

# JCECE Biology Sample Paper – 1

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.** R. H. Whittaker proposed the five-kingdom classification in 1969. Which of the following was NOT used by him as a main criterion for delimiting the five kingdoms?

- (A) cell structure (prokaryotic vs eukaryotic)
- (B) mode of nutrition (autotrophic vs heterotrophic)
- (C) the number of chromosomes in the organism
- (D) body organisation (cellular vs multicellular)

**Q2.** The correct sequence of taxonomic categories arranged from the lowest (most specific) to the highest (most inclusive) rank is:

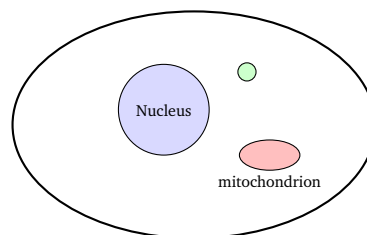
- (A) species → genus → family → order → class → phylum → kingdom
- (B) kingdom → phylum → class → order → family → genus → species
- (C) genus → species → family → order → class → phylum
- (D) species → family → genus → class → order → phylum



- Q3.** In the green algae (Chlorophyceae), the dominant photosynthetic pigments that give the group its characteristic grass-green colour are:
- (A) fucoxanthin (a brown xanthophyll)
  - (B) phycoerythrin (a red pigment)
  - (C) phycocyanin (a blue pigment)
  - (D) chlorophyll *a* and chlorophyll *b*
- Q4.** Sponges (phylum Porifera) carry a unique water-transport (canal) system. The specialised flagellated cells that line the canals and create the water current are called:
- (A) cnidoblasts
  - (B) choanocytes (collar cells)
  - (C) flame cells
  - (D) nematocytes
- Q5.** The meristem responsible for an increase in the girth (diameter) of a dicot stem during secondary growth, and which is located between the xylem and phloem, is the:
- (A) apical meristem
  - (B) intercalary meristem
  - (C) lateral meristem (cambium)
  - (D) primary meristem of the shoot tip
- Q6.** The type of epithelium that lines the inner surface of the small intestine and bears microvilli for absorption is:
- (A) simple squamous epithelium
  - (B) stratified squamous epithelium
  - (C) ciliated cuboidal epithelium
  - (D) simple columnar epithelium



- Q7.** In sweet potato, food is stored in swollen *adventitious* roots, whereas in carrot it is stored in a swollen *tap* root. The fleshy storage root of sweet potato is therefore an example of a:
- (A) fusiform tap root
  - (B) conical tap root
  - (C) napiform tap root
  - (D) tuberous adventitious root
- Q8.** In the earthworm (*Pheretima*), the part of the alimentary canal that grinds the soil and ingested organic matter with the help of ingested mineral particles is the:
- (A) pharynx
  - (B) gizzard
  - (C) typhlosole
  - (D) buccal cavity
- Q9.** In the animal cell shown below, the double-membrane organelle marked is the site of aerobic respiration. Its principal function is to:



- (A) synthesise ATP through oxidative phosphorylation
  - (B) synthesise and package secretory proteins
  - (C) carry out intracellular digestion using hydrolytic enzymes
  - (D) store the hereditary material of the cell
- Q10.** The transport of a substance across a plasma membrane *against* its concentration gradient, with the expenditure of metabolic energy (ATP), is called:



- (A) simple diffusion
- (B) active transport
- (C) osmosis
- (D) facilitated diffusion

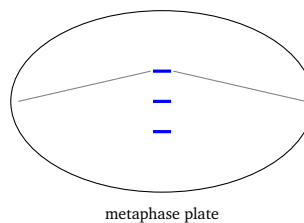
**Q11.** Among the following carbohydrates, the one that is a *monosaccharide* (cannot be hydrolysed into a simpler sugar) is:

- (A) sucrose
- (B) lactose
- (C) glucose
- (D) starch

**Q12.** An enzyme that catalyses the transfer of electrons, i.e. oxidation–reduction reactions between two substrates, belongs to the enzyme class:

- (A) oxidoreductase
- (B) transferase
- (C) hydrolase
- (D) ligase

**Q13.** The figure shows chromosomes aligned at the equator with spindle fibres reaching them from two poles. This is the metaphase plate of mitotic metaphase. In the *prophase* that precedes it, which of the following events occurs?



- (A) the chromatids of each chromosome separate and move to opposite poles

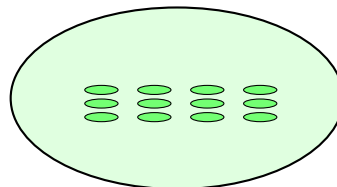


- (B) the chromosomal material condenses into compact chromosomes and the nuclear envelope starts to disappear
- (C) two daughter nuclei reform and the cytoplasm divides
- (D) the chromosomes line up exactly on the equatorial plate

**Q14.** The actual reduction in chromosome number (from diploid to haploid) during meiosis takes place in:

- (A) meiosis II, when chromatids separate
- (B) neither division; the number stays the same
- (C) both meiosis I and meiosis II equally
- (D) meiosis I, when homologous chromosomes separate

**Q15.** The chloroplast shown contains stacked membranous discs (grana). The *light* reactions of photosynthesis (capture of light, photolysis of water, formation of ATP and NADPH) occur on the:



grana (thylakoids)

- (A) outer membrane of the chloroplast
- (B) fluid stroma surrounding the grana
- (C) thylakoid membranes of the grana
- (D) cytoplasm outside the chloroplast

**Q16.** Glycolysis is the partial oxidation of one molecule of glucose. The end product of glycolysis (per glucose molecule) is:

- (A) one molecule of pyruvate
- (B) two molecules of pyruvate
- (C) two molecules of lactic acid only



(D) two molecules of acetyl CoA

**Q17.** Most of the water absorbed by a plant is lost as water vapour to the atmosphere, chiefly through tiny pores in the leaf epidermis. This loss, and the pores through which it mainly occurs, are:

(A) transpiration through stomata

(B) guttation through hydathodes

(C) imbibition through cell walls

(D) bleeding through cut xylem

**Q18.** Plants require certain mineral elements in very small (trace) amounts. Which of the following is a *micronutrient*?

