JCECE Biology Sample Paper – 8

Duration: 60 Minutes **Maximum Marks: 50**

Instructions

- This paper contains **50** Multiple Choice Questions (Single Correct Answer), modelled on the Biology portion of **JCECE** entrance.
- Each correct answer carries **+1 mark**. There is -0.25 **mark** for each incorrect answer; unattempted questions get 0.
- Only **one** option is correct. Choose carefully.
- Syllabus level: **Class 11 and Class 12 NCERT Biology (Jharkhand JAC / CBSE aligned) – Botany and Zoology.**
- Use of mobile phones, calculators, or electronic gadgets is strictly prohibited.

Q1. Acellular slime moulds (e.g. *Physarum*) form a multinucleate, creeping mass of protoplasm under suitable conditions, and produce spore-bearing fruiting bodies under unfavourable conditions. In Whittaker's five-kingdom scheme, slime moulds are placed in the kingdom:

(A) Monera

(B) Fungi

(C) Plantae

(D) Protista

Q2. A taxonomic aid in which animals and plants are kept in protected environments under human care for study and public viewing, and where wild animals are exhibited in enclosures, is the:

(A) herbarium (pressed, dried plant specimens)

(B) zoological park (zoo)

(C) botanical garden

(D) taxonomic key

Q3. In many fungi, asexual reproduction commonly takes place by means of non-motile spores that are produced exogenously in chains at the tips of special hyphae. These asexual spores are called:

(A) conidia

(B) zoospores (flagellated, motile)

(C) ascospores (formed inside an ascus)

(D) basidiospores (formed on a basidium)

Q4. The phylum whose adult members are exclusively marine, show radial symmetry, possess a water-vascular system with tube feet for locomotion, and have an endoskeleton of calcareous ossicles, is:

(A) Mollusca

(B) Arthropoda

(C) Echinodermata

(D) Annelida

Q5. In a dicot stem, all the tissues lying internal to the epidermis except the vascular bundles – such as the cortex, pericycle, pith and medullary rays – together make up the:

(A) epidermal tissue system

(B) ground tissue system

(C) vascular tissue system

(D) dermal tissue system

Q6. Some columnar or cuboidal epithelial cells get specialised for secretion of substances at the surface. When the secretory product is released through ducts onto an epithelial surface (e.g. salivary and sweat glands), the gland is classed as:

(A) an endocrine (ductless) gland

(B) a neurosecretory cell

(C) a mixed gland

(D) an exocrine (duct) gland

Q7. In the ovary of a flower, when the ovules are borne on a central axis and the ovary is divided into many chambers (locules) by septa, the type of placentation is:

(A) axile placentation

(B) parietal placentation

(C) marginal placentation

(D) free central placentation

Q8. In the cockroach (*Periplaneta*), the thin yellowish filamentous tubules attached at the junction of the midgut and hindgut, which remove nitrogenous wastes from the haemolymph, are the:

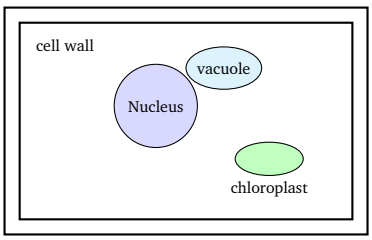
(A) hepatic caeca

(B) gastric caeca

(C) Malpighian tubules

(D) salivary glands

Q9. In the plant cell shown, the outermost rigid layer (made chiefly of cellulose) surrounds the cell membrane. The chief functions of this cell wall are to:



(A) synthesise ATP for the whole cell

(B) give shape, rigidity and mechanical protection to the cell

(C) carry out photosynthesis

(D) store the genetic material of the cell

Q10. According to the fluid-mosaic model, the bulk framework of the plasma membrane is formed by a bilayer in which the polar (hydrophilic) heads face outwards and the non-polar (hydrophobic) tails face inwards. The molecules forming this bilayer are mainly:

(A) nucleic acids

(B) polysaccharides

(C) integral proteins only

(D) phospholipids

Q11. Almost all enzymes are biocatalysts that speed up metabolic reactions without being consumed. Chemically, the vast majority of enzymes are:

(A) carbohydrates

(B) lipids

(C) proteins

(D) simple inorganic ions

Q12. Many enzymes are conjugate proteins consisting of a protein part and a non-protein part. The complete, catalytically active enzyme made of the protein part (apoenzyme) plus its non-protein cofactor is called the:

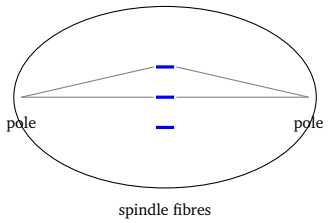
(A) holoenzyme

(B) apoenzyme alone

(C) coenzyme alone

(D) zymogen

Q13. The figure shows chromosomes held at the cell equator by fibres radiating from the two poles. These spindle fibres that attach to the chromosomes and later move them are made of the protein:



(A) keratin

(B) myosin

(C) tubulin (microtubules)

(D) collagen

Q14. A diploid cell with a chromosome number of $2n = 24$ undergoes meiosis to form gametes. The chromosome number in each of the four daughter cells (gametes) produced will be:

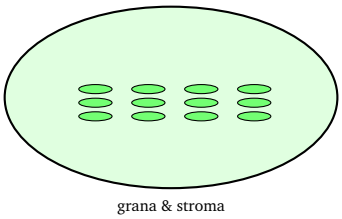
(A) 24

(B) 12

(C) 48

(D) 6

Q15. The chloroplast shown is the site of photosynthesis. When several factors (light, CO_2, temperature) influence the rate of photosynthesis, the law of limiting factors states that the rate is determined by:



(A) the sum of all the factors taken together

(B) only the temperature, always

(C) only light, irrespective of other factors

(D) the factor that is in the shortest supply (nearest its minimum)

Q16. In eukaryotic cells, after glycolysis the pyruvate enters a particular organelle where the citric acid (Krebs) cycle takes place. The Krebs cycle occurs in the:

(A) mitochondrial matrix

(B) cytoplasm (cytosol)

(C) nucleus

(D) ribosomes

Q17. According to the cohesion–tension theory, the upward movement of water (ascent of sap) in tall trees is driven mainly by a force generated at the leaves due to the evaporation of water. This force is the:

(A) root pressure developed in the root cells

(B) imbibition by the cell walls

(C) transpiration pull (tension) created in the xylem

(D) active pumping of water by xylem vessels

Q18. One mineral element is a constituent of the chlorophyll molecule and also activates the enzymes of respiration and photosynthesis. This element is:

(A) phosphorus

(B) magnesium

(C) sulphur

(D) potassium

Q19. In many plants the growing apical bud suppresses the growth of the lateral (axillary) buds below it; removing the shoot tip allows the lateral buds to grow. This phenomenon, controlled chiefly by auxin from the apex, is called:

