



BOARD KCET PYQ (2023)

Kannada

BOTANY

1. Which of the following statements is **correct**?
(A) Sickle cell anaemia is a quantitative problem
(B) Thalassaemia is a qualitative problem
(C) Female carrier for haemophilia may transmit the disease to sons
(D) Change in whole set of chromosomes is called aneuploidy
2. 'Gene-mapping' technology was developed by
(A) Sturtevant (B) Tschermak
(C) Mendel (D) Correns
3. Find the **correct** statement.
(1) Generally a gene regulates a trait, but sometimes one gene has effect on multiple traits.
(2) The trait AB-blood group of man is regulated by one dominant allele and another recessive allele. Hence it is co-dominant.
(A) Both Statements (1) and (2) are correct
(B) Statement (1) is correct
(C) Both the Statements are wrong
(D) Statement (2) is correct
4. In one of the hybridisation experiments, a homozygous dominant parent and a homozygous recessive parent are crossed for a trait.
(Plant shows Mendelian inheritance pattern)
(A) Dominant parent trait appears in F_1 generation and recessive parent trait appears in F_1 and F_2 generations.
(B) Dominant parent trait appears in F_1 generation and recessive parent trait appears in F_2 generation.
(C) Dominant parent trait appears in F_2 generation and recessive parent trait appears only in F_1 generation
(D) Dominant parent trait appears in both F_1 & F_2 generations, recessive parent trait appears in only F_2 generation.
5. Histone proteins are positively charged because they are rich in basic amino acid residues
(A) Arginine and Phenylalanine
(B) Arginine and Alanine
(C) Arginine and Proline
(D) Arginine and Lysine
6. Eukaryotic genes are monocistronic but they are split genes because
(A) Exons are interrupted by Introns
(B) They contain Exons only
(C) Introns are interrupted with Mutons
(D) They contain Introns only
7. The Lac-Operon model was elucidated by
(A) Hershey and Chase
(B) Watson and Crick
(C) Jacob and Crick
(D) Francois Jacob and Jaques Monod
8. In male heterogametic type of sex determination
(A) Male parent produces dissimilar gametes
(B) Male parent produces similar gametes
(C) Males do not produce gametes
(D) Female parent produces dissimilar gametes
9. Identify from the following a pair of better yielding semi dwarf varieties of rice developed in India.
(A) Jaya and Kalyan Sona
(B) Jaya and Ratna
(C) Kalyan Sona and Sonalika
(D) Sonalika and Ratna
10. Roquefort cheese is ripened by
(A) Virus
(B) Bacterium
(C) Yeast
(D) Fungi



11. Four students were assigned a science project to find out the pollution levels of lakes in their surrounding. After analysing the quality of water samples, the BOD values were found as follows: Which among the following water samples is highly polluted?

(A) 6 mg/L (B) 0.6 mg/L
(C) 0.16mg/L (D) 0.06 mg/L

12. Generally, bears avoid winter by undergoing

(A) Aestivation (B) Diapause
(C) Migration (D) Hibernation

13. Match Column - I with Column - II. Select the option with correct combination.

Column - I	Column - II
1. Standing state	p. quad Mass of living material at a given time.
2. Pioneer species	q. Amount of nutrients in the soil at a given time.
3. Detritivores	r. quad Species that invade a bare area.
4. Standing crop	s. quad Breakdown detritus into smaller particles.

(A) 1 - q, 2 - r, 3 - p, 4 - p
(B) 1 - q, 2 - r, 3 - p, 4 - s
(C) 1 - p, 2 - s, 3 - r, 4 - q
(D) 1 - p, 2 - r, 3 - s, 4 - q

14. The toxic heavy metals from various industries which cause water pollution, normally have a density

(A) more than $7.5\text{g} / \text{cm}^3$
(B) more than $5\text{g} / \text{cm}^3$
(C) more than $12.5\text{g} / \text{cm}^3$
(D) more than $15\text{g} / \text{cm}^3$

15. Identify the correct option showing the relative contribution of different greenhouse gases to the total global warming.

(A) CFC - 6%, CO_2 - 60%, Methane - 20%, N_2O - 14%

(B) CFC - 14%, CO_2 - 60%, Methane - 20%, N_2O - 6%

(C) CFC - 14%, CO_2 - 60%, Methane - 6%, N_2O - 20%

(D) CFC - 20%, CO_2 - 60%, Methane - 14%, N_2O - 6%

16. A flower has 10 stamens each having bilobed ditheous anther. If each microsporangium has 5 pollen mother cells, how many pollen grains would be produced by the flower?