(A) nitrogen

(B) potassium

(C) calcium

(D) zinc

**Q19.** The plant growth regulator that promotes cell elongation, is responsible for apical dominance, and is used to induce parthenocarpic (seedless) fruits is:

(A) abscisic acid

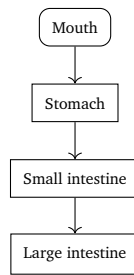
(B) ethylene

(C) auxin

(D) cytokinin

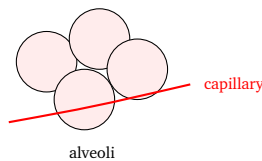
**Q20.** The flow diagram shows the human alimentary canal. In the *stomach*, the inactive proenzyme pepsinogen is converted by HCl into the active protein-digesting enzyme:





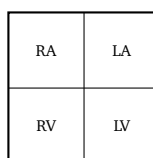
- (A) trypsin
- (B) pepsin
- (C) ptyalin (salivary amylase)
- (D) lipase

**Q21.** Gas exchange occurs across the thin walls of the alveoli shown, which are surrounded by blood capillaries. In the blood, oxygen is transported *mainly* in the form of:



- (A) dissolved freely in the blood plasma
- (B) as carbaminohaemoglobin
- (C) as oxyhaemoglobin bound to haemoglobin
- (D) as bicarbonate ions

**Q22.** The four-chambered human heart is shown. During the *joint diastole* stage of the cardiac cycle, the state of the heart is best described as:

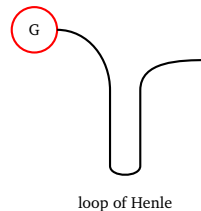


- (A) all four chambers are relaxed and the heart is filling with blood
- (B) both ventricles are contracting and pumping blood out



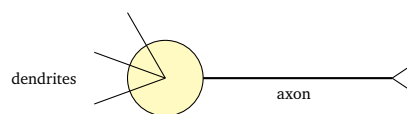
- (C) both atria are contracting to force blood into the ventricles
- (D) the left ventricle alone is contracting

**Q23.** In the nephron shown, the cup-like structure labelled 'G' encloses a tuft of capillaries. This cup, which collects the filtrate from the glomerulus, is the:



- (A) collecting duct
  - (B) proximal convoluted tubule
  - (C) Bowman's capsule
  - (D) distal convoluted tubule
- Q24.** According to the sliding-filament theory of muscle contraction, the shortening of a sarcomere during contraction is caused by:
- (A) the actual shortening of the myosin filaments themselves
  - (B) the actual shortening of the actin filaments themselves
  - (C) the disappearance of the A band of the sarcomere
  - (D) the thin (actin) filaments sliding over the thick (myosin) filaments

**Q25.** In the neuron diagram, the short, branched processes that receive impulses and carry them *towards* the cell body are labelled. These receiving processes are the:



- (A) the axon
- (B) the dendrites

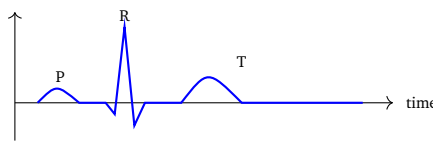


- (C) the synaptic knobs
- (D) the myelin sheath

**Q26.** The hormone secreted by the posterior pituitary (neurohypophysis) that promotes reabsorption of water in the kidney tubules and thereby reduces the loss of water in urine is:

- (A) growth hormone (GH)
- (B) thyroid-stimulating hormone (TSH)
- (C) prolactin
- (D) antidiuretic hormone (ADH / vasopressin)

**Q27.** In the electrocardiogram (ECG) trace shown, the prominent sharp deflection marked 'R' is part of the QRS complex. This QRS complex of the ECG represents:



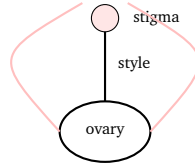
- (A) depolarisation of the atria (atrial contraction)
- (B) repolarisation of the ventricles
- (C) depolarisation of the ventricles (ventricular contraction)
- (D) the resting (isoelectric) phase of the heart

**Q28.** In a myelinated nerve fibre the impulse appears to 'jump' from one node of Ranvier to the next, making conduction much faster than in an unmyelinated fibre. This mode of conduction is called:

- (A) saltatory conduction
- (B) continuous conduction
- (C) synaptic transmission
- (D) retrograde conduction



**Q29.** The longitudinal section of a flower is shown. Within the *anther* of the stamen, a typical microsporangium is surrounded by four wall layers; the innermost nutritive layer that nourishes the developing pollen grains is the:



- (A) epidermis  
(B) endothecium  
(C) middle layers  
(D) tapetum
- Q30.** In angiosperms, one of the two male gametes fuses with the egg to form the zygote while the other fuses with the two polar nuclei. This characteristic event involving two fusions is called:
- (A) simple fertilization  
(B) double fertilization  
(C) self-pollination  
(D) parthenogenesis
- Q31.** In the human male reproductive system, the actual production of sperms (spermatogenesis) takes place in the:
- (A) seminiferous tubules of the testis  
(B) prostate gland  
(C) epididymis  
(D) seminal vesicle
- Q32.** In the human menstrual cycle, the release of a secondary oocyte from the mature Graafian follicle of the ovary, occurring around the middle of the cycle, is called:



- (A) menstruation
- (B) implantation
- (C) ovulation
- (D) parturition

**Q33.** Among the following birth-control measures, the one that is a *surgical* (permanent) method of contraception is:

- (A) vasectomy / tubectomy (sterilisation)
- (B) the condom
- (C) the oral contraceptive pill
- (D) the intra-uterine device (IUD)

**Q34.** In a Mendelian monohybrid cross, a pure tall pea plant (TT) is crossed with a pure dwarf plant (tt). When the F<sub>1</sub> tall plants are self-pollinated, the expected phenotypic ratio of tall to dwarf in the F<sub>2</sub> generation is:

- (A) 1 : 1
- (B) 3 : 1
- (C) 9 : 3 : 3 : 1
- (D) 1 : 2 : 1

**Q35.** In a dihybrid cross between two pea plants heterozygous for both seed shape and seed colour (RrYy × RrYy), the expected phenotypic ratio in the offspring is:

- (A) 3 : 1
- (B) 1 : 1 : 1 : 1
- (C) 1 : 2 : 1
- (D) 9 : 3 : 3 : 1

**Q36.** The tendency of genes located close together on the same chromosome to be inherited together, rather than assorting independently, is called:

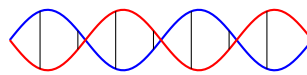


- (A) linkage
- (B) independent assortment
- (C) incomplete dominance
- (D) codominance

**Q37.** In the human XX–XY mechanism of sex determination, the sex of the child is decided by the type of sex chromosome carried by the:

- (A) egg, since the mother is heterogametic
- (B) ovum, which may carry either X or Y
- (C) sperm, which may carry either an X or a Y chromosome
- (D) somatic cells of the embryo

**Q38.** The DNA double helix is shown with its two complementary strands joined by base pairs. According to the base-pairing (Chargaff) rule, adenine always pairs with:



double helix

- (A) guanine, by three hydrogen bonds
- (B) thymine, by two hydrogen bonds
- (C) cytosine, by two hydrogen bonds
- (D) another adenine, by one hydrogen bond