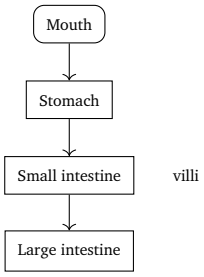
(A) vernalization

(B) photoperiodism

(C) geotropism

(D) apical dominance

Q20. The diagram shows the human alimentary canal. The inner lining of the *small intestine* is thrown into numerous tiny finger-like projections that greatly increase the surface area for absorption of digested food. These projections are the:



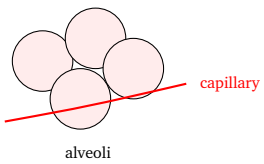
(A) rugae of the stomach

(B) villi (and microvilli)

(C) taste buds

(D) rennin folds

Q21. The alveoli shown are the sites of gas exchange. In one occupational respiratory disorder, proliferation of fibrous connective tissue in the lungs (due to chronic exposure to fine silica or asbestos dust) causes inflammation and severe damage. This disorder is:



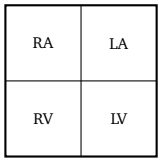
(A) occupational lung fibrosis (e.g. asbestosis / silicosis)

(B) simple iron-deficiency anaemia

(C) peptic ulcer of the stomach

(D) goitre due to iodine deficiency

Q22. The four-chambered heart is shown. When a healthy young adult's blood pressure is recorded as 120/80 mm Hg, the figure 120 mm Hg represents the:



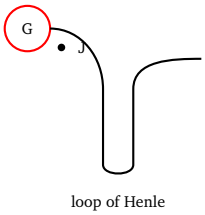
(A) diastolic pressure (ventricles relaxed)

(B) mean arterial pressure

(C) systolic pressure (ventricles contracting)

(D) pulse pressure of the arteries

Q23. In the nephron shown, at the point marked 'J' the distal convoluted tubule comes in close contact with the afferent arteriole. The specialised cellular region formed here, which secretes renin and helps regulate blood pressure and filtration, is the:



(A) Bowman's capsule

(B) proximal convoluted tubule

(C) collecting duct

(D) juxtaglomerular apparatus (JGA)

Q24. The contractile proteins of a skeletal muscle fibre are arranged as thick and thin filaments in the myofibrils. The *thick* filaments of the sarcomere are made of the protein:

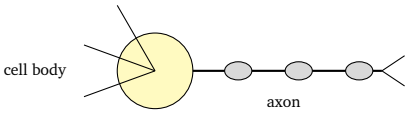
(A) actin

(B) troponin

(C) tropomyosin

(D) myosin

Q25. In the neuron shown, the long process (axon) is covered at intervals by an insulating sheath, with small gaps in between. In a myelinated fibre the impulse jumps from gap to gap, speeding conduction. The insulating sheath and the gaps are, respectively, the:



(A) myelin sheath and nodes of Ranvier

(B) dendrites and synaptic knobs

(C) Nissl granules and axon hillock

(D) Schwann cells and the soma

Q26. Enlargement of the thyroid gland (goitre), commonly seen in regions where the drinking water and soil are poor in a particular element, is caused mainly by the dietary deficiency of:

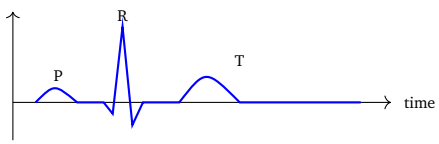
(A) calcium

(B) iodine

(C) iron

(D) vitamin C

Q27. The ECG trace shown originates from the heart's own electrical activity. The heartbeat is initiated by a specialised node that generates rhythmic action potentials (the pacemaker potential) on its own, without nervous stimulation. This natural pacemaker is the:



(A) the bundle of His

(B) the Purkinje fibres

(C) the sino-atrial node (SAN)

(D) the atrio-ventricular node (AVN)

Q28. When a nerve fibre is stimulated, the membrane at that point suddenly becomes far more permeable to one ion, which rushes inward and reverses the membrane potential (depolarisation). The ion responsible for this inward rush is:

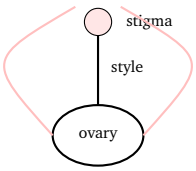
(A) chloride (Cl^-)

(B) sodium (Na^+)

(C) calcium (Ca^{2+})

(D) potassium (K^+)

Q29. The longitudinal section of a flower is shown. The female reproductive unit (carpel/pistil) is made of three parts. The swollen basal part that encloses the ovules is the:



(A) stigma (the receptive tip)

(B) style (the elongated stalk)

(C) filament

(D) ovary

Q30. Many flowering plants have evolved devices to prevent self-pollination and encourage cross-pollination. The maturation of the anthers and the stigma of the same flower at *different* times is one such device, called:

(A) dichogamy (different timing of anther & stigma maturity)

(B) cleistogamy (pollination in closed flowers)

(C) autogamy (self-pollination)

(D) geitonogamy

Q31. Inside the seminiferous tubules of the testis, large pyramidal cells provide nourishment to the developing germ cells (sperms). These nurse cells are the:

(A) Leydig cells (interstitial cells)

(B) primary spermatocytes

(C) Sertoli cells

(D) spermatogonia

Q32. In the human menstrual cycle, the phase marked by the breakdown and shedding of the uterine endometrial lining along with blood (the menstrual flow), occurring when the released egg is not fertilised, is the:

(A) ovulatory phase

(B) menstrual phase

(C) proliferative (follicular) phase

(D) secretory (luteal) phase

Q33. Among the following, the measure that does NOT directly help in controlling the rapid growth of the human population is:

(A) promoting the use of broad-spectrum antibiotics

(B) providing incentives to couples with small families

(C) educating people on the use of contraceptive methods

(D) raising the marriageable age of boys and girls

Q34. In Mendel's monohybrid cross, the tall F_1 pea plants (Tt) were self-pollinated. In the F_2 generation, the *genotypic* ratio of TT : Tt : tt obtained was:

(A) $3 : 1$

(B) $9 : 3 : 3 : 1$

(C) $1 : 2 : 1$

(D) $1 : 1$

Q35. The type of gene interaction in which one gene (at one locus) masks or suppresses the expression of another, non-allelic gene (at a different locus) is called:

(A) incomplete dominance

(B) codominance

(C) multiple allelism

(D) epistasis

Q36. When two linked genes lie very close together on a chromosome so that crossing over between them practically never occurs and they are nearly always inherited together, the linkage is said to be:

(A) complete linkage

(B) incomplete linkage

(C) no linkage (independent assortment)

(D) sex linkage

Q37. A human female showing a sterile, short-statured phenotype with rudimentary ovaries is found to have only a single X chromosome (genotype 45, X0). This chromosomal disorder is:

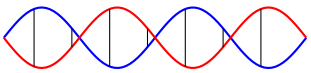
(A) Klinefelter's syndrome (47, XXY)

(B) Turner's syndrome (45, X0)

(C) Down's syndrome (trisomy 21)

(D) Edward's syndrome (trisomy 18)

Q38. The double-helical DNA is shown. One key chemical difference between DNA and RNA is in the nitrogen base used. The base *thymine* present in DNA is replaced in RNA by:



DNA double helix

(A) adenine

(B) guanine

(C) uracil

(D) cytosine

Q39. In eukaryotes the primary transcript (hnRNA) contains both coding and non-coding stretches. During processing, the non-coding intervening sequences (introns) are removed and the coding sequences (exons) are joined together. This process is called:

(A) splicing

(B) capping

(C) tailing (polyadenylation)

(D) replication

Q40. When a small group of individuals migrates and establishes a new isolated colony, the new population may show allele frequencies very different from the original large population, simply by chance sampling. This change in the founding population is the:

(A) natural selection of the fittest

(B) directional selection

(C) adaptive radiation

(D) founder effect (a form of genetic drift)

Q41. Chronic inflammation of the lymphatic vessels of the lower limbs, leading to gross swelling (elephantiasis), is caused by a worm of the genus

Wuchereria. This disease (filariasis) is transmitted to humans by the bite of:

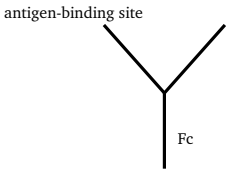
(A) the sandfly

(B) the female *Culex* mosquito

(C) the housefly

(D) the female *Anopheles* mosquito

Q42. The Y-shaped antibody molecule is shown. Sometimes the body's immune system fails to distinguish 'self' from 'non-self' and produces antibodies that attack its own cells and tissues. Such a disorder (e.g. rheumatoid arthritis) is called:



(A) an allergic (hypersensitivity) reaction

(B) an active immunity response

(C) an autoimmune disease

(D) passive immunisation

Q43. The large holes ('eyes') and the characteristic flavour of Swiss cheese are produced by a bacterium that releases large amounts of carbon dioxide during ripening. This bacterium is:

(A) *Saccharomyces cerevisiae*

(B) *Aspergillus niger*

(C) *Lactobacillus acidophilus*

(D) *Propionibacterium sharmanii* (*P. freudenreichii*)

Q44. In a crop-improvement programme, the step in which two selected parents with desirable characters are crossed so as to combine their good traits into a single progeny is called:

(A) cross-hybridisation

(B) germplasm collection

(C) commercialisation of the variety

(D) selection of superior recombinants

Q45. For transferring genes into plant cells, biotechnologists often use a natural plasmid from a soil bacterium that normally causes crown-gall tumours in plants. This widely used plant-cloning vector is the:

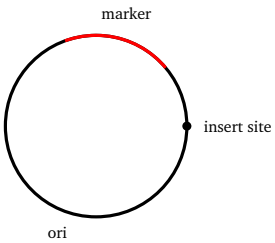
(A) lambda phage of *E. coli*

(B) Ti plasmid of *Agrobacterium tumefaciens*

(C) bacterial F plasmid

(D) the BAC vector

Q46. The cloning vector is shown carrying an inserted DNA. A collection of clones containing DNA copied from the messenger RNAs of a cell (using the enzyme reverse transcriptase) is known as a:



(A) genomic DNA library

(B) gene probe

(C) DNA fingerprint

(D) cDNA (complementary DNA) library

Q47. In India, the statutory body that examines the safety of introducing genetically modified organisms for public services and decides on the validity of GM research is the:

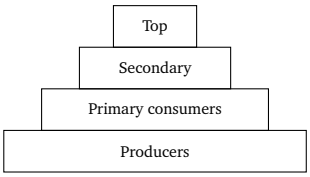
(A) Genetic Engineering Appraisal Committee (GEAC)

(B) Indian Council of Agricultural Research (ICAR)

(C) World Health Organisation (WHO)

(D) Food Corporation of India (FCI)

Q48. The ecological pyramid shown represents trophic levels. The mass of living material (biomass) present in a given trophic level at any one point of time, expressed as dry weight or energy per unit area, is called the:



(A) gross primary productivity

(B) standing crop (standing biomass)

(C) net primary productivity

(D) secondary productivity

Q49. In the logistic (sigmoid) model of population growth, a habitat with limited resources can support only a certain maximum population size, beyond which the population cannot grow further. This limit, denoted by 'K', is the:

(A) biotic potential

(B) intrinsic rate of natural increase

(C) carrying capacity

(D) population density

Q50. In several parts of India, certain forest patches are protected and left undisturbed because of religious and cultural beliefs of local communities. These tracts of forest, which conserve many rare species in situ, are called:

(A) wildlife sanctuaries

(B) biosphere reserves

(C) sacred groves

(D) botanical gardens

Detailed Solutions

Q1.

Solution

Concept — Slime moulds: Slime moulds are saprophytic protists. Their body moves as a plasmodium (acellular forms) which may grow several feet, and on differentiation forms fruiting bodies bearing spores with true walls.

Step 1 — Recall their features: multinucleate creeping plasmodium, spore-bearing fruiting bodies, eukaryotic, mostly saprophytic.

Step 2 — Place them: in Whittaker's scheme these eukaryotic, mostly unicellular/colonial protists are grouped under Kingdom Protista.

Why other options are wrong:

- (A) Monera are prokaryotes; slime moulds are eukaryotes.
- (B) Fungi have a chitinous cell wall throughout; slime mould plasmodium is naked protoplasm.
- (C) Plantae are autotrophic, walled multicellular plants.

Final Answer: Kingdom Protista $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q1

Q2.

Solution

Concept — Taxonomic aids: Museums, zoological parks, botanical gardens, herbaria and keys are aids that help in identification and study of organisms. A zoological park (zoo) keeps wild animals in protected enclosures for study and public viewing.

Step 1 — Match the description: living animals/plants kept under human care in enclosures for study and viewing = zoological park.

Step 2 — Confirm: zoos allow study of food habits and behaviour of wild animals.

Why other options are wrong:

- (A) a herbarium stores dried, pressed plant specimens on sheets, not living animals.
- (C) a botanical garden grows living plants, not animals.
- (D) a taxonomic key is a printed tool for identification, not a place.

Final Answer: zoological park (zoo) $\Rightarrow$ B

Answer: (B) Go Back to Q2

Q3.

Solution

Concept — Asexual reproduction in fungi: Fungi reproduce asexually by spores. Conidia are non-motile asexual spores produced exogenously (externally) in chains at the tips of special hyphae called conidiophores (e.g. in *Penicillium*, *Aspergillus*).

Step 1 — Read the clue: non-motile, exogenous, borne in chains at hyphal tips.

Step 2 — Name them: these are conidia.

Why other options are wrong:

- (B) zoospores are motile (flagellated) asexual spores formed inside sporangia.
- (C) ascospores are sexual spores formed inside an ascus.
- (D) basidiospores are sexual spores formed externally on a basidium.

Final Answer: conidia $\Rightarrow$ A

Answer: (A) Go Back to Q3

Q4.

Solution

Concept — Echinodermata: Echinoderms (starfish, sea urchins) are exclusively marine, show radial symmetry as adults, possess a unique water-vascular system with tube feet for locomotion and feeding, and have an endoskeleton of calcareous ossicles.

