

JCECE Biology Sample Paper – 9

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. Whittaker's five-kingdom scheme placed all prokaryotic organisms, which lack a true membrane-bound nucleus, into a single kingdom. On the basis of this *cell type* criterion, bacteria and cyanobacteria are grouped in the kingdom:

- (A) Protista
- (B) Monera
- (C) Fungi
- (D) Plantae

Q2. The lowest and the most basic unit of taxonomic classification, defined as a group of organisms that are fundamentally similar and can interbreed freely among themselves, is the:

- (A) genus
- (B) family
- (C) species



(D) order

Q3. Several commercially important products are obtained from algae. The gel-forming polysaccharide *agar*, widely used as a culture medium base and in food, is obtained from the red algae:

(A) *Gelidium* and *Gracilaria*

(B) *Laminaria* and *Fucus*

(C) *Chlorella* and *Spirogyra*

(D) *Volvox* and *Ulothrix*

Q4. All chordates share three fundamental features at some stage of their life. Which one of the following is a defining (diagnostic) character of phylum Chordata?

(A) a ventral, solid nerve cord

(B) radial symmetry of the body

(C) presence of a pseudocoelom

(D) a notochord, a dorsal hollow nerve cord and pharyngeal gill slits

Q5. In a typical dicotyledonous stem the vascular bundles contain a strip of cambium between the xylem and phloem, which allows secondary growth. Such a vascular bundle is described as:

(A) closed (without cambium)

(B) open (with cambium)

(C) radial

(D) concentric and amphivasal

Q6. Two kinds of dense regular connective tissue attach different structures in the body. The tissue that attaches a *skeletal muscle to a bone* is the:

(A) tendon

(B) ligament



- (C) areolar tissue
- (D) adipose tissue

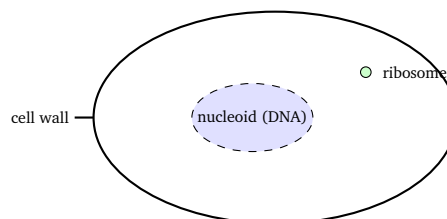
Q7. In the plants *China rose*, *mustard* and *sunflower* a single leaf arises at each node and successive leaves are arranged in a spiral around the stem. This pattern of leaf arrangement is called:

- (A) opposite phyllotaxy
- (B) whorled phyllotaxy
- (C) alternate phyllotaxy
- (D) decussate phyllotaxy

Q8. In the frog (*Rana*), the largest digestive gland of the body, which secretes bile that is stored in the gall bladder and helps in the emulsification of fats, is the:

- (A) pancreas
- (B) liver
- (C) spleen
- (D) stomach

Q9. The cell shown lacks a membrane-bound nucleus and its genetic material lies free in the cytoplasm as a nucleoid. Compared with a eukaryotic cell, such a *prokaryotic* cell also characteristically lacks:



- (A) a cell wall and a plasma membrane
- (B) ribosomes for protein synthesis
- (C) a cell membrane bounding the cytoplasm



(D) membrane-bound organelles such as mitochondria and the endoplasmic reticulum

Q10. Simple diffusion of a substance across the plasma membrane is a passive process. The *rate* of this diffusion is increased by:

(A) a steeper concentration gradient across the membrane

(B) a thicker membrane to cross

(C) a larger size of the diffusing molecule

(D) a lower temperature of the medium

Q11. When two monosaccharide units join together to form a disaccharide such as maltose, the covalent bond formed between them (with loss of a water molecule) is called a:

(A) peptide bond

(B) phosphodiester bond

(C) glycosidic bond

(D) hydrogen bond

Q12. The activity of an enzyme is strongly influenced by temperature and pH. At temperatures well above its optimum, the sharp fall in enzyme activity is mainly because the enzyme undergoes:

(A) activation, which increases its rate

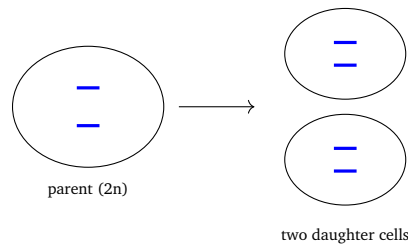
(B) a change to a faster isoenzyme form

(C) binding of more substrate molecules

(D) denaturation, with loss of its three-dimensional shape

Q13. The figure shows a diploid ($2n$) parent cell undergoing mitosis. With respect to the chromosome number, each of the two daughter cells produced by mitosis is:



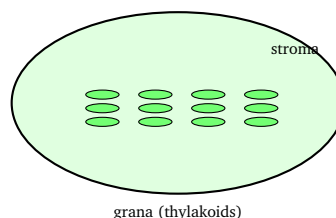


- (A) diploid (2n), with the same chromosome number as the parent
- (B) haploid (n), with half the parent's chromosome number
- (C) tetraploid (4n), with double the parent's number
- (D) variable in chromosome number from cell to cell

Q14. Meiosis involves two successive anaphases. The essential difference between anaphase I and anaphase II is that:

- (A) in anaphase I sister chromatids separate, while in anaphase II homologous chromosomes separate
- (B) in anaphase I homologous chromosomes separate, while in anaphase II sister chromatids separate
- (C) no separation of any kind occurs in anaphase II
- (D) both anaphase I and anaphase II separate only sister chromatids

Q15. In C_3 plants, when the oxygen concentration is high relative to carbon dioxide, the enzyme RuBisCO of the chloroplast shown binds O_2 instead of CO_2 . This wasteful light-dependent process, which does not produce ATP or sugar, is called:



- (A) the Calvin cycle
- (B) cyclic photophosphorylation



- (C) photorespiration
- (D) the oxidative phosphorylation of mitochondria

Q16. Before pyruvate enters the Krebs cycle it is converted, in the mitochondrial matrix, into a 2-carbon compound with the release of CO_2 and the reduction of NAD^+ . This 'link reaction' produces:

- (A) acetyl coenzyme A
- (B) lactic acid
- (C) oxaloacetic acid
- (D) glucose-6-phosphate

Q17. A flaccid plant cell is placed in pure water. Because water moves into the cell by osmosis, the cell swells and its protoplast presses against the wall. With respect to the surrounding solution the cell has been placed in a solution that is:

- (A) hypertonic, causing plasmolysis
- (B) isotonic, causing no change
- (C) hypertonic, causing the cell to shrink
- (D) hypotonic, causing the cell to become turgid

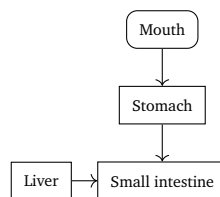
Q18. Mineral ions are absorbed by root cells partly without using metabolic energy and partly with the expenditure of ATP. The uptake of ions *against* their concentration gradient, which requires metabolic energy, is called:

- (A) passive absorption by simple diffusion
- (B) active absorption (active uptake)
- (C) imbibition by the cell wall
- (D) mass flow along the gradient

Q19. When the increase in the size of a growing organ is plotted against time, an S-shaped (sigmoid) growth curve is obtained. The three successive phases of growth shown by this curve are:

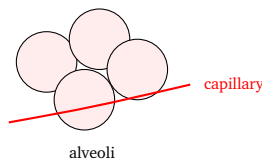
- (A) lag phase, log phase and a phase of accelerating growth
- (B) only a single linear phase throughout
- (C) the lag phase, the log (exponential) phase and the stationary (maturation) phase
- (D) the death phase followed by a lag phase

Q20. The flow diagram shows part of the human digestive system. A disorder in which the *liver* is affected and the skin and eyes turn yellow due to the deposition of bile pigments such as bilirubin is:



- (A) jaundice
- (B) constipation
- (C) diarrhoea
- (D) vomiting

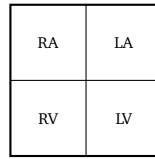
Q21. Gas exchange across the alveolar wall shown is driven by differences in the partial pressures of the gases. At the alveolus, oxygen diffuses from the alveolar air into the blood because the partial pressure of oxygen (pO_2) is:



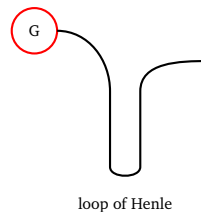
- (A) lower in the alveolar air than in the deoxygenated blood
- (B) higher in the alveolar air than in the deoxygenated blood
- (C) exactly equal in the alveolar air and the blood
- (D) zero in the alveolar air



Q22. Besides the blood circulation shown, the body has a second fluid, lymph, that drains the tissue spaces. Compared with blood plasma, lymph is a colourless fluid that:



- (A) is rich in red blood corpuscles
 (B) contains a large amount of plasma proteins
 (C) carries oxygenated blood to the body tissues
 (D) lacks red blood cells and most plasma proteins but contains white blood cells (lymphocytes)
- Q23.** When the kidneys, whose functional unit (the nephron) is shown, fail to remove wastes, the patient's blood is purified by an artificial device. In haemodialysis the urea and other wastes are removed from the blood by:



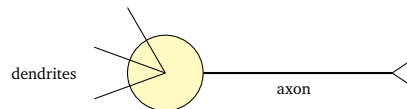
- (A) diffusion across a selectively permeable membrane into a dialysing fluid free of wastes
 (B) active secretion of wastes by the machine using ATP
 (C) filtration of whole blood cells out of the body
 (D) evaporation of urea from the warmed blood
- Q24.** The painful inflammation of joints caused by the accumulation of *uric acid* crystals in the joints (for example in the big toe) is the disorder known as:

- (A) osteoporosis



- (B) muscular dystrophy
- (C) gout (gouty arthritis)
- (D) tetany

Q25. The neuron shown is part of the autonomic nervous system, which controls involuntary functions. The *sympathetic* division of this system, active in 'fight or flight' situations, would:

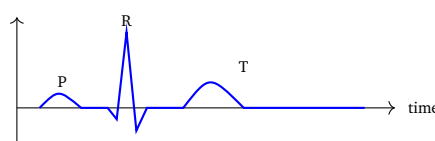


- (A) slow down the heart rate and constrict the pupils
- (B) increase the heart rate and dilate the pupils
- (C) stimulate digestion and salivation
- (D) have no effect on the heart

Q26. Lipid-soluble steroid hormones (such as cortisol) act on their target cells by a mechanism in which the hormone:

- (A) cannot enter the cell and acts only on the cell surface
- (B) is broken down before reaching the cell
- (C) binds to a membrane receptor and generates cyclic AMP only
- (D) enters the cell, binds an intracellular receptor and regulates gene expression

Q27. In the heart's conducting system, whose electrical activity produces the ECG trace shown, the fine fibres that spread the impulse rapidly throughout the ventricular muscle, causing the ventricles to contract, are the:



- (A) Purkinje fibres

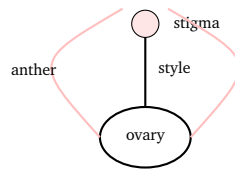


- (B) the sino-atrial node (SAN)
- (C) the chordae tendineae
- (D) the bundle of His only, without further branches

Q28. At most synapses in the human body the impulse is transmitted from one neuron to the next by the release of a chemical messenger across the synaptic cleft. Such a junction is a:

- (A) gap junction where ions flow directly between cells
- (B) chemical synapse using a neurotransmitter
- (C) tight junction with no transmission
- (D) purely electrical synapse with fused membranes

Q29. The longitudinal section of a flower is shown. Inside the anther, the innermost wall layer of the microsporangium, the *tapetum*, has the special function of:



- (A) dehiscing the anther to release pollen
- (B) forming the outer protective wall of the anther
- (C) nourishing the developing pollen grains (microspores)
- (D) attracting pollinating insects

Q30. After fertilization in a flowering plant, definite changes take place in the flower. The ripened *ovary* develops into the fruit, while the structure that develops into the seed is the:

- (A) ovule
- (B) stigma
- (C) anther



(D) petal

Q31. In the human female, the fusion of the sperm with the secondary oocyte (fertilization) normally takes place in the:

(A) uterus (endometrium)

(B) ovary

(C) cervix

(D) ampullary region of the fallopian tube (oviduct)

Q32. The vigorous contractions of the uterine wall that bring about childbirth (parturition) at the end of pregnancy are mainly triggered by the hormone:

(A) progesterone

(B) prolactin

(C) oxytocin

(D) insulin

Q33. Oral contraceptive pills taken by women prevent pregnancy chiefly by:

(A) surgically blocking the fallopian tubes

(B) inhibiting ovulation (and altering the uterine lining) through their hormones

(C) forming a physical barrier in the vagina

(D) killing the sperms inside the male

Q34. A tall pea plant carries the genotype Tt for plant height (T tall is dominant over t dwarf). Because its two alleles for this trait are different, this plant is correctly described as:

(A) heterozygous (a hybrid) for plant height

(B) homozygous dominant for plant height



- (C) homozygous recessive for plant height
- (D) nullizygous for plant height

Q35. In sweet pea, flower colour appears only when two dominant genes (C and P) are present together; either gene alone, or neither, gives white flowers. A cross between two such double heterozygotes ($CcPp \times CcPp$) gives a modified F_2 ratio of coloured to white of:

- (A) 3 : 1
- (B) 1 : 1
- (C) 9 : 3 : 3 : 1
- (D) 9 : 7

Q36. Morgan's classic studies of linkage used the white-eye character of the fruit fly *Drosophila melanogaster*. The white-eye allele is recessive and is located on the X chromosome, so the gene shows:

- (A) autosomal dominant inheritance
- (B) sex-linked (X-linked) inheritance
- (C) Y-linked (holandric) inheritance
- (D) cytoplasmic (maternal) inheritance

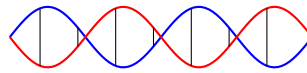
Q37. Sickle-cell anaemia is an autosomal recessive disorder in which a single substitution of the amino acid valine for glutamic acid occurs at the 6th position of the beta-globin chain of haemoglobin. This single change arises from a mutation of the type:

- (A) a large deletion of the whole gene
- (B) a chromosomal aneuploidy (extra chromosome)
- (C) a duplication of the entire chromosome
- (D) a point mutation (single base substitution) in the beta-globin gene

Q38. The DNA strand shown has a sugar–phosphate backbone. Along a single polynucleotide strand, successive nucleotides are joined together by the



bond that links the 3'-carbon of one sugar to the 5'-carbon of the next sugar through a phosphate. This bond is the:



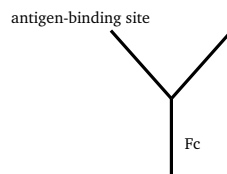
sugar-phosphate backbone

- (A) a hydrogen bond between the bases
(B) a peptide bond
(C) a phosphodiester bond
(D) a glycosidic bond between two sugars
- Q39.** The central dogma of molecular biology describes the usual flow of genetic information in a cell. This flow is correctly represented as:
- (A) DNA → RNA → protein
(B) protein → RNA → DNA
(C) RNA → DNA → protein
(D) protein → DNA → RNA
- Q40.** When a few individuals from a large population start a new isolated colony, the allele frequencies of the new colony may differ markedly from the parent population simply by chance. This change in allele frequency due to a small founding group is an example of:
- (A) natural selection
(B) gene flow (migration)
(C) directed mutation
(D) genetic drift (the founder effect)
- Q41.** Dengue and chikungunya are two viral fevers of humans. The common vector that transmits both of these diseases is the:
- (A) female *Anopheles* mosquito



- (B) *Aedes* mosquito
- (C) female *Culex* mosquito
- (D) housefly (*Musca*)

Q42. AIDS is caused by the Human Immunodeficiency Virus (HIV), which weakens the immune defences (including the antibody-producing system represented by the molecule shown). HIV does this chiefly by attacking and destroying the:



- (A) red blood cells of the blood
 - (B) platelets that help in clotting
 - (C) helper T-lymphocytes (T_H cells) of the immune system
 - (D) the epithelial cells of the skin
- Q43.** To meet the growing demand for protein, microbes themselves can be grown on a large scale and used as food or feed rich in protein. This microbial biomass used as a protein source is called:
- (A) single-cell protein (SCP)
 - (B) biogas
 - (C) an antibiotic
 - (D) a biofertiliser
- Q44.** Some improved crop varieties are produced by deliberately exposing seeds to chemicals or radiation to create new, useful, heritable changes which are then selected. This method of crop improvement is called:
- (A) simple selection of natural variants
 - (B) mutation breeding

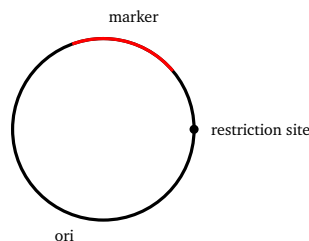


- (C) tissue culture (micropropagation)
- (D) apiculture

Q45. The polymerase chain reaction (PCR) uses repeated heating and cooling cycles. The DNA polymerase used in PCR must withstand the high denaturation temperature; the thermostable enzyme used for this purpose is:

- (A) DNA ligase
- (B) a restriction endonuclease
- (C) reverse transcriptase
- (D) Taq polymerase (from *Thermus aquaticus*)

Q46. The plasmid vector is shown. Before any gene can be cloned into such a vector, the genetic material must first be isolated from the cell in pure form. The very first step in isolating DNA from a bacterial cell is to:

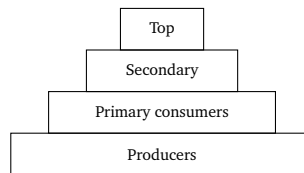


- (A) run the DNA on a gel for electrophoresis
 - (B) break open (lyse) the cell so as to release the DNA along with other macromolecules
 - (C) ligate the DNA into the vector
 - (D) amplify the DNA by PCR
- Q47.** 'Golden rice' is a genetically engineered variety of rice developed to combat a nutritional deficiency. It has been engineered to be rich in:
- (A) iron and zinc only
 - (B) vitamin C (ascorbic acid)



- (C) pro-vitamin A (β -carotene)
- (D) dietary protein (lysine)

Q48. The diagram shows the trophic structure of an ecosystem through which nutrients cycle. The natural reservoir of *phosphorus* in the phosphorus cycle is:



- (A) rocks (phosphate-bearing rocks of the Earth's crust)
 - (B) the atmosphere, as phosphorus gas
 - (C) the ozone layer
 - (D) lightning in the air
- Q49.** The gradual and orderly process by which the species composition of a community changes over time at a site, finally leading to a stable climax community, is called:
- (A) predation
 - (B) competitive exclusion
 - (C) carrying capacity
 - (D) ecological succession
- Q50.** Alexander von Humboldt observed that within a region the number of species increases with the area being explored, but only up to a limit. On a log–log plot this species–area relationship is a straight line whose slope (the regression coefficient) is represented by the letter:
- (A) C (the Y-intercept)
 - (B) S (species richness)
 - (C) Z (the slope of the line)
 - (D) A (the area)



Detailed Solutions

Q1.

Solution

Concept — Kingdom Monera: In Whittaker's five-kingdom system the most basic criterion is cell type. All prokaryotes (cells lacking a true membrane-bound nucleus and membrane-bound organelles) are placed in kingdom Monera.

Step 1 — Read the key clue: the organisms 'lack a true membrane-bound nucleus' ⇒ they are prokaryotes.

Step 2 — Assign the kingdom: bacteria and cyanobacteria (blue-green algae) are prokaryotes and so belong to Monera.

Why other options are wrong:

- (A) Protista contains eukaryotic, mostly unicellular organisms with a true nucleus.
- (C) Fungi are eukaryotic, with a true nucleus and cell wall of chitin.
- (D) Plantae are multicellular eukaryotic autotrophs.

Final Answer: prokaryotes ⇒ Monera ⇒

Answer: (B) [Go Back to Q1](#)

Q2.

Solution

Concept — Basic unit of classification: Species is the lowest and most basic taxonomic category — a group of organisms that are fundamentally similar and (in sexually reproducing forms) can interbreed.

Step 1 — Read the definition: 'fundamentally similar' and 'interbreed freely' describe a species.

Step 2 — Confirm its rank: species is the smallest, most specific unit, below genus.