**Q39.** During DNA replication each of the two parental strands serves as a template, so that every daughter DNA molecule has one old (parental) strand and one newly synthesised strand. This mode of replication is described as:

- (A) semiconservative
- (B) conservative
- (C) dispersive



(D) non-template

**Q40.** Charles Darwin's theory of evolution by natural selection is most accurately summed up by the phrase:

(A) inheritance of acquired characters

(B) use and disuse of organs

(C) sudden large mutations driving evolution

(D) survival of the fittest (differential reproduction of favourable variations)

**Q41.** Malaria in humans is caused by a protozoan parasite of the genus *Plasmodium*. This parasite is transmitted from person to person by the bite of the:

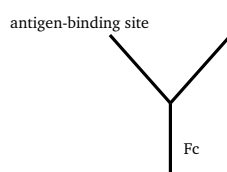
(A) male *Anopheles* mosquito

(B) female *Anopheles* mosquito

(C) female *Culex* mosquito

(D) female *Aedes* mosquito

**Q42.** The Y-shaped antibody molecule is shown. A typical antibody (immunoglobulin) molecule is built of four polypeptide chains, namely:



(A) four identical heavy chains

(B) four identical light chains

(C) two light (small) chains and two heavy (large) chains

(D) one heavy chain and one light chain

**Q43.** Milk is converted into curd by microorganisms that also improve its nutritional quality by increasing vitamin B<sub>12</sub>. These microorganisms are:



- (A) lactic acid bacteria (*Lactobacillus*)
- (B) *Aspergillus* moulds
- (C) *Penicillium* moulds
- (D) methanogen bacteria

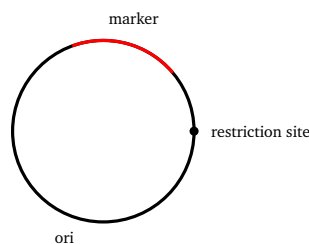
**Q44.** In a classical plant-breeding programme aimed at developing an improved crop variety, the very first essential step is:

- (A) selection and testing of superior recombinants
- (B) cross-hybridisation among selected parents
- (C) release and commercialisation of the new cultivar
- (D) collection of variability (germplasm collection)

**Q45.** In recombinant DNA technology, the enzymes that act as ‘molecular scissors’ by cutting DNA at specific recognition sequences are called:

- (A) restriction endonucleases
- (B) DNA ligases
- (C) DNA polymerases
- (D) exonucleases

**Q46.** The plasmid cloning vector is shown. For the recombinant DNA to multiply (be copied) inside the host bacterium, the vector must possess a specific sequence labelled ‘ori’. This ‘origin of replication’ is the site that:



- (A) allows selection of transformed host cells
- (B) is recognised and cut by a restriction enzyme

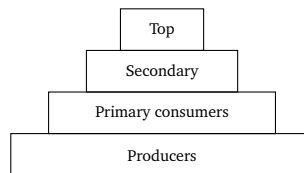


- (C) controls the initiation of replication and the copy number of the linked DNA
- (D) codes for the foreign protein of interest

**Q47.** Bt cotton is a transgenic crop that is resistant to certain insect pests. This insect resistance is due to a gene (*cry* gene) introduced into cotton from the bacterium:

- (A) *Agrobacterium tumefaciens*
- (B) *Bacillus thuringiensis*
- (C) *Escherichia coli*
- (D) *Rhizobium leguminosarum*

**Q48.** The ecological pyramid shown places producers at the base, followed by successive consumers. In a grassland food chain (grass → grasshopper → frog → snake), the frog occupies the trophic level of the:



- (A) secondary consumer (third trophic level)
- (B) producer (first trophic level)
- (C) primary consumer (second trophic level)
- (D) top carnivore (fourth trophic level)

**Q49.** An interaction between two species in which *both* the interacting partners are benefited is called:

- (A) predation
- (B) competition
- (C) parasitism
- (D) mutualism



- Q50.** Biodiversity is studied at three hierarchical levels. The variety of organisms present in different ecosystems (such as forests, grasslands, wetlands and deserts) of a geographical region represents:
- (A) genetic diversity
  - (B) species diversity
  - (C) ecosystem (ecological) diversity
  - (D) molecular diversity



## Detailed Solutions

Q1.

## Solution

**Concept — Five-kingdom classification:** Whittaker (1969) used cell structure, body organisation (complexity), mode of nutrition, reproduction and phylogenetic relationships as the main criteria.

**Step 1 — List the genuine criteria:** prokaryotic/eukaryotic cell type, unicellular/multicellular body, and autotrophic/heterotrophic nutrition are all used.

**Step 2 — Spot the odd one out:** the absolute number of chromosomes was never a basis of his classification.

**Why other options are wrong:**

- (A) cell structure is a primary Whittaker criterion.
- (B) mode of nutrition is a primary criterion.
- (D) body organisation is a primary criterion.

**Final Answer:** chromosome number is NOT a criterion  $\Rightarrow$

**Answer:** (C) [Go Back to Q1](#)

Q2.

## Solution

**Concept — Taxonomic hierarchy:** The categories, from lowest to highest, are species, genus, family, order, class, phylum (division) and kingdom.

**Step 1 — Start with the smallest unit:** species is the most basic, lowest category.

**Step 2 — Build upward:** species  $\rightarrow$  genus  $\rightarrow$  family  $\rightarrow$  order  $\rightarrow$  class  $\rightarrow$  phylum  $\rightarrow$  kingdom.

**Why other options are wrong:**

- (B) lists the hierarchy highest-to-lowest, i.e. reversed.
- (C) places genus before species and is incomplete.
- (D) jumbles family, genus and class.

**Final Answer:** species  $\rightarrow$  ...  $\rightarrow$  kingdom  $\Rightarrow$

**Answer:** (A) [Go Back to Q2](#)



Q3.

**Solution**

**Concept — Algal pigments:** The three algal classes differ in their dominant pigment: Chlorophyceae (green) have chlorophyll *a* and *b*, Phaeophyceae (brown) have fucoxanthin, and Rhodophyceae (red) have phycoerythrin.

**Step 1 — Identify the group:** green algae = Chlorophyceae.

**Step 2 — Recall its pigments:** chlorophyll *a* and chlorophyll *b* give the grass-green colour.

**Why other options are wrong:**

- (A) fucoxanthin is the brown-algae pigment.
- (B) phycoerythrin is the red-algae pigment.
- (C) phycocyanin is a blue pigment of cyanobacteria/red algae.

**Final Answer:** chlorophyll *a* and *b* ⇒

[Go Back to Q3](#)

Q4.

**Solution**

**Concept — Porifera:** Sponges have a water-canal system; the flagellated collar cells (choanocytes) line the spongocoel/canals and drive the water current that brings food and oxygen.