Step 1 — Match the diagnostic features: marine + radial symmetry + water-vascular system + ossicles = Echinodermata.

Step 2 — Confirm: these characters are unique to this phylum.

Why other options are wrong:

- (A) molluscs have a soft body, mantle and often a calcareous shell, but no water-vascular system.

- (B) arthropods have a chitinous exoskeleton and jointed legs, and are bilaterally symmetrical.
- (D) annelids are metamerically segmented bilateral worms.

Final Answer: Echinodermata $\Rightarrow$ C

Answer: (C) Go Back to Q4

Q5.

Solution

Concept — Tissue systems: A plant body has three tissue systems — epidermal (outer protective), ground (all tissues except epidermis and vascular bundles) and vascular (xylem + phloem). The ground tissue includes cortex, pericycle, pith and medullary rays.

Step 1 — Read the list: cortex, pericycle, pith and medullary rays.

Step 2 — Identify the system: together these form the ground tissue system.

Why other options are wrong:

- (A) the epidermal tissue system is only the outer epidermis with stomata and hairs.
- (C) the vascular tissue system is the xylem and phloem (the bundles), which are excluded here.
- (D) 'dermal tissue system' is just another name for the epidermal system.

Final Answer: ground tissue system $\Rightarrow$ B

Answer: (B) Go Back to Q5

Q6.

Solution

Concept — Glandular epithelium: Glands are of two kinds — exocrine glands secrete their products (mucus, saliva, sweat, enzymes) through ducts onto a surface, whereas endocrine glands are ductless and pour hormones directly into the blood.

Step 1 — Read the clue: secretion released through ducts onto a surface (salivary, sweat glands).

Step 2 — Classify: a duct-bearing secretory gland is an exocrine gland.

Why other options are wrong:

- (A) an endocrine gland is ductless and secretes hormones into the blood.
- (B) a neurosecretory cell is a nerve cell that secretes hormones, not a duct gland.
- (C) a mixed gland (e.g. pancreas) has both parts; the description here is purely of a duct gland.

Final Answer: exocrine (duct) gland $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q6

Q7.

Solution

Concept — Placentation: The arrangement of ovules on the placenta within the ovary is placentation. In axile placentation the placenta is axial and the ovules are attached to a central axis in a multilocular (multi-chambered) ovary (e.g. china rose, tomato, lemon).

Step 1 — Read the clue: ovules on a central axis, ovary divided into many locules by septa.

Step 2 — Identify: this is axile placentation.

Why other options are wrong:

- (B) parietal placentation has ovules on the inner ovary wall, ovary becoming unilocular (or bilocular by a false septum).
- (C) marginal placentation has a single row of ovules along one margin (e.g. pea).
- (D) free central placentation has ovules on a central axis in a unilocular ovary with no septa.

Final Answer: axile placentation $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q7

Q8.

Solution

Concept — Excretion in cockroach: The cockroach excretes nitrogenous waste through Malpighian tubules — thin yellowish filamentous tubules attached at the junction of the midgut and hindgut. They absorb wastes from the haemolymph and convert them to uric acid (uricotelic excretion).

Step 1 — Match location & function: tubules at midgut–hindgut junction removing nitrogenous waste = Malpighian tubules.

Step 2 — Confirm: they are the chief excretory organs of insects.

Why other options are wrong:

- (A) hepatic (gastric) caeca lie at the junction of foregut and midgut and secrete digestive enzymes.
- (B) gastric caeca aid digestion, not excretion.
- (D) salivary glands secrete saliva for digestion.

Final Answer: Malpighian tubules $\Rightarrow$ $\boxed{\text{C}}$

Answer: (C) Go Back to Q8

Q9.

Solution

Concept — Cell wall: The plant cell wall is a rigid, non-living layer made mainly of cellulose lying outside the plasma membrane. It gives the cell a definite shape, provides rigidity and mechanical strength, and protects the protoplast.

Step 1 — Identify the structure: the outermost rigid cellulose layer is the cell wall.

Step 2 — State its function: it gives shape, rigidity and protection.

Why other options are wrong:

- (A) ATP is produced in the mitochondria, not by the cell wall.
- (C) photosynthesis is carried out by chloroplasts.
- (D) the genetic material is stored in the nucleus.

Final Answer: gives shape, rigidity and protection $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q9

Q10.

Solution

Concept — Membrane composition: The plasma membrane is built of a phospholipid bilayer with proteins embedded in it. The phospholipids are amphipathic: their polar (hydrophilic) heads face the aqueous sides and their non-polar (hydrophobic) tails face inwards.

Step 1 — Read the clue: bilayer with polar heads outward and non-polar tails inward.

Step 2 — Name the molecules: this arrangement is characteristic of phospholipids.

Why other options are wrong:

- (A) nucleic acids are not part of the membrane framework.
- (B) polysaccharides occur only as short surface chains (glycocalyx), not the bilayer.
- (C) proteins are embedded in or attached to the bilayer but do not form it.

Final Answer: phospholipids $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q10

Q11.

Solution

Concept — Nature of enzymes: Almost all enzymes are proteins (a few RNA molecules, called ribozymes, also act as biocatalysts). As proteins they have a specific three-dimensional shape and an active site.

Step 1 — Recall the chemical nature: the great majority of enzymes are proteins.

Step 2 — Confirm: their catalytic activity depends on the precise folding of the polypeptide chain.

Why other options are wrong:

- (A) carbohydrates are energy and structural molecules, not catalysts.
- (B) lipids store energy and form membranes.
- (D) simple inorganic ions may act only as cofactors, not as the enzyme itself.

Final Answer: proteins $\Rightarrow$ $\boxed{\text{C}}$

Answer: (C) Go Back to Q11

Q12.

Solution

Concept — Holoenzyme: A conjugate enzyme has a protein part called the apoenzyme and a non-protein part called the cofactor (which may be a metal ion, a prosthetic group or a coenzyme). The complete, catalytically active enzyme = apoenzyme + cofactor = holoenzyme.

Step 1 — Read the definition: protein part + non-protein cofactor, fully active.

Step 2 — Name it: this complete active enzyme is the holoenzyme.

Why other options are wrong:

- (B) the apoenzyme alone (without its cofactor) is inactive.
- (C) the coenzyme alone is only the non-protein helper.
- (D) a zymogen is an inactive enzyme precursor (e.g. pepsinogen).

Final Answer: holoenzyme $\Rightarrow$ A

Answer: (A) Go Back to Q12

Q13.

Solution

Concept — Spindle apparatus: The spindle fibres that move chromosomes during cell division are made of microtubules, which are polymers of the protein tubulin. They attach to the kinetochores of chromosomes and pull them to the poles.

Step 1 — Identify the fibres: the equator-to-pole fibres in the figure are spindle fibres (microtubules).

Step 2 — Name their protein: microtubules are built of tubulin.