Why other options are wrong:

- (A) genus is a group of related species, a higher category.
- (B) family groups related genera and is still higher.
- (D) order is even higher, grouping related families.

Final Answer: species ⇒



Answer: (C) [Go Back to Q2](#)

Q3.

Solution

Concept — Products from algae: Several hydrocolloids are obtained from algae — agar from red algae (*Gelidium*, *Gracilaria*), algin from brown algae and carrageenan from red algae. Agar is used to make culture media and in food.

Step 1 — Match product to group: agar comes from red algae (Rhodophyceae).

Step 2 — Name the genera: *Gelidium* and *Gracilaria* are the standard agar-yielding red algae.

Why other options are wrong:

- (B) *Laminaria* and *Fucus* are brown algae that yield algin, not agar.
- (C) *Chlorella* and *Spirogyra* are green algae.
- (D) *Volvox* and *Ulothrix* are also green algae.

Final Answer: *Gelidium* and *Gracilaria* ⇒

Answer: (A) [Go Back to Q3](#)

Q4.

Solution

Concept — Chordate characters: The three fundamental chordate features (present at least in the embryo) are a notochord, a dorsal hollow (tubular) nerve cord and paired pharyngeal gill slits; they also have a post-anal tail.

Step 1 — Recall the diagnostic trio: notochord + dorsal hollow nerve cord + pharyngeal gill slits.

Step 2 — Match the option: option (D) lists exactly these three.

Why other options are wrong:

- (A) the chordate nerve cord is dorsal and hollow, not ventral and solid (that is the non-chordate plan).
- (B) chordates are bilaterally symmetrical, not radially symmetrical.
- (C) a pseudocoelom is a feature of Aschelminthes, not of chordates.

Final Answer: notochord, dorsal hollow nerve cord and gill slits ⇒



Answer: (D) [Go Back to Q4](#)

Q5.

Solution

Concept — Vascular bundle types: A vascular bundle that has cambium between xylem and phloem can undergo secondary growth and is called an 'open' bundle (typical of dicot stems). A bundle without cambium is 'closed' (typical of monocot stems).

Step 1 — Read the clue: cambium is present between xylem and phloem and allows secondary growth.

Step 2 — Name the type: a bundle with cambium = open vascular bundle.

Why other options are wrong:

- (A) a closed bundle lacks cambium and cannot show secondary growth.
- (C) a radial arrangement (xylem and phloem on separate radii) is seen in roots, not described here.
- (D) amphivasal concentric bundles have phloem surrounded by xylem and lack cambium.

Final Answer: open (with cambium) ⇒ **B**

Answer: (B) [Go Back to Q5](#)

Q6.

Solution

Concept — Tendon vs ligament: Both are dense regular connective tissues. A tendon (collagen fibres) joins skeletal muscle to bone; a ligament (with some elastic fibres) joins one bone to another bone.

Step 1 — Read the clue: attaches a skeletal muscle to a bone.

Step 2 — Match: muscle-to-bone connector = tendon.

Why other options are wrong:

- (B) a ligament joins bone to bone (at a joint), not muscle to bone.
- (C) areolar tissue is a loose connective tissue filling spaces, not an attachment cord.
- (D) adipose tissue is a fat-storing loose connective tissue.



Final Answer: tendon \Rightarrow

Answer: (A) [Go Back to Q6](#)

Q7.

Solution

Concept — Phyllotaxy: Phyllotaxy is the pattern of arrangement of leaves on the stem. When one leaf arises per node and the leaves are arranged spirally (e.g. China rose, mustard, sunflower), it is alternate phyllotaxy.

Step 1 — Read the clue: single leaf per node, arranged spirally.

Step 2 — Name the pattern: alternate phyllotaxy.

Why other options are wrong:

- (A) opposite phyllotaxy has a pair of leaves at each node (e.g. *Calotropis*).
- (B) whorled phyllotaxy has more than two leaves at each node (e.g. *Alstonia*).
- (D) decussate is a special opposite type with successive pairs at right angles, not single leaves.

Final Answer: alternate phyllotaxy \Rightarrow

Answer: (C) [Go Back to Q7](#)

Q8.

Solution

Concept — Frog digestive gland: In the frog the liver is the largest digestive gland. It secretes bile, which is stored in the gall bladder and poured into the intestine, where it emulsifies fats to aid their digestion.

Step 1 — Read the clues: largest gland, secretes bile, bile stored in gall bladder, emulsifies fats.

Step 2 — Identify the organ: all of these describe the liver.

Why other options are wrong:

- (A) the pancreas secretes digestive enzymes and insulin, not bile.
- (C) the spleen is a lymphoid organ (blood storage/filtering), not a digestive gland.
- (D) the stomach is a part of the alimentary canal, not a bile-secreting gland.



Final Answer: liver \Rightarrow

Answer: (B) [Go Back to Q8](#)

Q9.

Solution

Concept — Prokaryote vs eukaryote: A prokaryotic cell has no true nucleus (only a nucleoid) and, crucially, no membrane-bound organelles such as mitochondria, endoplasmic reticulum, Golgi or chloroplasts. It does possess a cell membrane, a cell wall and ribosomes.

Step 1 — Identify the cell: no membrane-bound nucleus, DNA as a nucleoid \Rightarrow prokaryote.

Step 2 — State what it lacks: membrane-bound organelles (mitochondria, ER, etc.).

Why other options are wrong:

- (A) prokaryotes do have a cell wall and a plasma membrane.
- (B) prokaryotes do have ribosomes (70S type).
- (C) prokaryotes do have a cell membrane.

Final Answer: membrane-bound organelles \Rightarrow

Answer: (D) [Go Back to Q9](#)

Q10.

Solution

Concept — Factors affecting diffusion: The rate of simple diffusion across a membrane increases with a steeper concentration gradient, a higher temperature, a thinner membrane and a smaller molecular size.

Step 1 — Pick the favourable factor: a steeper concentration gradient speeds diffusion.

Step 2 — Confirm: more difference in concentration \Rightarrow faster net movement.

Why other options are wrong:

- (B) a thicker membrane slows diffusion.
- (C) a larger molecule diffuses more slowly.
- (D) a lower temperature slows molecular movement and hence diffusion.



Final Answer: a steeper concentration gradient \Rightarrow

[Go Back to Q10](#)

Q11.

Solution

Concept — Glycosidic bond: A glycosidic bond is the covalent linkage formed between two monosaccharide units (with the elimination of a water molecule) to build disaccharides and polysaccharides, e.g. in maltose, sucrose and starch.

Step 1 — Identify the molecules joined: two sugar (monosaccharide) units.

Step 2 — Name the bond: sugar to sugar = glycosidic bond.