**Step 1 — Recall the cell:** choanocytes (collar cells) bear a flagellum surrounded by a collar of microvilli.

**Step 2 — Note their role:** their beating flagella create the inward water current.

**Why other options are wrong:**

- (A) cnidoblasts and (D) nematocytes are stinging cells of Coelenterata.
- (C) flame cells are the excretory cells of flatworms.

**Final Answer:** choanocytes ⇒

[Go Back to Q4](#)



Q5.

**Solution**

**Concept — Meristems:** Apical meristems cause increase in length; lateral meristems (vascular cambium and cork cambium) cause increase in girth during secondary growth.

**Step 1 — Match function to type:** increase in girth = lateral meristem.

**Step 2 — Locate it:** the vascular cambium lies between the xylem and phloem.

**Why other options are wrong:**

- (A) apical meristem adds length at root/shoot tips.
- (B) intercalary meristem is found at the base of internodes/leaves and adds length.
- (D) the shoot-tip primary meristem also adds length, not girth.

**Final Answer:** lateral meristem (cambium) ⇒

**Answer: (C)** [Go Back to Q5](#)

Q6.

**Solution**

**Concept — Epithelial tissue:** Tall, pillar-like cells with their nuclei at the base form columnar epithelium; when they bear microvilli and line absorptive surfaces they form the absorptive lining of the gut.

**Step 1 — Match site to type:** the small-intestine lining is simple columnar epithelium.

**Step 2 — Note the adaptation:** microvilli on these columnar cells greatly increase the absorptive surface area.

**Why other options are wrong:**

- (A) simple squamous lines alveoli and blood vessels (for diffusion), not absorption.
- (B) stratified squamous forms protective skin/oesophagus lining.
- (C) ciliated cuboidal is not the absorptive intestinal lining.

**Final Answer:** simple columnar epithelium ⇒

**Answer: (D)** [Go Back to Q6](#)



Q7.

**Solution**

**Concept — Root modifications:** Storage roots may be modified tap roots (fusiform, conical, napiform) or modified adventitious roots. Sweet potato stores food in adventitious roots, whereas carrot, radish and turnip are modified tap roots.

**Step 1 — Identify the root system:** sweet potato food-storage roots arise as adventitious roots, not from the radicle.

**Step 2 — Name the modification:** swollen adventitious storage root = tuberous (root tuber).

**Why other options are wrong:**

- (A) fusiform tap root = radish.
- (B) conical tap root = carrot.
- (C) napiform tap root = turnip.

**Final Answer:** tuberous adventitious root ⇒

[Go Back to Q7](#)

Q8.

**Solution**

**Concept — Earthworm digestion:** The gut of *Pheretima* runs mouth → buccal cavity → pharynx → oesophagus → gizzard → stomach → intestine. The muscular gizzard grinds soil particles and organic matter.

**Step 1 — Match function to organ:** grinding of food with ingested mineral grains = gizzard.

**Step 2 — Confirm:** the thick muscular wall of the gizzard mechanically crushes the food.

**Why other options are wrong:**

- (A) the pharynx helps in swallowing, not grinding.
- (C) the typhlosole is a fold of the intestine that increases absorptive area.
- (D) the buccal cavity is the mouth chamber that takes in food.

**Final Answer:** gizzard ⇒

[Go Back to Q8](#)



Q9.

**Solution**

**Concept — Mitochondrion:** The mitochondrion is the double-membraned 'powerhouse' of the cell; its inner membrane (cristae) houses the electron transport chain and ATP synthase, so it produces ATP by oxidative phosphorylation.

**Step 1 — Identify the organelle:** the labelled double-membrane body is the mitochondrion.

**Step 2 — State its main job:** aerobic respiration generates most of the cell's ATP here.

**Why other options are wrong:**

- (B) protein packaging and secretion is done by the Golgi apparatus.
- (C) intracellular digestion is done by lysosomes.
- (D) the hereditary material is stored in the nucleus.

**Final Answer:** synthesises ATP by oxidative phosphorylation ⇒

[Go Back to Q9](#)

Q10.

**Solution**

**Concept — Membrane transport:** Passive transport (diffusion, osmosis, facilitated diffusion) moves substances *down* the gradient without energy. Active transport moves them *against* the gradient and needs ATP, using carrier 'pump' proteins.

**Step 1 — Read the key words:** 'against the concentration gradient' and 'expenditure of energy'.

**Step 2 — Match:** these are the defining features of active transport.

**Why other options are wrong:**

- (A) simple diffusion and (D) facilitated diffusion are passive, moving down the gradient.
- (C) osmosis is the passive diffusion of water across a membrane.

**Final Answer:** active transport ⇒

[Go Back to Q10](#)



Q11.

**Solution**

**Concept — Carbohydrate classes:** Monosaccharides (e.g. glucose, fructose) cannot be hydrolysed further; disaccharides (sucrose, lactose, maltose) yield two monosaccharides; polysaccharides (starch, cellulose) yield many.

**Step 1 — Test each option:** sucrose → glucose + fructose; lactose → glucose + galactose; starch → many glucose units.

**Step 2 — Find the simplest:** glucose is a single sugar unit and cannot be hydrolysed.

**Why other options are wrong:**

- (A) sucrose is a disaccharide.
- (B) lactose is a disaccharide.
- (D) starch is a polysaccharide.

**Final Answer:** glucose ⇒

**Answer: (C)** [Go Back to Q11](#)

Q12.

**Solution**

**Concept — Enzyme classes:** The six IUB enzyme classes are oxidoreductases, transferases, hydrolases, lyases, isomerases and ligases. Oxidoreductases catalyse oxidation–reduction (electron-transfer) reactions.

**Step 1 — Read the catalysed reaction:** transfer of electrons / oxidation–reduction between two substrates.

**Step 2 — Match to class:** this is the oxidoreductase class.

**Why other options are wrong:**

- (B) transferases transfer a chemical group (not electrons).
- (C) hydrolases catalyse hydrolysis using water.
- (D) ligases join two molecules using ATP.

**Final Answer:** oxidoreductase ⇒

**Answer: (A)** [Go Back to Q12](#)



Q13.

**Solution**

**Concept — Mitotic prophase:** In prophase the chromatin condenses into compact chromosomes (each with two sister chromatids), the spindle begins to form, and by late prophase the nuclear envelope and nucleolus break down.

**Step 1 — Recall prophase events:** condensation of chromosomes and disappearance of the nuclear envelope.

**Step 2 — Distinguish from the figure:** the figure shows metaphase (alignment at the equator); prophase precedes this.

**Why other options are wrong:**

- (A) chromatid separation is anaphase.
- (C) reformation of nuclei and cytokinesis is telophase.
- (D) alignment on the equatorial plate is metaphase (shown), not prophase.