Why other options are wrong:

- (A) keratin is a structural protein of skin, hair and nails.
- (B) myosin is a contractile protein of muscle.
- (D) collagen is the fibrous protein of connective tissue.

Final Answer: tubulin (microtubules) $\Rightarrow$ C

Answer: (C) Go Back to Q13

Q14.

Solution

Concept — Meiosis and chromosome number: Meiosis is a reduction division: a diploid (2n) cell produces four haploid (n) cells. The number is halved because homologous chromosomes separate in meiosis I.

Step 1 — Note the diploid number: $2n = 24$, so $n = 12$.

Step 2 — Apply reduction: each gamete is haploid with $n = 12$ chromosomes.

Why other options are wrong:

- (A) 24 is the diploid number of the parent cell, not of the gamete.
- (C) 48 would be a doubling, which does not occur.
- (D) 6 would be one-quarter; meiosis halves, not quarters, the number.

Final Answer: $n = 12$ chromosomes $\Rightarrow$ B

Answer: (B) Go Back to Q14

Q15.

Solution

Concept — Law of limiting factors: Blackman's law states that when a process is governed by several factors, its rate is limited by the factor that is nearest its minimum (in shortest supply); changing only that factor will change the rate.

Step 1 — Read the principle: the rate is set by the factor in shortest supply.

Step 2 — Apply: e.g. at low light, light is limiting; raising CO_2 alone will not help.

Why other options are wrong:

- (A) it is not the sum of factors, but the single most deficient one.
- (B) temperature is limiting only when it is the deficient factor.
- (C) light is limiting only when it is the deficient factor.

Final Answer: the factor in shortest supply $\Rightarrow$ D

Answer: (D) Go Back to Q15

Q16.

Solution

Concept — Site of Krebs cycle: Glycolysis occurs in the cytoplasm; the pyruvate then enters the mitochondrion. The Krebs (citric acid) cycle takes place in the mitochondrial matrix, while the electron transport chain lies on the inner mitochondrial membrane.

Step 1 — Trace the pathway: pyruvate $\rightarrow$ mitochondrion $\rightarrow$ acetyl CoA $\rightarrow$ Krebs cycle.

Step 2 — Locate the cycle: it runs in the fluid matrix of the mitochondrion.

Why other options are wrong:

- (B) the cytoplasm is the site of glycolysis, not the Krebs cycle.
- (C) the nucleus houses DNA and is not a respiratory site.
- (D) ribosomes are sites of protein synthesis.

Final Answer: mitochondrial matrix $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q16

Q17.

Solution

Concept — Transpiration pull: The cohesion–tension theory explains the ascent of sap. Evaporation of water from the mesophyll cells (transpiration) creates a tension (negative pressure) in the xylem; this transpiration pull draws the continuous water column upward.

Step 1 — Identify the driving force: loss of water at the leaves generates tension in the xylem.

Step 2 — Name it: this is the transpiration pull.

Why other options are wrong:

- (A) root pressure is a minor push from the roots and cannot raise water in tall trees.
- (B) imbibition moves water into dry colloids; it is not the main lifting force.
- (D) xylem vessels are dead and do not actively pump water.

Final Answer: transpiration pull (tension) $\Rightarrow$ $\boxed{\text{C}}$

Answer: (C) Go Back to Q17

Q18.

Solution

Concept — Role of magnesium: Magnesium is the central metal atom of the chlorophyll molecule. It also activates many enzymes of respiration and photosynthesis and is involved in the binding of ribosomal subunits.

Step 1 — Read the clue: constituent of chlorophyll + activator of respiratory/photosynthetic enzymes.

Step 2 — Identify the element: this is magnesium.

Why other options are wrong:

- (A) phosphorus is a constituent of nucleic acids, ATP and phospholipids, not chlorophyll.
- (C) sulphur is part of cysteine, methionine and certain coenzymes.
- (D) potassium maintains turgor and opens/closes stomata.

Final Answer: magnesium $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q18

Q19.

Solution

Concept — Apical dominance: The apical (terminal) bud produces auxin which moves down and inhibits the growth of the lateral (axillary) buds. Removing the apex (decapitation) releases this inhibition, so the lateral buds sprout. This is apical dominance.

Step 1 — Read the clue: apex suppresses lateral buds; removing the tip frees them.

Step 2 — Name the phenomenon: apical dominance.

Why other options are wrong:

- (A) vernalization is the promotion of flowering by low temperature.
- (B) photoperiodism is the response of flowering to day length.
- (C) geotropism is growth in response to gravity.

Final Answer: apical dominance $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q19

Q20.

Solution

Concept — Villi and microvilli: The mucosa of the small intestine bears finger-like folds called villi; their epithelial cells in turn bear microvilli (the brush border). Together they enormously increase the absorptive surface area.

Step 1 — Read the clue: finger-like projections of the small-intestine lining that increase absorptive area.

Step 2 — Name them: villi (each cell bearing microvilli).

Why other options are wrong:

- (A) rugae are folds of the empty stomach wall, not absorptive villi.
- (C) taste buds are sensory receptors on the tongue.
- (D) 'rennin folds' is not a real structure; rennin is a milk-curdling enzyme.

Final Answer: villi (and microvilli) $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q20

Q21.

Solution

Concept — Occupational respiratory disorders: Long-term inhalation of fine industrial dust (silica, asbestos) causes proliferation of fibrous tissue in the lungs, leading to inflammation and fibrosis (e.g. silicosis, asbestosis). These are occupational lung diseases.

Step 1 — Read the clue: chronic dust exposure $\rightarrow$ fibrous-tissue proliferation in the lungs.

Step 2 — Identify: this is occupational lung fibrosis (silicosis/asbestosis).

Why other options are wrong:

- (B) iron-deficiency anaemia is a blood disorder, not a lung disease.
- (C) a peptic ulcer affects the stomach/duodenum lining.
- (D) goitre is a thyroid enlargement due to iodine deficiency.

Final Answer: occupational lung fibrosis $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q21

Q22.

Solution

Concept — Blood pressure: Blood pressure is written as systolic/diastolic. The systolic pressure (the higher value, normally about 120 mm Hg) is the arterial pressure during ventricular contraction (systole); the diastolic pressure (about 80 mm Hg) is during ventricular relaxation.

Step 1 — Read the value: 120 mm Hg is the higher (upper) figure.

Step 2 — Match: the higher figure is the systolic pressure (ventricles contracting).

Why other options are wrong:

- (A) the diastolic pressure is the lower figure, 80 mm Hg.
- (B) mean arterial pressure is a calculated average, not the recorded 120.
- (D) pulse pressure is the *difference* (120 − 80 = 40 mm Hg).

Final Answer: systolic pressure ⇒ C

Answer: (C) Go Back to Q22

Q23.

Solution

Concept — Juxtaglomerular apparatus: Where the distal convoluted tubule touches the afferent arteriole of its own glomerulus, a special region called the juxtaglomerular apparatus (JGA) is formed. Its cells secrete renin, which regulates blood pressure and glomerular filtration (the renin–angiotensin mechanism).