Why other options are wrong:

- (A) a peptide bond joins amino acids in proteins.
- (B) a phosphodiester bond joins nucleotides in nucleic acids.
- (D) a hydrogen bond is a weak attraction, not the covalent linkage between sugar units.

Final Answer: glycosidic bond \Rightarrow

[Go Back to Q11](#)

Q12.

Solution

Concept — Temperature and enzymes: Enzyme activity rises with temperature up to an optimum, then falls steeply because the high temperature denatures the protein — the three-dimensional shape (and the active site) is destroyed.

Step 1 — Read the clue: activity falls sharply *above* the optimum temperature.

Step 2 — Give the reason: the enzyme is denatured, losing its functional shape.

Why other options are wrong:

- (A) above the optimum the rate falls, it is not activated.
- (B) heat does not convert the enzyme into a faster isoenzyme.
- (C) more substrate binding would not explain a fall in activity caused by heat.

Final Answer: denaturation (loss of shape) \Rightarrow



Answer: (D) [Go Back to Q12](#)

Q13.

Solution

Concept — Mitosis and chromosome number: Mitosis is an equational division. A diploid ($2n$) parent cell divides to give two daughter cells, each with exactly the same diploid ($2n$) chromosome number and the same genetic content as the parent.

Step 1 — Recall the outcome: mitosis keeps the chromosome number constant.

Step 2 — Apply to the figure: $2n$ parent \rightarrow two $2n$ daughter cells.

Why other options are wrong:

- (B) halving of the number ($2n \rightarrow n$) occurs in meiosis, not mitosis.
- (C) mitosis does not double the chromosome number to $4n$.
- (D) the daughter cells are genetically identical, not variable.

Final Answer: diploid ($2n$), same as parent \Rightarrow **A**

Answer: (A) [Go Back to Q13](#)

Q14.

Solution

Concept — Anaphase I vs anaphase II: In anaphase I (reductional division) the homologous chromosomes of each bivalent separate and move to opposite poles, halving the number. In anaphase II (equational) the sister chromatids of each chromosome separate.

Step 1 — Anaphase I: homologous chromosomes separate.

Step 2 — Anaphase II: sister chromatids separate.

Why other options are wrong:

- (A) reverses the two events.
- (C) separation does occur in anaphase II (of chromatids).
- (D) homologues, not chromatids, separate in anaphase I.

Final Answer: homologues separate in I, chromatids in II \Rightarrow **B**

Answer: (B) [Go Back to Q14](#)



Q15.

Solution

Concept — Photorespiration: In C_3 plants, when O_2 is high and CO_2 is low, RuBisCO acts as an oxygenase and fixes O_2 onto RuBP. The resulting pathway releases CO_2 and consumes energy without making sugar or ATP; it is called photorespiration.

Step 1 — Read the clue: RuBisCO binds O_2 instead of CO_2 ; no ATP or sugar is made.

Step 2 — Name the process: photorespiration (the C_2 cycle).

Why other options are wrong:

- (A) the Calvin cycle fixes CO_2 and does make sugar.
- (B) cyclic photophosphorylation makes ATP; it is not wasteful in this sense.
- (D) oxidative phosphorylation occurs in mitochondria during respiration, not here.

Final Answer: photorespiration \Rightarrow

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

Q16.

Solution

Concept — Link reaction: After glycolysis, each pyruvate ($3C$) is oxidatively decarboxylated in the mitochondrial matrix: it loses one CO_2 , reduces NAD^+ to $NADH$, and the remaining 2-carbon acetyl group combines with coenzyme A to form acetyl CoA.

Step 1 — Track the carbons: pyruvate (C_3) \rightarrow acetyl group (C_2) + CO_2 .

Step 2 — Name the product: the 2-carbon unit is carried as acetyl coenzyme A.

Why other options are wrong:

- (B) lactic acid forms only in anaerobic fermentation, not in the link reaction.
- (C) oxaloacetic acid is the 4-carbon acceptor in the Krebs cycle, not the product here.
- (D) glucose-6-phosphate is an early glycolytic intermediate.

Final Answer: acetyl coenzyme A \Rightarrow

Answer: (A) [Go Back to Q16](#)



Q17.

Solution

Concept — Tonicity and turgor: A solution more dilute than the cell sap (lower solute, e.g. pure water) is hypotonic. Water enters the cell by osmosis, the protoplast swells and presses on the wall, making the cell turgid.

Step 1 — Compare the solutions: pure water has less solute than the cell sap \Rightarrow hypotonic.

Step 2 — State the effect: water enters, the cell becomes turgid (endosmosis).

Why other options are wrong:

- (A) a hypertonic solution would draw water out and cause plasmolysis, the opposite of swelling.
- (B) an isotonic solution would cause no net water movement, so no swelling.
- (C) again describes a hypertonic (shrinking) situation, which contradicts the swelling described.

Final Answer: hypotonic \rightarrow turgid \Rightarrow

[Go Back to Q17](#)

Q18.

Solution

Concept — Mineral uptake: Minerals enter root cells by two routes. Passive uptake follows the concentration gradient without energy, whereas active uptake moves ions *against* the gradient and needs metabolic energy (ATP) and carrier proteins.

Step 1 — Read the clue: uptake 'against the concentration gradient' needing metabolic energy.

Step 2 — Name it: active absorption.

Why other options are wrong:

- (A) passive diffusion moves ions down the gradient without energy.
- (C) imbibition is the absorption of water by hydrophilic colloids, not ion uptake against a gradient.
- (D) mass flow moves substances along, not against, a gradient.

Final Answer: active absorption \Rightarrow



Answer: (B) [Go Back to Q18](#)

Q19.

Solution

Concept — Phases of growth: A growing organ shows a sigmoid (S-shaped) growth curve with three phases: a lag phase (slow initial growth), a log or exponential phase (rapid growth), and a stationary / maturation phase (growth slows and stops).

Step 1 — Recall the three phases: lag → log (exponential) → stationary.

Step 2 — Match the option: option (C) names exactly these three.

Why other options are wrong:

- (A) wrongly ends with a fresh 'accelerating' phase instead of the stationary phase.
- (B) growth is not a single linear phase; the curve is sigmoid.
- (D) growth does not begin with a death phase.

Final Answer: lag, log and stationary phases ⇒

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

Q20.

Solution

Concept — Jaundice: Jaundice is a liver-related disorder in which the skin and the whites of the eyes turn yellow because bile pigments (mainly bilirubin) accumulate in the blood and body tissues.

Step 1 — Read the symptoms: liver affected, yellowing of skin and eyes, bilirubin deposition.

Step 2 — Name the disorder: jaundice.

Why other options are wrong:

- (B) constipation is irregular, difficult bowel movement, with no yellowing.
- (C) diarrhoea is frequent watery stools, not a bile-pigment disorder.
- (D) vomiting is the ejection of stomach contents, not jaundice.