**Final Answer:** chromosomes condense and nuclear envelope disappears  $\Rightarrow$  **B**

**Answer: (B)** [Go Back to Q13](#)

Q14.

**Solution**

**Concept — Meiosis:** Meiosis I is the reductional division: homologous chromosomes pair and then separate, halving the chromosome number ( $2n \rightarrow n$ ). Meiosis II is equational, separating sister chromatids.

**Step 1 — Identify where the number halves:** when homologous chromosomes (not chromatids) separate.

**Step 2 — Assign the division:** this homologue separation happens in anaphase I of meiosis I.

**Why other options are wrong:**

- (A) meiosis II separates chromatids but does not reduce the number.
- (B) the number does change; it is halved.
- (C) only meiosis I is reductional, not both equally.

**Final Answer:** meiosis I (separation of homologues)  $\Rightarrow$  **D**

**Answer: (D)** [Go Back to Q14](#)



Q15.

**Solution**

**Concept — Photosynthesis sites:** The light reactions occur on the thylakoid membranes of the grana (where the pigment photosystems, electron carriers and ATP synthase lie); the light-independent (Calvin) reactions occur in the stroma.

**Step 1 — Locate the light reaction:** pigment systems and photolysis are membrane-bound on the thylakoids.

**Step 2 — Confirm:** ATP and NADPH are formed across the thylakoid membrane.

**Why other options are wrong:**

- (A) the outer membrane is not the photosynthetic surface.
- (B) the stroma is the site of the dark (Calvin) reactions.
- (D) the surrounding cytoplasm is not involved.

**Final Answer:** thylakoid membranes of the grana ⇒

**Answer: (C)** [Go Back to Q15](#)

Q16.

**Solution**

**Concept — Glycolysis:** In glycolysis one 6-carbon glucose molecule is partially oxidised in the cytoplasm into two molecules of 3-carbon pyruvate (pyruvic acid), with a net gain of 2 ATP and 2 NADH.

**Step 1 — Track the carbons:** glucose ( $C_6$ ) splits into two  $C_3$  units.

**Step 2 — Name the product:** the two  $C_3$  units are pyruvate.

**Why other options are wrong:**

- (A) gives only one pyruvate; glucose yields two.
- (C) lactic acid forms later, only under anaerobic conditions in muscle.
- (D) acetyl CoA is formed after glycolysis, in the link reaction.

**Final Answer:** two molecules of pyruvate ⇒

**Answer: (B)** [Go Back to Q16](#)



Q17.

**Solution**

**Concept — Transpiration:** The loss of water in the form of vapour from the aerial parts of a plant, mainly through the stomata of leaves, is called transpiration.

**Step 1 — Identify the process:** vapour loss = transpiration.

**Step 2 — Identify the structure:** it occurs mainly through stomata.

**Why other options are wrong:**

- (B) guttation is loss of liquid water (droplets) through hydathodes.
- (C) imbibition is the absorption of water by hydrophilic colloids.
- (D) bleeding is exudation of sap from cut/injured stems.

**Final Answer:** transpiration through stomata ⇒

[Go Back to Q17](#)

Q18.

**Solution**

**Concept — Plant nutrients:** Macronutrients (e.g. N, P, K, Ca, Mg, S) are needed in large amounts; micronutrients (e.g. Fe, Mn, Zn, Cu, B, Mo, Cl) are needed in trace amounts.

**Step 1 — Test each option:** N, K and Ca are all macronutrients.

**Step 2 — Find the trace element:** zinc (Zn) is required only in trace amounts, i.e. a micronutrient.

**Why other options are wrong:**

- (A) nitrogen is a macronutrient.
- (B) potassium is a macronutrient.
- (C) calcium is a macronutrient.

**Final Answer:** zinc ⇒

[Go Back to Q18](#)



Q19.

**Solution**

**Concept — Auxins:** Auxins (e.g. IAA) promote cell elongation, maintain apical dominance (suppress lateral buds), promote rooting, prevent early fruit/leaf abscission and can induce parthenocarpic fruits.

**Step 1 — Match the listed roles:** cell elongation, apical dominance and seedless fruits all point to auxin.

**Step 2 — Conclude:** the hormone is auxin.

**Why other options are wrong:**

- (A) abscisic acid is a growth inhibitor causing dormancy and stomatal closure.
- (B) ethylene promotes fruit ripening and senescence.
- (D) cytokinins promote cell division and delay senescence.

**Final Answer:** auxin  $\Rightarrow$

**Answer: (C)** [Go Back to Q19](#)

Q20.

**Solution**

**Concept — Gastric digestion:** The gastric glands of the stomach secrete inactive pepsinogen; HCl converts it into the active enzyme pepsin, which digests proteins into peptones and proteoses.

**Step 1 — Identify the proenzyme and product:** pepsinogen  $\xrightarrow{\text{HCl}}$  pepsin.

**Step 2 — Confirm the site:** this activation occurs in the stomach.

**Why other options are wrong:**

- (A) trypsin is a pancreatic protease active in the small intestine.
- (C) ptyalin is the salivary amylase that acts in the mouth on starch.
- (D) lipase digests fats, mainly in the small intestine.

**Final Answer:** pepsin  $\Rightarrow$

**Answer: (B)** [Go Back to Q20](#)



Q21.

**Solution**

**Concept — Oxygen transport:** About 97% of oxygen in blood is carried bound to the iron of haemoglobin in red blood cells as oxyhaemoglobin; only a small fraction is dissolved in plasma.

**Step 1 — Recall the main carrier:** haemoglobin binds  $O_2$  to form oxyhaemoglobin.

**Step 2 — Confirm the proportion:** the bulk of  $O_2$  travels this way, not free in plasma.

**Why other options are wrong:**

- (A) only ~3% of  $O_2$  is dissolved in plasma.
- (B) carbaminohaemoglobin is a form of carbon dioxide transport.
- (D) bicarbonate ions transport carbon dioxide, not oxygen.

**Final Answer:** oxyhaemoglobin bound to haemoglobin  $\Rightarrow$

[Go Back to Q21](#)

Q22.

**Solution**

**Concept — Cardiac cycle:** In joint diastole all four chambers are relaxed; blood from the great veins flows passively through the open atrio-ventricular valves into the ventricles while the semilunar valves are shut.

**Step 1 — Define joint diastole:** simultaneous relaxation of atria and ventricles.

**Step 2 — State the result:** the relaxed heart fills passively with blood.

**Why other options are wrong:**

- (B) ventricular contraction is ventricular systole.
- (C) atrial contraction is atrial systole.
- (D) contraction of one ventricle alone is not the diastole stage.

**Final Answer:** all chambers relaxed and filling  $\Rightarrow$

[Go Back to Q22](#)



Q23.

