Separation of chromatids in metaphase.
    (c) Proper attachment of chromosomes to the spindle poles.
    (d) Separation of chromatids in anaphase.

57. Which of the following statements comply with the chromosomal theory of inheritance?
    (a) the chromosomes retain their genetic identity within each individual in a population.
    (b) the two sets of homologous chromosomes in a diploid cell are not functionally equivalent.
    (c) the nuclei of all cells including germ line cells contain two sets of chromosomes
    (d) the maternal and paternal homologues synapse during meiosis and then move to opposite poles thereby segregated into different cells.

58. Menstrual cycle is a series of natural change in hormone production and structure of uterus and ovaries of the female reproductive system. Which of the following statements are true for the ovulation phase?
    (a) Estrogen level is increased.
    (b) Progestogen is the primary hormone in this phase.
    (c) Luteinizing hormone is the primary hormone of this phase.
    (d) The vesicular ovarian follicle becomes corpus luteum.

59. After a young Black headed Gull Chick *Larus ridibundus* hatches and frees itself from the shell, the parents carefully pick up the remnant pieces of shell in their bills, fly off to some distant location and drop them, a behaviour also seen in many other bird species. What are the most plausible evolutionary reasons for this behaviour?
    (a) The sharp edges of the shells might injure the chicks.
    (b) The bright white inner surface of the shell may attract potential predators.
    (c) The shells might clutter the nest and hamper the parent's attempt to brood and feed chicks.
    (d) Unlike the mottled outer surface of the eggshell, the white inner surface does not have camouflaging effect.

60. Immunity is the overall ability of host to fight the disease-causing organisms. Which among the following statements are true regarding acquired immunity?
    (a) It is characterized by memory.
    (b) It is non-specific type of defence.
    (c) It is achieved through several barriers like physical, physiological, cellular, etc.
    (d) It includes primary and secondary responses.

Rough Work