Step 1 — Read the clue: contact of DCT with afferent arteriole, secretes renin, regulates BP and filtration.

Step 2 — Name it: the juxtaglomerular apparatus (JGA).

Why other options are wrong:

- (A) Bowman's capsule cups the glomerulus and collects filtrate.
- (B) the proximal convoluted tubule reabsorbs most of the filtrate.
- (C) the collecting duct carries urine towards the pelvis.

Final Answer: juxtaglomerular apparatus (JGA) ⇒ D

Answer: (D) Go Back to Q23

Q24.

Solution

Concept — Muscle proteins: A sarcomere has thick filaments made of myosin and thin filaments made of actin (with troponin and tropomyosin). During contraction the thin actin filaments slide over the thick myosin filaments.

Step 1 — Recall the thick filament: it is composed of the protein myosin.

Step 2 — Confirm: myosin heads form cross-bridges that pull the actin filaments.

Why other options are wrong:

- (A) actin forms the thin filaments, not the thick ones.
- (B) troponin is a regulatory protein on the thin filament.
- (C) tropomyosin is another regulatory protein on the thin filament.

Final Answer: myosin $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q24

Q25.

Solution

Concept — Myelinated axon: In a myelinated nerve fibre the axon is wrapped by an insulating myelin sheath (formed by Schwann cells), interrupted at intervals by gaps called nodes of Ranvier. The impulse leaps from node to node (saltatory conduction), which is faster.

Step 1 — Name the insulating sheath: the myelin sheath.

Step 2 — Name the gaps: the nodes of Ranvier (sites of saltatory conduction).

Why other options are wrong:

- (B) dendrites and synaptic knobs are not the axonal sheath and its gaps.
- (C) Nissl granules and the axon hillock are parts of the cell body region.
- (D) Schwann cells make the myelin, but the gaps are the nodes, not the soma.

Final Answer: myelin sheath and nodes of Ranvier $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q25

Q26.

Solution

Concept — Simple goitre: Iodine is essential for the synthesis of the thyroid hormones (thyroxine). When dietary iodine is deficient, the thyroid enlarges to try to trap more iodine, producing a swelling in the neck called goitre.

Step 1 — Link the disorder to the element: goitre $\leftrightarrow$ deficiency of iodine.

Step 2 — Confirm: this is why common salt is iodised.

Why other options are wrong:

- (A) calcium deficiency causes rickets/osteomalacia and tetany, not goitre.
- (C) iron deficiency causes anaemia.
- (D) vitamin C deficiency causes scurvy.

Final Answer: iodine $\Rightarrow$ B

Answer: (B) Go Back to Q26

Q27.

Solution

Concept — Pacemaker: The heartbeat is initiated by the sino-atrial node (SAN), a patch of specialised tissue in the wall of the right atrium. It generates rhythmic action potentials on its own (autorhythmicity) and is therefore called the pacemaker.

Step 1 — Read the clue: node that generates the rhythm without nerve stimulation.

Step 2 — Name it: the sino-atrial node (SAN).

Why other options are wrong:

- (A) the bundle of His conducts the impulse to the ventricles; it does not initiate the beat.
- (B) Purkinje fibres spread the impulse through the ventricular walls.
- (D) the AVN relays the impulse from the atria to the ventricles.

Final Answer: sino-atrial node (SAN) $\Rightarrow$ C

Answer: (C) Go Back to Q27

Q28.

Solution

Concept — Ionic basis of impulse: At rest the membrane is polarised (more Na^+ outside, more K^+ inside). On stimulation, the membrane becomes highly permeable to Na^+, which rushes inward, reversing the potential — this is depolarisation (the action potential).

Step 1 — Identify the inward-rushing ion: Na^+ enters and reverses the potential.

Step 2 — Confirm: this Na^+ influx is the basis of depolarisation.

Why other options are wrong:

- (A) Cl^- does not produce the depolarising inward current here.
- (C) Ca^{2+} influx is important at synapses, not for axonal depolarisation.
- (D) K^+ moves *outward* during repolarisation, restoring the resting state.

Final Answer: sodium (Na^+) $\Rightarrow$ B

Answer: (B) Go Back to Q28

Q29.

Solution

Concept — Parts of the carpel: A carpel (pistil) has three parts — the stigma (the receptive tip that receives pollen), the style (the elongated stalk) and the ovary (the swollen basal part that encloses the ovules).

Step 1 — Read the clue: the swollen basal part enclosing the ovules.

Step 2 — Name it: this is the ovary.

Why other options are wrong:

- (A) the stigma is the receptive tip, not the basal part.
- (B) the style is the connecting stalk between stigma and ovary.
- (C) the filament is part of the stamen (male part), not the carpel.

Final Answer: ovary $\Rightarrow$ D

Answer: (D) Go Back to Q29

Q30.

Solution

Concept — Outbreeding devices: To prevent self-pollination, plants use devices such as dichogamy (anther and stigma of a flower maturing at different times), self-incompatibility, and unisexuality. Dichogamy directly relies on different timing of maturity.

Step 1 — Read the clue: anthers and stigma of the same flower mature at different times.

Step 2 — Name the device: this is dichogamy.

Why other options are wrong:

- (B) cleistogamy is pollination within closed flowers, which actually *ensures* self-pollination.
- (C) autogamy is self-pollination, the opposite of an outbreeding device.
- (D) geitonogamy is pollination between two flowers of the same plant (still genetically self).

Final Answer: dichogamy $\Rightarrow$ A

Answer: (A) Go Back to Q30

Q31.

Solution

Concept — Sertoli cells: The seminiferous tubules contain dividing germ cells (spermatogonia) and large pyramidal Sertoli cells. The Sertoli cells provide nourishment and support to the developing germ cells (sperms).

Step 1 — Read the clue: large nurse cells nourishing the developing sperms inside the tubule.

Step 2 — Name them: these are the Sertoli cells.

Why other options are wrong:

- (A) Leydig (interstitial) cells lie *outside* the tubules and secrete testosterone.
- (B) primary spermatocytes are themselves germ cells being formed, not nurse cells.
- (D) spermatogonia are the stem cells that divide to form sperms, not nurse cells.

Final Answer: Sertoli cells $\Rightarrow$ C

Answer: (C) Go Back to Q31

Q32.

Solution

Concept — Menstrual phase: The human menstrual cycle has menstrual, follicular (proliferative), ovulatory and luteal (secretory) phases. When the released ovum is not fertilised, the corpus luteum degenerates, hormone levels fall, and the uterine lining breaks down, causing the menstrual flow (menstrual phase).

Step 1 — Read the clue: breakdown and shedding of the endometrium with blood, on non-fertilisation.

Step 2 — Name the phase: the menstrual phase.

Why other options are wrong:

- (A) the ovulatory phase is the mid-cycle release of the ovum.
- (C) the proliferative (follicular) phase rebuilds the endometrium.
- (D) the secretory (luteal) phase maintains a thickened endometrium under the corpus luteum.