Final Answer: jaundice ⇒



Answer: (A) [Go Back to Q20](#)

Q21.

Solution

Concept — Partial pressures and gas exchange: A gas diffuses from a region of higher partial pressure to one of lower partial pressure. In the alveolus the pO_2 is about 104 mm Hg, higher than the ~ 40 mm Hg of the deoxygenated blood, so O_2 moves from air into blood.

Step 1 — Recall the rule: gases move down their partial-pressure gradient.

Step 2 — Compare the values: alveolar $pO_2 >$ blood pO_2 , so oxygen enters the blood.

Why other options are wrong:

- (A) if alveolar pO_2 were lower, O_2 would move the wrong way.
- (C) if the values were equal, there would be no net diffusion.
- (D) alveolar pO_2 is not zero; alveolar air is rich in oxygen.

Final Answer: higher in alveolar air than in blood \Rightarrow **B**

Answer: (B) [Go Back to Q21](#)

Q22.

Solution

Concept — Lymph: Lymph is the colourless tissue fluid that drains into lymphatic vessels. It resembles plasma but lacks red blood cells and most of the large plasma proteins; it does contain white blood cells, mainly lymphocytes.

Step 1 — Recall the composition: no RBCs, few plasma proteins, but lymphocytes present.

Step 2 — Match the option: option (D) states exactly this.

Why other options are wrong:

- (A) lymph has essentially no red blood corpuscles.
- (B) lymph is poor in plasma proteins, not rich in them.
- (C) lymph does not carry oxygenated blood; that is the job of arteries.

Final Answer: lacks RBCs and most proteins, has lymphocytes \Rightarrow **D**



Answer: (D) [Go Back to Q22](#)

Q23.

Solution

Concept — Haemodialysis: In an artificial kidney the patient's blood is passed over one side of a selectively permeable membrane while a wash (dialysing) fluid, having the same composition as plasma but no nitrogenous wastes, flows on the other side. Wastes such as urea diffuse out of the blood into the fluid down their concentration gradient.

Step 1 — Identify the principle: removal of wastes by diffusion across a selectively permeable membrane.

Step 2 — Confirm: the dialysing fluid lacks wastes, so urea diffuses out of the blood.

Why other options are wrong:

- (B) the machine relies on simple diffusion, not active ATP-driven secretion.
- (C) blood cells are retained; only small waste molecules cross the membrane.
- (D) urea is not removed by evaporation.

Final Answer: diffusion into a waste-free dialysing fluid \Rightarrow

Answer: (A) [Go Back to Q23](#)

Q24.

Solution

Concept — Gout: Gout (gouty arthritis) is an inflammation of the joints caused by the deposition of uric-acid (sodium urate) crystals in the joints, classically the joint of the big toe, producing severe pain and swelling.

Step 1 — Read the cause: accumulation of uric-acid crystals in joints.

Step 2 — Name the disorder: gout.

Why other options are wrong:

- (A) osteoporosis is the weakening of bones due to loss of bone mass, not uric-acid crystals.
- (B) muscular dystrophy is a progressive degeneration of muscles.
- (D) tetany is muscle spasm caused by low blood calcium, not uric-acid de-



position.

Final Answer: gout \Rightarrow

Answer: (C) [Go Back to Q24](#)

Q25.

Solution

Concept — Sympathetic nervous system: The autonomic nervous system has sympathetic and parasympathetic divisions. The sympathetic division prepares the body for emergencies ('fight or flight'): it speeds up the heart, dilates the pupils, widens airways and inhibits digestion.

Step 1 — Recall sympathetic effects: faster heart, dilated pupils.

Step 2 — Match the option: option (B) describes exactly these effects.

Why other options are wrong:

- (A) slowing the heart and constricting pupils are *parasympathetic* effects.
- (C) stimulating digestion and salivation is also parasympathetic.
- (D) the sympathetic system does affect the heart (it speeds it up).

Final Answer: increases heart rate, dilates pupils \Rightarrow

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

Q26.

Solution

Concept — Steroid hormone action: Steroid hormones are lipid-soluble, so they pass through the plasma membrane, bind to specific intracellular (cytoplasmic or nuclear) receptors, and the hormone–receptor complex acts on DNA to regulate (switch on or off) gene expression.

Step 1 — Note the solubility: lipid-soluble \Rightarrow can cross the membrane.

Step 2 — State the mechanism: binds an intracellular receptor and regulates gene transcription.

Why other options are wrong:

- (A) being lipid-soluble, it *can* enter the cell.
- (B) it is not broken down before acting; it acts inside the cell.



- (C) acting via a surface receptor and cyclic AMP is the mechanism of protein/peptide hormones, not steroids.

Final Answer: enters cell, binds intracellular receptor, regulates genes ⇒

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

Q27.

Solution

Concept — Conducting system of the heart: The impulse runs SAN → AVN → bundle of His → its right and left branches → Purkinje fibres. The fine Purkinje fibres spread the impulse rapidly through the ventricular musculature, triggering ventricular contraction.

Step 1 — Identify the terminal fibres: the fibres ramifying through the ventricle wall are the Purkinje fibres.

Step 2 — State their role: they make the ventricles contract almost simultaneously.

Why other options are wrong:

- (B) the SAN is the pacemaker that initiates the impulse, not the terminal ventricular fibres.
- (C) the chordae tendineae are tendon cords that anchor the heart valves; they are not conducting fibres.
- (D) the bundle of His does conduct, but it is its Purkinje branches that spread through the ventricle muscle.

Final Answer: Purkinje fibres ⇒

Answer: (A) [Go Back to Q27](#)

Q28.

Solution

Concept — Chemical synapse: At a chemical synapse the pre-synaptic neuron releases a neurotransmitter into the synaptic cleft; the transmitter diffuses across and binds receptors on the post-synaptic membrane to pass on the impulse. Most synapses in the body are of this chemical type.

Step 1 — Read the clue: transmission by a chemical messenger across the synaptic cleft.



Step 2 — Name the junction: a chemical synapse.

Why other options are wrong:

- (A) and (D) describe electrical synapses, where ions flow directly between cells through fused membranes / gap junctions and no transmitter is used.
- (C) a tight junction seals cells together and does not transmit nerve impulses.

Final Answer: chemical synapse (neurotransmitter) ⇒

[Go Back to Q28](#)

Q29.

Solution

Concept — Tapetum: The tapetum is the innermost of the four wall layers of the anther microsporangium. It provides nourishment to the developing microspores (pollen grains), supplying nutrients, enzymes and the materials for the pollen wall.

Step 1 — Locate the layer: tapetum = innermost anther wall layer.

Step 2 — State its function: it nourishes the developing pollen grains.