(A) 800 (B) 200
(C) 1600 (D) 400

17. During transcription the DNA stand with $3 \rightarrow 5$ polarity of the structural gene always acts as a template because

(A) Enzyme DNA dependent RNA polymerase always catalyse polymerisation in both the directions

(B) Enzyme DNA dependent RNA polymerase always catalyse the polymerisation $5 \rightarrow 3$ directions

(C) Nucleotides of DNA strand with $5 \rightarrow 3$ are transferred to mRNA

(D) Enzyme DNA dependent RNA polymerase always catalyse the polymerisation $3 \rightarrow 5$ directions.

18. According to David Tilman's long term ecosystem experiments, the total biomass in plots with more species shows,

(A) Average variation from year-to-year
(B) Less variation from year-to-year
(C) No variation from year-to-year
(D) High variation from year-to-year.

19. Identify the incorrect statement regarding the flow of energy between various components of the food chain.

(A) Green plants capture about 10% of the solar energy that falls on leaves

(B) The amount of energy available at each trophic level is 10% of previous trophic level

(C) Each trophic level loses some energy as heat to the environment



(D) Energy flow is unidirectional

20. Match the column-I with column-II and choose the correct option from the following:

Column - I (Plant groups)	Column - II (Examples)
1. Bryophyta	p. <i>Pinus</i>
2. Gymnosperm	q. <i>Adiantum</i>
3. Algae	r. <i>Sphagnum</i>
4. Pteridophyta	s. <i>Ectocarpus</i>

- (A) 1-q, 2-p, 3-s, 4-r
(B) 1-s, 2-r, 3-q, 4-p
(C) 1-q, 2-s, 3-p, 4-r
(D) 1-r, 2-p, 3-s, 4-q

21. Identify the floral formula of plant belonging to potato family.

- (A) $\frac{\text{♂}}{+}, P_{3+3}, A_{3+3}, G_{(3)}$
(B) $\frac{\text{♂}}{+}, K_{(5)}, \overset{\text{C}_{(5)}}{\text{C}_{(5)}}, A_5, \underline{G}_{(2)}$
(C) $\frac{\text{♂}}{+}, K_{(5)}, C_{(5)}, A_{(9)-1}, G_1$
(D) $\frac{\text{♂}}{+}, K_{10}, C_{10}, A_{10}, \bar{G}_2$

22. When the vascular cambium is present between the xylem and phloem, then the vascular bundle is called

- (A) Endarch (B) Exarch
(C) Closed (D) Open

23. Select the correctly matched pair of organisms with their order.

- (A) Homo, sapiens: Poales
(B) Triticum, aestivum: Sapindales
(C) Mangifera, indica: Primata
(D) Musa, domestica: Diptera

24. The complex formed by a pair of synapsed homologous chromosomes is called

- (A) Bivalent (B) Pentavalent
(C) Univalent (D) Triad

25. Match column-I with column-II. Select the option with correct combination.

Column - I	Column - II
1. Hypertonic	p. Two molecules move in the same direction across the membrane.
2. Capillarity	q. External solution is more concentrated than cellsap.
3. Symport	r. Water loss in the form of droplets.
4. Guttation	s. Ability of water to rise in thin tubes.

- (A) 1-q, 2-p, 3-s, 4-r
(B) 1-q, 2-s, 3-r, 4-p
(C) 1-q, 2-s, 3-p, 4-r
(D) 1-q, 2-r, 3-p, 4-s

26. Toxicity of which micronutrient induces deficiency of iron, magnesium and calcium?

- (A) Manganese (B) Zinc
(C) Boron (D) Molybdenum

27. Bamboo species flowers

- (A) Once in lifetime
(B) Every year
(C) Twice in 50-100 years
(D) Once in 12 years

28. In Bryophyllum, the adventitious buds arise from

- (A) Shoot apex
(B) Leaf axil
(C) Leaf base
(D) Notches in the leaf margin

29. Primary endosperm nucleus is formed by fusion of

- (A) One polar nucleus and male gamete
(B) Two polar nuclei and one male gamete
(C) Two polar nuclei and two male gamete
(D) Ovum and male gamete



30. Which pair of the following cells in the embryo sac are destined to change their ploidy after fertilization?

(A) Central cell and antipodals

(B) Antipodals and synergids

(C) Egg cell and central cell

(D) Synergids and egg cell



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Hint & Solution

1. (C)

1. Haemophilia is an X-linked recessive disorder in which the defective gene is present on the X chromosome.
2. A carrier female possesses one normal allele and one mutant allele; therefore, she usually does not show the disease.
3. A son inherits his X chromosome from the mother and the Y chromosome from the father. If he receives the mutant X chromosome, he develops haemophilia.
4. Thus, a carrier mother can transmit the disease to 50% of her sons, while daughters may become carriers if they inherit the mutant allele.
5. The other options are incorrect because sickle-cell anaemia is a qualitative defect, thalassaemia is a quantitative defect, and change in the whole chromosome set is called polyploidy, not aneuploidy.