Final Answer: menstrual phase $\Rightarrow$ B

Answer: (B) Go Back to Q32

Q33.

Solution

Concept — Population control: Measures to control human population growth include raising the marriageable age, offering incentives for small families and spreading awareness of contraception. Using antibiotics treats bacterial infections and has nothing to do with controlling birth rate.

Step 1 — Test each option for relevance to birth control: (B), (C) and (D) directly reduce the birth rate.

Step 2 — Spot the odd one: (A) the use of broad-spectrum antibiotics treats infections; it does not control population.

Why other options are wrong (i.e. they DO help):

- (B) incentives encourage smaller families.
- (C) contraceptive education lowers unwanted births.

- (D) raising the marriageable age shortens the reproductive span.

Final Answer: use of antibiotics (does not control population) $\Rightarrow$ A

Answer: (A) Go Back to Q33

Q34.

Solution

Concept — Monohybrid genotypic ratio: A self-cross of the heterozygous F_1 (Tt $\times$ Tt) gives, by the Punnett square, the genotypes TT, Tt, Tt, tt. So the genotypic ratio is 1 TT : 2 Tt : 1 tt, while the phenotypic ratio is 3 tall : 1 dwarf.

Step 1 — Set up the cross: Tt $\times$ Tt gives gametes T and t from each parent.

Step 2 — Read the genotypes: 1 TT : 2 Tt : 1 tt.

Why other options are wrong:

- (A) $3:1$ is the *phenotypic* ratio, not the genotypic ratio.
- (B) $9:3:3:1$ is the dihybrid phenotypic ratio.
- (D) $1:1$ is the test-cross ratio.

Final Answer: $1:2:1$ (TT : Tt : tt) $\Rightarrow$ C

Answer: (C) Go Back to Q34

Q35.

Solution

Concept — Epistasis: Epistasis is a gene interaction in which one gene (the epistatic gene) at one locus masks or suppresses the phenotypic expression of another, non-allelic gene at a different locus. It often modifies the normal $9:3:3:1$ dihybrid ratio.

Step 1 — Read the definition: one non-allelic gene masking another at a different locus.

Step 2 — Name it: this is epistasis.

Why other options are wrong:

- (A) incomplete dominance is a blending between two *alleles* of the same gene.
- (B) codominance is the joint expression of two alleles of the same gene.

- (C) multiple allelism refers to a gene having more than two alleles.

Final Answer: epistasis $\Rightarrow$ D

Answer: (D) Go Back to Q35

Q36.

Solution

Concept — Complete vs incomplete linkage: Linked genes lying very close together show almost no crossing over and are inherited together — this is complete linkage. When the genes are farther apart, crossing over occurs sometimes, giving incomplete linkage with recombinants.

Step 1 — Read the clue: genes so close that crossing over practically never occurs, almost always inherited together.

Step 2 — Identify: this is complete linkage.

Why other options are wrong:

- (B) incomplete linkage shows some recombinants due to occasional crossing over.
- (C) 'no linkage' means genes on different chromosomes assort independently.
- (D) sex linkage refers to genes on the sex chromosomes, a different concept.

Final Answer: complete linkage $\Rightarrow$ A

Answer: (A) Go Back to Q36

Q37.

Solution

Concept — Turner's syndrome: Turner's syndrome results from monosomy of the X chromosome (45, X0). Affected individuals are sterile females, short-statured, with rudimentary ovaries and underdeveloped secondary sexual characters.

Step 1 — Read the karyotype: a single X (45, X0) in a phenotypic female.

Step 2 — Name the disorder: Turner's syndrome.

Why other options are wrong:

- (A) Klinefelter's syndrome is 47, XXY (a sterile male, not 45, X0).

- (C) Down's syndrome is trisomy of chromosome 21 (an autosomal disorder).
- (D) Edward's syndrome is trisomy of chromosome 18 (autosomal).

Final Answer: Turner's syndrome (45, X0) $\Rightarrow$ B

Answer: (B) Go Back to Q37

Q38.

Solution

Concept — DNA vs RNA: DNA contains the sugar deoxyribose and the base thymine; RNA contains ribose and, in place of thymine, the pyrimidine base uracil. Both share adenine, guanine and cytosine.

Step 1 — Identify the DNA-only base: thymine occurs in DNA.

Step 2 — Find its RNA replacement: in RNA, thymine is replaced by uracil.

Why other options are wrong:

- (A) adenine is present in both DNA and RNA.
- (B) guanine is present in both.
- (D) cytosine is present in both.

Final Answer: uracil $\Rightarrow$ C

Answer: (C) Go Back to Q38

Q39.

Solution

Concept — RNA splicing: In eukaryotes the primary transcript (hnRNA) has exons (coding) interrupted by introns (non-coding). During processing, the introns are excised and the exons are joined together. This removal of introns and joining of exons is called splicing.

Step 1 — Read the clue: removal of introns and joining of exons.

Step 2 — Name the process: splicing.

Why other options are wrong:

- (B) capping adds a methyl-guanosine cap to the $5'$ end.
- (C) tailing (polyadenylation) adds a poly-A tail to the $3'$ end.
- (D) replication is the copying of DNA, not RNA processing.

Final Answer: splicing $\Rightarrow$ A

Answer: (A) Go Back to Q39

Q40.

Solution

Concept — Founder effect: Genetic drift is a random change in allele frequencies, marked in small populations. When a few individuals found a new isolated colony, the founder population may, by chance, have allele frequencies very different from the parent population — this is the founder effect.

Step 1 — Read the clue: a small migrant group founds a new colony with altered allele frequencies by chance.

Step 2 — Name it: the founder effect (a form of genetic drift).

Why other options are wrong:

- (A) natural selection is non-random and adaptive, not chance-driven.
- (B) directional selection shifts the population toward one extreme phenotype.
- (C) adaptive radiation is the diversification of one ancestor into many forms.

Final Answer: founder effect $\Rightarrow$ D

Answer: (D) Go Back to Q40

Q41.

Solution

Concept — Filariasis: Filariasis (elephantiasis) is caused by the filarial worms *Wuchereria bancrofti* and *W. malayi*, which live in the lymphatic vessels and cause chronic inflammation and gross swelling of the limbs. The parasite is transmitted by the bite of the female *Culex* mosquito.

Step 1 — Identify the pathogen and vector: *Wuchereria* worm, carried by *Culex*.

Step 2 — Name the vector: the female *Culex* mosquito.

Why other options are wrong:

- (A) the sandfly transmits kala-azar (leishmaniasis).
- (C) the housefly mechanically spreads typhoid and cholera.
- (D) the female *Anopheles* transmits malaria.

Final Answer: female *Culex* mosquito ⇒ B

Answer: (B) Go Back to Q41

Q42.

Solution

Concept — Autoimmune disease: Normally the immune system tolerates 'self' antigens. In an autoimmune disorder this self-tolerance breaks down and the body produces antibodies/lymphocytes that attack its own cells and tissues (e.g. rheumatoid arthritis).