Why other options are wrong:

- (A) dehiscence (splitting) of the anther is aided by the endothecium, not the tapetum.
- (B) the outermost protective layer is the epidermis, not the tapetum.
- (D) attracting insects is a function of petals/nectar, not the tapetum.

Final Answer: nourishes developing pollen grains ⇒

[Go Back to Q29](#)

Q30.

Solution

Concept — Fruit and seed formation: After fertilization, the ovary wall matures into the fruit (pericarp) and each fertilized ovule develops into a seed. The zygote within the ovule forms the embryo of the seed.

Step 1 — Recall the fates: ovary → fruit; ovule → seed.

Step 2 — Pick the structure that becomes the seed: the ovule.



Why other options are wrong:

- (B) the stigma is the pollen-receiving tip of the carpel; it withers, it does not form the seed.
- (C) the anther is the male part that makes pollen; it is not involved in seed formation.
- (D) the petals are accessory parts that usually fall off after fertilization.

Final Answer: ovule → seed ⇒

[Go Back to Q30](#)

Q31.

Solution

Concept — Site of fertilization: In humans, fertilization normally occurs in the ampulla, the widened upper part of the fallopian tube (oviduct), where the sperm meets and fuses with the secondary oocyte. The resulting zygote then travels to the uterus.

Step 1 — Recall where sperm meets egg: the ampullary region of the oviduct.

Step 2 — Confirm: fertilization is completed here, then the embryo moves to the uterus for implantation.

Why other options are wrong:

- (A) the uterus is the site of implantation and development, not of fertilization.
- (B) the ovary releases the oocyte but is not where fertilization occurs.
- (C) the cervix is the neck of the uterus, a passage, not the fertilization site.

Final Answer: ampullary region of the fallopian tube ⇒

[Go Back to Q31](#)



Q32.

Solution

Concept — Parturition: Parturition (childbirth) is induced by a neuroendocrine reflex. Oxytocin from the posterior pituitary acts on the uterine smooth muscle to cause strong contractions, which in turn stimulate more oxytocin release, pushing the foetus out.

Step 1 — Identify the hormone of labour: oxytocin causes powerful uterine contractions.

Step 2 — Confirm: it is central to the parturition reflex.

Why other options are wrong:

- (A) progesterone maintains pregnancy and tends to keep the uterus quiet; its fall precedes labour.
- (B) prolactin stimulates milk synthesis, not uterine contraction.
- (D) insulin regulates blood glucose and has no role in parturition.

Final Answer: oxytocin \Rightarrow

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

Q33.

Solution

Concept — Oral contraceptive pills: Oral pills contain small doses of progestogen (alone or with oestrogen). Their hormones inhibit ovulation, alter the uterine lining (endometrium) to discourage implantation and thicken the cervical mucus, thereby preventing pregnancy.

Step 1 — Identify the main action: they suppress ovulation.

Step 2 — Add the supporting action: they also change the endometrium and cervical mucus.

Why other options are wrong:

- (A) surgical blocking of tubes is tubectomy, not the action of a pill.
- (C) forming a physical barrier is the action of a condom/diaphragm.
- (D) the pill acts in the female body; it does not act on sperm inside the male.

Final Answer: inhibits ovulation (hormonal action) \Rightarrow

Answer: (B) [Go Back to Q33](#)



Q34.

Solution

Concept — Homozygous vs heterozygous: An individual carrying two *different* alleles of a gene (e.g. Tt) is heterozygous (a hybrid) for that trait; one carrying two *identical* alleles (TT or tt) is homozygous.

Step 1 — Read the genotype: Tt has two different alleles (T and t).

Step 2 — Name the condition: heterozygous for plant height.

Why other options are wrong:

- (B) homozygous dominant would be TT (two T alleles).
- (C) homozygous recessive would be tt (two t alleles).
- (D) 'nullizygous' (no alleles of the gene) does not apply; the plant has both alleles.

Final Answer: heterozygous (Tt) \Rightarrow

[Go Back to Q34](#)

Q35.

Solution

Concept — Complementary genes: When two different dominant genes are both required to produce a single trait (here flower colour), the normal 9 : 3 : 3 : 1 dihybrid ratio is modified. The 9 (C_P_) give colour, while the 3 + 3 + 1 = 7 (lacking C or P or both) are white, giving a 9 : 7 ratio.

Step 1 — Find the coloured class: only C_P_ (both dominants present) = 9 parts coloured.

Step 2 — Group the white classes: 3(C_pp) + 3(ccP_) + 1(ccpp) = 7 parts white.

Why other options are wrong:

- (A) 3 : 1 is the monohybrid ratio.
- (B) 1 : 1 is a test-cross ratio.
- (C) 9 : 3 : 3 : 1 is the unmodified dihybrid ratio (no gene interaction).

Final Answer: 9 : 7 (complementary genes) \Rightarrow

[Go Back to Q35](#)



Q36.

Solution

Concept — Sex-linked inheritance: The white-eye gene of *Drosophila* that Morgan studied lies on the X chromosome. A gene located on a sex chromosome is inherited along with it and shows sex-linked (here X-linked) inheritance, giving criss-cross patterns between the sexes.

Step 1 — Note the location: the white-eye allele is on the X chromosome.

Step 2 — Name the inheritance: X-linked (sex-linked) inheritance.

Why other options are wrong:

- (A) autosomal genes are on non-sex chromosomes; this gene is on the X.
- (C) Y-linked (holandric) genes pass only father to son; the white-eye gene is X-linked.
- (D) cytoplasmic inheritance involves organelle DNA, not the X chromosome.

Final Answer: X-linked (sex-linked) inheritance \Rightarrow

[Go Back to Q36](#)

Q37.

Solution

Concept — Sickle-cell mutation: Sickle-cell anaemia results from a single base substitution (GAG \rightarrow GTG) in the beta-globin gene, which changes one codon so that valine replaces glutamic acid at the 6th position. This single base change is a point mutation.

Step 1 — Read the molecular change: one amino acid (Glu \rightarrow Val) due to a single base change.

Step 2 — Classify the mutation: a single base substitution is a point mutation.

Why other options are wrong:

- (A) it is not a large deletion; only one base is changed.
- (B) it is not aneuploidy; the chromosome number is normal.
- (C) it is not a chromosome duplication; the change is at the single-base level.

Final Answer: point mutation (single base substitution) \Rightarrow

[Go Back to Q37](#)



Q38.

Solution

Concept — Phosphodiester bond: Along a single DNA (or RNA) strand, the nucleotides are linked by phosphodiester bonds: a phosphate group bridges the 3'-carbon of one sugar and the 5'-carbon of the next, forming the sugar-phosphate backbone.

Step 1 — Read the linkage: 3'-carbon of one sugar joined to the 5'-carbon of the next through a phosphate.