2. (A)

1. Alfred Sturtevant developed the first genetic map using the principle of linkage and recombination.
2. He observed that the frequency of recombination between two genes depends on the distance separating them on the chromosome.
3. Genes that are located closer together show lower recombination frequency, whereas genes farther apart show higher recombination frequency.

4. This relationship enabled the arrangement of genes in a linear order on chromosomes, leading to the construction of genetic maps.

5. Gene mapping is useful in locating genes, studying linkage relationships, and understanding chromosome organization.

3. (B)

1. A single gene generally controls one trait, but in some cases one gene influences multiple traits, a phenomenon called pleiotropy.
2. An example is phenylketonuria, where a mutation in one gene affects several characteristics of the body.
3. The ABO blood group is controlled by three alleles—IA, IB and i—not by one dominant and one recessive allele.
4. IA and IB are equally expressed together in individuals with AB blood group, showing codominance.
5. Therefore, Statement (1) is correct, while Statement (2) is incorrect because codominance does not involve a dominant–recessive relationship.

4. (D)

1. A cross between TT × tt produces all Tt offspring in the F₁ generation.
2. Since the dominant allele masks the recessive allele, all F₁ plants express the dominant trait.
3. Self-pollination of F₁ plants produces the F₂ generation with a genotypic ratio of 1 : 2 : 1.
4. The F₂ generation shows a phenotypic ratio of 3 : 1, with three dominant and one recessive individual.



5. Thus, the recessive trait disappears in F_1 but reappears in F_2 due to segregation of alleles during gamete formation.

5. (D)

1. Histones are basic proteins associated with DNA in eukaryotic chromosomes.
2. They are rich in the basic amino acids lysine and arginine, which carry a positive charge.
3. The positively charged histones bind strongly to the negatively charged phosphate groups of DNA.
4. DNA wraps around histone octamers to form nucleosomes, the repeating units of chromatin.
5. This interaction helps in packing DNA efficiently inside the nucleus and regulates chromosome organization.

6. (A)

1. Most eukaryotic genes are monocistronic, meaning they code for only one polypeptide.
2. These genes are called split genes because coding sequences (exons) are interrupted by non-coding sequences (introns).
3. During transcription, both exons and introns are copied into the primary RNA transcript.
4. Introns are removed by RNA splicing, and exons are joined together to form mature mRNA.
5. Only the mature mRNA is translated into a functional protein.

7. (D)

1. The lac operon model was proposed by Francois Jacob and Jacques Monod to explain gene regulation in bacteria.
2. It is an example of an inducible operon, where genes are expressed only when lactose is present.
3. In the absence of lactose, the repressor protein binds to the operator and blocks transcription.
4. When lactose is available, it acts as an inducer, inactivates the repressor, and allows transcription of structural genes.

5. The lac operon demonstrates how gene expression is regulated according to the metabolic needs of the cell.

8. (A)

1. In male heterogamety, the male possesses two different sex chromosomes (XY), while the female has two similar sex chromosomes (XX).
2. The male produces two types of gametes, one carrying the X chromosome and the other carrying the Y chromosome.
3. The female produces only one type of gamete, each carrying an X chromosome.
4. Fertilization by an X-bearing sperm produces a female (XX), while fertilization by a Y-bearing sperm produces a male (XY).
5. Therefore, the male parent determines the sex of the offspring by producing dissimilar gametes.

9. (B)

1. Jaya and Ratna are high-yielding semi-dwarf rice varieties developed in India.
2. Semi-dwarf varieties are resistant to lodging and respond well to fertilizers.
3. These varieties contributed significantly to increased rice production during crop improvement programmes.
4. Kalyan Sona and Sonalika are high-yielding wheat varieties, not rice.
5. Development of improved crop varieties aims to achieve higher yield, better quality, and resistance to biotic and abiotic stresses.