**Solution**

**Concept — Nephron:** Each nephron begins with a double-walled cup, the Bowman's capsule, which encloses the glomerulus (a knot of capillaries). Bowman's capsule plus glomerulus make up the malpighian (renal) corpuscle.

**Step 1 — Identify the cup 'G':** the cup enclosing the glomerulus is Bowman's capsule.

**Step 2 — State its role:** it collects the glomerular filtrate.

**Why other options are wrong:**

- (A) the collecting duct carries urine away, near the end of the nephron.
- (B) the PCT is the coiled tubule after Bowman's capsule.
- (D) the DCT is the coiled tubule before the collecting duct.

**Final Answer:** Bowman's capsule  $\Rightarrow$

**Answer: (C)** [Go Back to Q23](#)

Q24.

**Solution**

**Concept — Sliding-filament theory:** During contraction the thin actin filaments slide inward over the stationary thick myosin filaments, pulling the Z-lines closer; the filaments themselves do not shorten.

**Step 1 — Identify what moves:** actin filaments slide over myosin.

**Step 2 — Note the effect:** the sarcomere shortens though filament lengths are unchanged.

**Why other options are wrong:**

- (A) myosin filaments do not shorten.
- (B) actin filaments do not shorten.
- (C) the A band (myosin length) stays constant; the I band shortens.

**Final Answer:** actin slides over myosin  $\Rightarrow$

**Answer: (D)** [Go Back to Q24](#)



Q25.

**Solution**

**Concept — Neuron structure:** A neuron has a cell body (cyton), many short branched dendrites that bring impulses *towards* the cyton, and a single long axon that carries impulses *away* from it.

**Step 1 — Read the clue:** short, branched, impulse-receiving processes.

**Step 2 — Match:** these are dendrites.

**Why other options are wrong:**

- (A) the axon carries impulses away from the cell body.
- (C) synaptic knobs are the axon terminals.
- (D) the myelin sheath insulates the axon; it does not receive impulses.

**Final Answer:** dendrites ⇒

**Answer: (B)** [Go Back to Q25](#)

Q26.

**Solution**

**Concept — Posterior pituitary hormones:** The posterior pituitary releases oxytocin and antidiuretic hormone (ADH/vasopressin). ADH acts on the distal tubules and collecting ducts of the kidney to increase water reabsorption.

**Step 1 — Match the function:** increased water reabsorption, less urine → ADH.

**Step 2 — Confirm the source:** ADH is stored and released by the posterior pituitary.

**Why other options are wrong:**

- (A) GH stimulates body growth.
- (B) TSH stimulates the thyroid gland.
- (C) prolactin stimulates milk production.

**Final Answer:** antidiuretic hormone (ADH) ⇒

**Answer: (D)** [Go Back to Q26](#)



Q27.

**Solution**

**Concept — ECG waves:** The P wave marks atrial depolarisation, the QRS complex marks ventricular depolarisation (ventricular contraction begins), and the T wave marks ventricular repolarisation.

**Step 1 — Locate the QRS complex:** it is the tall sharp deflection containing the R peak.

**Step 2 — Assign its meaning:** QRS = depolarisation of the ventricles.

**Why other options are wrong:**

- (A) atrial depolarisation is the P wave.
- (B) ventricular repolarisation is the T wave.
- (D) the flat baseline is the resting (isoelectric) phase.

**Final Answer:** depolarisation of the ventricles ⇒

**Answer:** (C) [Go Back to Q27](#)

Q28.

**Solution**

**Concept — Saltatory conduction:** In myelinated fibres the axon membrane is exposed only at the nodes of Ranvier; the impulse ‘jumps’ from node to node, which makes conduction much faster than the continuous conduction of unmyelinated fibres.

**Step 1 — Read the clue:** impulse jumps node to node, faster conduction.

**Step 2 — Name it:** saltatory conduction.

**Why other options are wrong:**

- (B) continuous conduction occurs in unmyelinated fibres and is slower.
- (C) synaptic transmission is signalling across a synapse, not along an axon.
- (D) retrograde conduction (backward) is not the normal mode.

**Final Answer:** saltatory conduction ⇒

**Answer:** (A) [Go Back to Q28](#)



Q29.

**Solution**

**Concept — Microsporangium wall:** A typical anther microsporangium is surrounded by four wall layers — epidermis, endothecium, middle layers and tapetum. The innermost tapetum nourishes the developing pollen grains.

**Step 1 — Recall the layers from outside in:** epidermis, endothecium, middle layers, tapetum.

**Step 2 — Identify the nutritive innermost layer:** tapetum.

**Why other options are wrong:**

- (A) the epidermis is the outermost protective layer.
- (B) the endothecium helps in anther dehiscence.
- (C) the middle layers lie between endothecium and tapetum and are not the nutritive innermost layer.

**Final Answer:** tapetum ⇒

[Go Back to Q29](#)

Q30.

**Solution**

**Concept — Double fertilization:** A unique angiosperm event in which one male gamete fuses with the egg (syngamy → zygote) and the other fuses with the two polar nuclei (triple fusion → primary endosperm nucleus).

**Step 1 — Count the fusions:** two fusions occur in the embryo sac.

**Step 2 — Name the event:** double fertilization.

**Why other options are wrong:**

- (A) simple fertilization involves a single fusion only.
- (C) self-pollination is transfer of pollen, not fusion of gametes.
- (D) parthenogenesis is development without fertilization.

**Final Answer:** double fertilization ⇒

[Go Back to Q30](#)



Q31.

**Solution**

**Concept — Male reproductive system:** The testes contain coiled seminiferous tubules; their germinal epithelium undergoes spermatogenesis to produce sperms, which then mature and are stored in the epididymis.

**Step 1 — Locate sperm production:** the seminiferous tubules of the testis.

**Step 2 — Confirm:** spermatogonia in these tubules form sperms.

**Why other options are wrong:**

- (B) the prostate adds secretions to semen.
- (C) the epididymis stores and matures sperms but does not make them.
- (D) the seminal vesicle secretes seminal fluid.

**Final Answer:** seminiferous tubules of the testis ⇒

**Answer: (A)** [Go Back to Q31](#)

Q32.

**Solution**

**Concept — Ovulation:** Around the middle of the menstrual cycle (about day 14), a surge of LH causes the mature Graafian follicle to rupture and release the secondary oocyte. This release is called ovulation.

**Step 1 — Read the description:** release of egg from the Graafian follicle at mid-cycle.

**Step 2 — Name it:** ovulation.

**Why other options are wrong:**

- (A) menstruation is the shedding of the uterine lining.
- (B) implantation is attachment of the blastocyst to the uterus.
- (D) parturition is the act of childbirth.