Step 1 — Read the clue: immune system attacks the body's own cells.

Step 2 — Name it: an autoimmune disease.

Why other options are wrong:

- (A) an allergy is an exaggerated response to a harmless foreign antigen (allergen), not self.
- (B) active immunity is protection produced by one's own antibodies after exposure to an antigen.
- (D) passive immunisation is the transfer of ready-made antibodies from outside.

Final Answer: autoimmune disease ⇒ C

Answer: (C) Go Back to Q42

Q43.

Solution

Concept — Microbes in dairy: Different microbes give cheeses their characters. The large holes and special flavour of Swiss cheese are produced by *Propionibacterium* (e.g. *P. sharmanii / P. freudenreichii*), which release large amounts of CO_2 during ripening.

Step 1 — Read the clue: large holes ('eyes') + flavour of Swiss cheese, from CO_2 release.

Step 2 — Name the microbe: *Propionibacterium sharmanii*.

Why other options are wrong:

- (A) *Saccharomyces cerevisiae* is baker's/brewer's yeast.

- (B) *Aspergillus niger* is used to produce citric acid.
- (C) *Lactobacillus* curdles milk into curd but does not make the Swiss-cheese holes.

Final Answer: *Propionibacterium sharmanii* $\Rightarrow$ D

Answer: (D) Go Back to Q43

Q44.

Solution

Concept — Hybridisation in plant breeding: After collecting variability and evaluating parents, the breeder crosses two selected parents (cross-hybridisation) so as to combine their desirable characters into a single progeny. The promising hybrids are then selected and tested.

Step 1 — Read the clue: crossing two chosen parents to combine good traits in the progeny.

Step 2 — Name the step: cross-hybridisation.

Why other options are wrong:

- (B) germplasm collection is the earlier step of gathering variability.
- (C) commercialisation is the final release step.
- (D) selection of superior recombinants comes *after* the cross is made.

Final Answer: cross-hybridisation $\Rightarrow$ A

Answer: (A) Go Back to Q44

Q45.

Solution

Concept — Ti plasmid: The Ti (tumour-inducing) plasmid of the soil bacterium *Agrobacterium tumefaciens*, which naturally causes crown-gall tumours, is modified and used as a vector to deliver desired genes into plant cells.

Step 1 — Read the clue: a natural plasmid from a soil bacterium causing crown gall, used as a plant vector.

Step 2 — Name it: the Ti plasmid of *Agrobacterium tumefaciens*.

Why other options are wrong:

- (A) lambda phage is a bacteriophage cloning vector for *E. coli*, not plants.
- (C) the F plasmid is the bacterial fertility plasmid, not a plant vector.
- (D) BAC vectors carry large DNA inserts in bacteria, not for crown-gall transfer.

Final Answer: Ti plasmid of *Agrobacterium tumefaciens* $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q45

Q46.

Solution

Concept — cDNA library: A cDNA (complementary DNA) library is a collection of clones made from the mRNA of a cell. The mRNA is copied into complementary DNA using the enzyme reverse transcriptase, and these cDNAs are cloned into vectors. A cDNA library lacks introns.

Step 1 — Read the clue: clones of DNA copied from mRNA using reverse transcriptase.

Step 2 — Name it: a cDNA library.

Why other options are wrong:

- (A) a genomic library is made from the whole genomic DNA (with introns), not from mRNA.
- (B) a gene probe is a single labelled sequence used to detect a gene.
- (C) a DNA fingerprint is a pattern used for identification, not a clone library.

Final Answer: cDNA (complementary DNA) library $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q46

Q47.

Solution

Concept — GEAC: In India the Genetic Engineering Appraisal Committee (GEAC) is the statutory body that makes decisions about the validity of GM research and the safety of introducing genetically modified organisms for public services.

Step 1 — Read the clue: Indian body that appraises GM safety and the validity of GM research.

Step 2 — Name it: the Genetic Engineering Appraisal Committee (GEAC).

Why other options are wrong:

- (B) ICAR coordinates agricultural research, not GMO biosafety appraisal.
- (C) the WHO is a global health body, not the Indian GM regulator.
- (D) the FCI handles food-grain storage and distribution.

Final Answer: Genetic Engineering Appraisal Committee (GEAC) $\Rightarrow$ A

Answer: (A) Go Back to Q47

Q48.

Solution

Concept — Standing crop: The standing crop (standing biomass) is the amount of living material present in a trophic level at a given moment, measured as mass (dry weight) or as energy content per unit area. It differs from productivity, which is a rate.

Step 1 — Read the clue: living biomass present at one point of time, per unit area.

Step 2 — Name it: the standing crop (standing biomass).

Why other options are wrong:

- (A) gross primary productivity is the rate of total organic matter produced (a rate, not a stock).
- (C) net primary productivity is GPP minus respiration (also a rate).
- (D) secondary productivity is the rate of new biomass formation by consumers.

Final Answer: standing crop (standing biomass) $\Rightarrow$ B

Answer: (B) Go Back to Q48

Q49.

Solution

Concept — Carrying capacity: In the logistic growth model, a habitat with limited resources can sustain only a maximum number of individuals of a population. This maximum, denoted 'K', is the carrying capacity; growth slows and levels off as the population approaches K.

Step 1 — Read the clue: maximum population a limited habitat can support, denoted K.

Step 2 — Name it: the carrying capacity.

Why other options are wrong:

- (A) biotic potential is the maximum reproductive capacity under ideal conditions.
- (B) the intrinsic rate of natural increase (r) is the per-capita growth rate.
- (D) population density is the number of individuals per unit area, not the ceiling K.

Final Answer: carrying capacity $\Rightarrow$ $\boxed{\text{C}}$

Answer: (C) Go Back to Q49

Q50.

Solution

Concept — Sacred groves: Sacred groves are tracts of forest protected and left undisturbed by local communities because of religious and cultural beliefs. They serve as refuges for many rare and endemic species and are an example of in-situ conservation.

Step 1 — Read the clue: forest patches protected on religious/cultural grounds, conserving rare species in situ.

Step 2 — Name them: sacred groves.

Why other options are wrong:

- (A) wildlife sanctuaries are legally notified protected areas, not religion-based community forests.
- (B) biosphere reserves are large multi-zone conservation areas designated by the government.
- (D) botanical gardens are ex-situ collections of cultivated plants.

Final Answer: sacred groves $\Rightarrow$ C

Answer: (C) Go Back to Q50

Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	D	2	B	3	A	4	C	5	B
6	D	7	A	8	C	9	B	10	D
11	C	12	A	13	C	14	B	15	D
16	A	17	C	18	B	19	D	20	B
21	A	22	C	23	D	24	D	25	A
26	B	27	C	28	B	29	D	30	A
31	C	32	B	33	A	34	C	35	D
36	A	37	B	38	C	39	A	40	D
41	B	42	C	43	D	44	A	45	B
46	D	47	A	48	B	49	C	50	C