10. (D)

1. Roquefort cheese is ripened using the fungus *Penicillium roqueforti*.
2. During ripening, the fungus grows within the cheese and produces characteristic blue-green veins.
3. It imparts the distinct flavour, aroma, and texture of Roquefort cheese.



4. The ripening process is a beneficial application of microorganisms in the food industry.

5. Different cheeses are produced using different microorganisms depending on the desired flavour and texture.

11. (A)

1. Biochemical Oxygen Demand (BOD) is the amount of oxygen required by microorganisms to decompose organic matter in water.

2. A higher BOD value indicates a greater amount of organic pollution.

3. Increased organic matter promotes microbial growth, leading to higher oxygen consumption.

4. As dissolved oxygen decreases, aquatic organisms experience difficulty in survival.

5. Therefore, water having 6 mg/L BOD is the most polluted among the given samples

12. (D)

1. Hibernation is a strategy adopted by some animals to survive unfavourable winter conditions.

2. During hibernation, metabolic activities slow down considerably.

3. Body temperature, heart rate, and breathing rate decrease to conserve energy.

4. Animals survive by utilizing stored body fat when food is scarce.

5. Bears undergo hibernation during winter to overcome low temperatures and food shortage.

13. (A)

1. Standing state refers to the amount of nutrients present in the soil at a given time.

2. Pioneer species are the first species to invade a bare area during ecological succession.

3. Detritivores break down detritus into smaller particles, increasing the surface area for decomposers.

4. Standing crop is the mass of living material present in an ecosystem at a particular time.

5. These terms describe important structural and functional components of an ecosystem.

14. (C)

1. Heavy metals released from industries are important water pollutants.

2. They are characterized by having a density greater than 12.5 g/cm^3 .

3. Common heavy metal pollutants include mercury, cadmium, and lead.

4. These metals are non-biodegradable and accumulate in living organisms.

5. Their accumulation through food chains causes serious health hazards and environmental pollution.

15. (B)

1. Carbon dioxide (CO_2) contributes about 60% to total global warming and is the major greenhouse gas.

2. Methane (CH_4) contributes about 20% and is released from wetlands, paddy fields, cattle and landfills.

3. Chlorofluorocarbons (CFCs) contribute about 14% and are potent greenhouse gases despite their lower concentration.

4. Nitrous oxide (N_2O) contributes about 6% and is mainly released from agricultural activities and industries.

5. Increased concentration of these greenhouse gases enhances the greenhouse effect, leading to global warming.

16. (A)

1. Each bilobed ditheous anther contains 4 microsporangia.

2. Each microsporangium has 5 pollen mother cells (PMCs).

3. Each PMC undergoes meiosis to produce 4 pollen grains.

4. Therefore, one anther produces $4 \times 5 \times 4 = 80$ pollen grains.

5. Since the flower has 10 stamens, the total number of pollen grains produced is $10 \times 80 = 800$.



17. (B)

1. During transcription, only one DNA strand acts as the template strand.
2. The template strand has 3'→5' polarity, allowing RNA synthesis in the opposite direction.
3. RNA polymerase synthesizes RNA only in the 5'→3' direction by adding nucleotides to the 3' end.
4. The RNA sequence formed is complementary to the template strand.
5. The opposite DNA strand is called the coding strand, as its sequence is similar to the RNA except thymine is replaced by uracil.

18. (B)

1. David Tilman's experiments demonstrated that ecosystems with greater species diversity are more stable.
2. Plots containing more species produced higher total biomass over time.
3. These plots also showed less year-to-year variation in productivity.
4. Greater biodiversity improves efficient utilization of available resources.
5. Thus, species-rich communities are more stable and productive than species-poor communities.

19. (A)

1. Green plants capture only 2–10% of the photosynthetically active radiation (PAR), not 10% of the total solar energy falling on leaves.
2. According to the 10% law, only about 10% of the energy at one trophic level is transferred to the next trophic level.
3. A major portion of energy is lost as heat during metabolic activities at each trophic level.
4. Energy flow in an ecosystem is unidirectional, moving from producers to consumers and finally to decomposers.
5. Therefore, statement (A) is incorrect, while the remaining statements correctly describe energy flow.