**Final Answer:** ovulation ⇒

**Answer: (C)** [Go Back to Q32](#)



Q33.

**Solution**

**Concept — Contraceptive methods:** Sterilisation (vasectomy in males, tubectomy in females) is a permanent surgical method that blocks the vas deferens or fallopian tubes; the others are reversible, non-surgical methods.

**Step 1 — Identify the surgical method:** vasectomy / tubectomy.

**Step 2 — Note it is permanent:** it prevents gamete transport surgically.

**Why other options are wrong:**

- (B) the condom is a barrier method, not surgical.
- (C) the pill is a hormonal method.
- (D) the IUD is an intra-uterine device, not a surgical sterilisation.

**Final Answer:** vasectomy / tubectomy (sterilisation)  $\Rightarrow$

**Answer: (A)** [Go Back to Q33](#)

Q34.

**Solution**

**Concept — Monohybrid cross:** Crossing  $TT \times tt$  gives all  $Tt$  (tall) in  $F_1$ . Selfing  $Tt \times Tt$  gives genotypes  $1TT: 2Tt: 1tt$ , i.e. 3 tall : 1 dwarf phenotypically.

**Step 1 —  $F_1$  cross:**  $TT \times tt \rightarrow$  all  $Tt$  (tall).

**Step 2 —  $F_1$  self:**  $Tt \times Tt$  Punnett square gives  $TT, Tt, Tt, tt$ .

**Step 3 — Convert to phenotype:** 3 plants carry  $T$  (tall) and 1 is  $tt$  (dwarf).

**Why other options are wrong:**

- (A) 1 : 1 is a test-cross ratio.
- (C) 9 : 3 : 3 : 1 is a dihybrid ratio.
- (D) 1 : 2 : 1 is the  $F_2$  genotypic ratio, not the phenotypic ratio.

**Final Answer:** 3 : 1  $\Rightarrow$

**Answer: (B)** [Go Back to Q34](#)



Q35.

**Solution**

**Concept — Dihybrid cross:** A cross between two double heterozygotes ( $RrYy \times RrYy$ ), where the two gene pairs assort independently, gives the classical  $F_2$  phenotypic ratio  $9 : 3 : 3 : 1$ .

**Step 1 — Each gene pair gives  $3 : 1$ :** round:wrinkled =  $3 : 1$  and yellow:green =  $3 : 1$ .

**Step 2 — Combine independently:**  $(3 : 1) \times (3 : 1)$  gives  $9 : 3 : 3 : 1$  for the four phenotype combinations.

**Why other options are wrong:**

- (A)  $3 : 1$  is a monohybrid ratio.
- (B)  $1 : 1 : 1 : 1$  is a dihybrid *test-cross* ratio.
- (C)  $1 : 2 : 1$  is a monohybrid genotypic / incomplete-dominance ratio.

**Final Answer:**  $9 : 3 : 3 : 1 \Rightarrow$

[Go Back to Q35](#)

Q36.

**Solution**

**Concept — Linkage:** Genes located on the same chromosome tend to be inherited together as a group and do not show independent assortment; this physical association is called linkage (discovered by Morgan).

**Step 1 — Read the definition:** genes on the same chromosome inherited together.

**Step 2 — Name it:** linkage.

**Why other options are wrong:**

- (B) independent assortment applies to genes on different chromosomes.
- (C) incomplete dominance is a blending of phenotypes.
- (D) codominance is the simultaneous expression of both alleles.

**Final Answer:** linkage  $\Rightarrow$

[Go Back to Q36](#)



Q37.

**Solution**

**Concept — Human sex determination:** Females are XX (homogametic, all eggs carry X); males are XY (heterogametic, sperms carry either X or Y). The sex of the child therefore depends on whether the fertilising sperm carries X (girl) or Y (boy).

**Step 1 — Identify the heterogametic sex:** the male (XY) makes two kinds of sperm.

**Step 2 — Conclude:** the sperm decides the child's sex.

**Why other options are wrong:**

- (A) the mother is homogametic, not heterogametic.
- (B) the ovum always carries X, so it cannot decide the sex.
- (D) the somatic cells of the embryo do not determine its sex.

**Final Answer:** the sperm (X or Y)  $\Rightarrow$

[Go Back to Q37](#)

Q38.

**Solution**

**Concept — Base pairing (Chargaff):** In DNA, adenine (A) pairs with thymine (T) through two hydrogen bonds, and guanine (G) pairs with cytosine (C) through three hydrogen bonds, keeping the two strands complementary.

**Step 1 — Recall the A partner:** adenine pairs with thymine.

**Step 2 — Note the bonds:** the A–T pair has two hydrogen bonds.

**Why other options are wrong:**

- (A) guanine pairs with cytosine, not adenine.
- (C) cytosine pairs with guanine.
- (D) adenine does not pair with another adenine.

**Final Answer:** thymine (two H-bonds)  $\Rightarrow$

[Go Back to Q38](#)



Q39.

**Solution**

**Concept — DNA replication:** Watson and Crick proposed, and Meselson and Stahl proved, that replication is semiconservative: each daughter DNA retains one parental strand and gains one newly made strand.

**Step 1 — Read the description:** one old strand + one new strand per daughter molecule.

**Step 2 — Name the mode:** semiconservative.

**Why other options are wrong:**

- (B) conservative replication would keep both parental strands together — not observed.
- (C) dispersive replication would scatter old and new pieces in each strand — not observed.
- (D) 'non-template' is not a recognised replication mode.

**Final Answer:** semiconservative ⇒

**Answer: (A)** [Go Back to Q39](#)

Q40.

**Solution**

**Concept — Natural selection:** Darwin proposed that organisms vary, more offspring are produced than can survive, and individuals with favourable variations survive and reproduce better — popularly 'survival of the fittest'.

**Step 1 — Recall Darwin's core idea:** differential survival and reproduction of favourable variants.

**Step 2 — Match the phrase:** survival of the fittest.

**Why other options are wrong:**

- (A) inheritance of acquired characters is Lamarck's idea.
- (B) use and disuse of organs is also Lamarckian.
- (C) evolution by sudden large mutations is de Vries's mutation theory, not Darwin's.

**Final Answer:** survival of the fittest ⇒

**Answer: (D)** [Go Back to Q40](#)



Q41.

**Solution**

**Concept — Malaria transmission:** Malaria is caused by *Plasmodium* and is spread when a female *Anopheles* mosquito (which needs a blood meal for its eggs) bites and injects sporozoites into a human.

**Step 1 — Identify the vector:** the mosquito *Anopheles*.

**Step 2 — Identify the sex:** only the female feeds on blood and transmits the parasite.

**Why other options are wrong:**

- (A) male *Anopheles* feeds on nectar, not blood.
- (C) female *Culex* transmits filariasis.
- (D) female *Aedes* transmits dengue and chikungunya.