20. (D)

1. Bryophyta – *Sphagnum*: *Sphagnum* is a moss belonging to Bryophyta and is commonly called peat moss.
2. Gymnosperm – *Pinus*: *Pinus* is a gymnosperm that bears naked seeds on cones.
3. Algae – *Ectocarpus*: *Ectocarpus* is a brown alga found in marine habitats.
4. Pteridophyta – *Adiantum*: *Adiantum* (maidenhair fern) is a vascular cryptogam belonging to Pteridophyta.
5. Correct matching is 1-r, 2-p, 3-s, 4-q

21. (B)

1. Flowers of the potato family (Solanaceae) are actinomorphic and bisexual.
2. The calyx consists of 5 united sepals, represented as K(5).
3. The corolla consists of 5 united petals, represented as C(5).
4. There are 5 epipetalous stamens and a bicarpellary, syncarpous superior ovary, represented as A5 $\underline{G}$ (2).
5. The floral formula corresponding to these characters is Option (B).

22. (D)

1. A vascular bundle containing vascular cambium between xylem and phloem is called an open vascular bundle.
2. The cambium remains actively dividing and produces secondary xylem and secondary phloem.
3. Open vascular bundles are responsible for secondary growth in dicot stems and gymnosperms.
4. In closed vascular bundles, cambium is absent and secondary growth does not occur.
5. Therefore, the presence of vascular cambium identifies the bundle as open.

23. (D)

1. *Musca domestica* (housefly) belongs to the order Diptera.



2. Diptera includes insects having one pair of functional wings, while the hind wings are modified into halteres.
3. *Homo sapiens* belongs to the order Primata, not Poales.
4. *Triticum aestivum* belongs to the order Poales, not Sapindales.
5. *Mangifera indica* belongs to the order Sapindales, not Primata.

24. (A)

1. During the zygotene stage of prophase I, homologous chromosomes pair with each other by synapsis.
2. The paired homologous chromosomes together form a bivalent.
3. Each chromosome of the bivalent consists of two sister chromatids, making a total of four chromatids (tetrad).
4. Crossing over occurs between non-sister chromatids of homologous chromosomes during the pachytene stage.
5. Formation of bivalents ensures proper segregation of homologous chromosomes during meiosis I.

25. (C)

1. Hypertonic solution is a solution whose solute concentration is higher than that of the cell sap, causing water to move out of the cell.
2. Capillarity is the ability of water to rise in narrow tubes due to cohesion between water molecules and adhesion with the tube walls.
3. Symport is a type of membrane transport in which two molecules move together in the same direction across the membrane.
4. Guttation is the loss of water in the form of liquid droplets through hydathodes, usually during early morning.
5. Therefore, the correct matching is 1-q, 2-s, 3-p, 4-r.

26. (A)

1. Excess manganese (Mn) in plants becomes toxic and interferes with normal growth.

2. Manganese toxicity inhibits the uptake of iron, magnesium and calcium by plant roots.
3. As a result, deficiency symptoms of these essential mineral nutrients appear in the plant.
4. Mineral toxicity generally occurs when a nutrient is present in concentrations higher than the plant's requirement.
5. Maintaining the proper balance of mineral nutrients is essential for normal plant growth and metabolism.

27. (A)

1. Bamboo exhibits monocarpic flowering, meaning it flowers only once during its lifetime.
2. The flowering interval may extend over several decades, depending on the species.
3. After flowering and seed production, the entire plant usually dies.
4. This is a characteristic feature of many bamboo species.
5. Such a long vegetative phase followed by a single flowering event is an important reproductive adaptation.

28. (D)

1. Bryophyllum reproduces vegetatively through adventitious buds formed on its leaves.
2. These buds develop from the notches present along the leaf margins.
3. Each bud grows into a small plantlet while still attached to the parent leaf.
4. After detachment, the plantlet develops roots and grows into an independent plant.
5. This is a natural method of vegetative propagation, producing genetically identical offspring.

29. (B)

1. During double fertilization, one male gamete fuses with the two polar nuclei present in the central cell.
2. This process is called triple fusion because three haploid nuclei participate.



3. Triple fusion produces the primary endosperm nucleus (PEN), which is triploid ($3n$).
4. The primary endosperm nucleus develops into the endosperm, which nourishes the developing embryo.
5. Triple fusion occurs only in flowering plants and is a unique feature of angiosperms.

30. (C)

1. During fertilization, one male gamete fuses with the egg cell to form the diploid ($2n$) zygote.
2. The second male gamete fuses with the two polar nuclei of the central cell during triple fusion.
3. This fusion produces the triploid ($3n$) primary endosperm nucleus.
4. Thus, both the egg cell and central cell undergo a change in ploidy after fertilization.
5. This phenomenon of two fusion events occurring in the same embryo sac is known as double fertilization, a characteristic feature of angiosperms.