**Final Answer:** female *Anopheles* mosquito  $\Rightarrow$

[Go Back to Q41](#)

Q42.

**Solution**

**Concept — Antibody structure:** An antibody (immunoglobulin) is Y-shaped and made of four polypeptide chains — two identical long heavy (H) chains and two identical short light (L) chains, written as  $H_2L_2$ .

**Step 1 — Count and type the chains:** two heavy + two light chains.

**Step 2 — Match the option:** two light and two heavy chains.

**Why other options are wrong:**

- (A) it is not four heavy chains.
- (B) it is not four light chains.
- (D) it is not a single H-L pair; there are two of each.

**Final Answer:** two light and two heavy chains  $\Rightarrow$

[Go Back to Q42](#)



Q43.

**Solution**

**Concept — Microbes making curd:** Lactic acid bacteria (LAB) such as *Lactobacillus* convert milk into curd by producing lactic acid, which coagulates the milk protein; they also raise its vitamin B<sub>12</sub> content.

**Step 1 — Identify the microbe:** *Lactobacillus* (lactic acid bacteria).

**Step 2 — Note the action:** they ferment lactose to lactic acid, forming curd.

**Why other options are wrong:**

- (B) *Aspergillus* is used in industrial fermentations, not curd.
- (C) *Penicillium* is used for antibiotics and cheese ripening, not curdling milk.
- (D) methanogens produce biogas, not curd.

**Final Answer:** lactic acid bacteria (*Lactobacillus*) ⇒

**Answer: (A)** [Go Back to Q43](#)

Q44.

**Solution**

**Concept — Plant-breeding steps:** The main steps in sequence are: (1) collection of variability (germplasm), (2) evaluation and selection of parents, (3) cross-hybridisation, (4) selection and testing of superior recombinants, and (5) testing, release and commercialisation. The first step is collecting variability.

**Step 1 — Recall the order:** variability must exist before parents can be selected and crossed.

**Step 2 — Identify the first step:** collection of genetic variability (germplasm collection).

**Why other options are wrong:**

- (A) selection/testing of recombinants is a later step.
- (B) cross-hybridisation is the third step.
- (C) release and commercialisation is the final step.

**Final Answer:** collection of variability ⇒

**Answer: (D)** [Go Back to Q44](#)



Q45.

**Solution**

**Concept — Molecular scissors:** Restriction endonucleases recognise specific palindromic DNA sequences and cut both strands at or near them, generating fragments (often with sticky ends) for recombinant DNA work.

**Step 1 — Match the function:** cutting DNA at specific recognition sites = restriction endonuclease.

**Step 2 — Confirm the nickname:** they are the ‘molecular scissors’.

**Why other options are wrong:**

- (B) DNA ligase joins (‘glues’) DNA fragments.
- (C) DNA polymerase synthesises new DNA strands.
- (D) exonucleases remove nucleotides only from the ends.

**Final Answer:** restriction endonucleases  $\Rightarrow$

**Answer: (A)** [Go Back to Q45](#)

Q46.

**Solution**

**Concept — Origin of replication (ori):** ‘ori’ is a sequence in a vector where replication starts; any DNA linked to it is replicated inside the host. The ori also governs the copy number of the linked plasmid.

**Step 1 — State the role of ori:** initiates replication and controls copy number.

**Step 2 — Confirm:** foreign DNA ligated into the vector is copied because of the ori.

**Why other options are wrong:**

- (A) selection of transformed cells is the job of selectable markers.
- (B) being cut by a restriction enzyme is the role of the recognition/restriction site.
- (D) coding for the protein of interest is the role of the foreign gene, not the ori.

**Final Answer:** controls initiation of replication and copy number  $\Rightarrow$

**Answer: (C)** [Go Back to Q46](#)



Q47.

**Solution**

**Concept — Bt cotton:** The *cry* genes coding for the insecticidal Bt toxin (Cry proteins) come from the soil bacterium *Bacillus thuringiensis*; transferring these genes makes cotton resistant to bollworms.

**Step 1 — Recall the source organism:** *Bacillus thuringiensis* (hence 'Bt').

**Step 2 — Confirm:** its *cry* gene gives the insect-resistance trait.

**Why other options are wrong:**

- (A) *Agrobacterium* is used as a gene-transfer vector, not the Cry-toxin source.
- (C) *E. coli* is a common cloning host, not the toxin source.
- (D) *Rhizobium* is a nitrogen-fixing symbiont.

**Final Answer:** *Bacillus thuringiensis* ⇒

**Answer: (B)** [Go Back to Q47](#)

Q48.

**Solution**

**Concept — Trophic levels:** Green plants (producers) are the first trophic level, herbivores (primary consumers) the second, primary carnivores (secondary consumers) the third, and so on. In grass → grasshopper → frog → snake, the frog eats the herbivore grasshopper.

**Step 1 — Place each organism:** grass = producer (T1); grasshopper = primary consumer (T2); frog = secondary consumer (T3); snake = tertiary consumer (T4).

**Step 2 — Identify the frog's level:** secondary consumer, third trophic level.

**Why other options are wrong:**

- (B) the producer is the grass.
- (C) the primary consumer is the grasshopper.
- (D) the top carnivore here is the snake.

**Final Answer:** secondary consumer (third trophic level) ⇒

**Answer: (A)** [Go Back to Q48](#)



Q49.

**Solution**

**Concept — Population interactions:** Mutualism (+/+) benefits both species; commensalism (+/0) helps one without affecting the other; competition (-/-) and predation/parasitism (+/-) harm at least one partner.

**Step 1 — Read the clue:** both partners benefited (+/+).

**Step 2 — Match:** this is mutualism.

**Why other options are wrong:**

- (A) predation benefits the predator but harms the prey (+/-).
- (B) competition harms both species (-/-).
- (C) parasitism benefits the parasite but harms the host (+/-).

**Final Answer:** mutualism  $\Rightarrow$

**Answer: (D)** [Go Back to Q49](#)

Q50.

**Solution**

**Concept — Levels of biodiversity:** Biodiversity occurs at three levels — genetic diversity (variation within a species), species diversity (variety of species), and ecosystem diversity (variety of ecosystems/habitats in a region).

**Step 1 — Read the clue:** variety of *ecosystems* (forests, grasslands, wetlands, deserts).

**Step 2 — Match the level:** this is ecosystem (ecological) diversity.

**Why other options are wrong:**

- (A) genetic diversity is variation within a single species.
- (B) species diversity is the variety of species at one site.
- (D) 'molecular diversity' is not one of the three recognised levels.

**Final Answer:** ecosystem (ecological) diversity  $\Rightarrow$

**Answer: (C)** [Go Back to Q50](#)



## Answer Key

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