Step 2 — Name the bond: phosphodiester bond.

Why other options are wrong:

- (A) hydrogen bonds join the two strands across the bases; they do not link nucleotides along a strand.
- (B) a peptide bond joins amino acids in proteins.
- (D) a glycosidic bond here links a base to its sugar, not two sugars along the backbone.

Final Answer: phosphodiester bond \Rightarrow

Answer: (C) [Go Back to Q38](#)

Q39.

Solution

Concept — Central dogma: The central dogma, proposed by Francis Crick, states that genetic information normally flows from DNA to RNA (transcription) and then from RNA to protein (translation): DNA \rightarrow RNA \rightarrow protein.

Step 1 — Recall the directions: DNA is transcribed to RNA; RNA is translated to protein.

Step 2 — Write the flow: DNA \rightarrow RNA \rightarrow protein.

Why other options are wrong:

- (B) protein does not normally direct the making of RNA or DNA.
- (C) the usual flow is DNA \rightarrow RNA, not RNA \rightarrow DNA (that reverse step occurs only in retroviruses).
- (D) protein \rightarrow DNA \rightarrow RNA is not the direction of information flow.

Final Answer: DNA \rightarrow RNA \rightarrow protein \Rightarrow



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

Q40.

Solution

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

Step 1 — Read the clue: a few founders, change in frequency 'by chance', new isolated colony.

Step 2 — Name it: genetic drift (founder effect).

Why other options are wrong:

- (A) natural selection changes frequencies through differential survival, not by random chance.
- (B) gene flow is the movement of alleles between populations, the opposite of the isolation described.
- (C) mutations are random changes in DNA, not the chance sampling of a small founding group.

Final Answer: genetic drift (founder effect) ⇒

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

Q41.

Solution

Concept — Aedes as a vector: Both dengue and chikungunya are arboviral fevers transmitted by the same vector, the *Aedes* mosquito (especially *Aedes aegypti*), a day-biting mosquito that breeds in clean stored water.

Step 1 — Recall the common vector: dengue and chikungunya share the *Aedes* mosquito.

Step 2 — Confirm: *Aedes* carries both viruses.

Why other options are wrong:

- (A) female *Anopheles* transmits malaria.
- (C) female *Culex* transmits filariasis.



- (D) the housefly spreads typhoid and cholera mechanically, not dengue.

Final Answer: *Aedes* mosquito \Rightarrow

Answer: (B) [Go Back to Q41](#)

Q42.

Solution

Concept — HIV and AIDS: HIV enters the body and infects the helper T-lymphocytes (T_H cells), inside which it multiplies and which it progressively destroys. As T_H numbers fall, the immune defence (including antibody production) collapses, leading to AIDS.

Step 1 — Identify the target cell: HIV chiefly attacks helper T-cells.

Step 2 — State the effect: their destruction cripples the immune system.

Why other options are wrong:

- (A) HIV does not primarily target red blood cells.
- (B) it does not attack platelets.
- (D) it does not destroy skin epithelial cells as its main target.

Final Answer: helper T-lymphocytes (T_H cells) \Rightarrow

Answer: (C) [Go Back to Q42](#)

Q43.

Solution

Concept — Single-cell protein (SCP): SCP is the protein obtained from microbial biomass (algae such as *Spirulina*, fungi/yeasts, and bacteria) grown on a large scale. It is a rich, alternative source of protein for food and animal feed.

Step 1 — Read the clue: microbes grown on a large scale used as a protein-rich food.

Step 2 — Name it: single-cell protein.

Why other options are wrong:

- (B) biogas is a fuel gas (mainly methane), not a protein source.
- (C) an antibiotic is a microbial product that kills microbes, not a protein food.



- (D) a biofertiliser enriches soil nutrients; it is not eaten as protein.

Final Answer: single-cell protein (SCP) ⇒

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

Q44.

Solution

Concept — Mutation breeding: In mutation breeding, seeds (or other plant parts) are deliberately treated with mutagens such as chemicals or ionising radiation to induce new heritable variations; useful mutants are then selected and bred into improved varieties.

Step 1 — Read the clue: exposing seeds to chemicals/radiation to create heritable changes, then selecting.

Step 2 — Name the method: mutation breeding.

Why other options are wrong:

- (A) simple selection only picks existing natural variants; it does not induce new mutations.
- (C) tissue culture multiplies identical plants; it does not deliberately create mutations.
- (D) apiculture is the rearing of honeybees, unrelated to crop mutation.

Final Answer: mutation breeding ⇒

Answer: (B) [Go Back to Q44](#)

Q45.

Solution

Concept — Taq polymerase: PCR alternates high (denaturation $\sim 94^{\circ}\text{C}$) and lower temperatures. The DNA polymerase used must survive the high temperature, so a thermostable enzyme, Taq polymerase from the thermophilic bacterium *Thermus aquaticus*, is used to synthesise the new strands.

Step 1 — Read the requirement: a heat-stable DNA polymerase for PCR.

Step 2 — Name the enzyme: Taq polymerase (from *Thermus aquaticus*).

Why other options are wrong:



- (A) DNA ligase joins fragments; it does not extend primers in PCR cycles.
- (B) a restriction endonuclease cuts DNA; it does not synthesise strands.
- (C) reverse transcriptase makes DNA from an RNA template (used in RT-PCR) and is not the standard thermostable PCR polymerase.

Final Answer: Taq polymerase \Rightarrow

[Go Back to Q45](#)

Q46.

Solution

Concept — DNA isolation: To obtain DNA, the cell must first be broken open so that its contents are released. Bacterial cells are lysed using enzymes (e.g. lysozyme) to release the DNA along with proteins, RNA and other macromolecules, which are then removed step by step.

Step 1 — Identify the very first step: breaking open (lysing) the cell to free the DNA.

Step 2 — Note what follows: proteins, RNA, etc. are then removed to purify the DNA.

Why other options are wrong:

- (A) gel electrophoresis is done later, to separate or check DNA fragments.
- (C) ligation into a vector comes much later in cloning.
- (D) PCR amplification is a downstream step, after the DNA has been isolated.

Final Answer: lyse the cell to release the DNA \Rightarrow

[Go Back to Q46](#)

Q47.

Solution

Concept — Golden rice: Golden rice is a transgenic variety engineered to synthesise and accumulate pro-vitamin A (β -carotene) in its grains, giving them a golden colour. It was developed to combat vitamin A deficiency in populations that depend on rice.

Step 1 — Recall the goal: to fight vitamin A deficiency.

Step 2 — State what was added: the grains are enriched in pro-vitamin A (β -



carotene).

Why other options are wrong:

- (A) golden rice is known for β -carotene, not specifically for iron and zinc.
- (B) it is not engineered chiefly for vitamin C.
- (D) it is not primarily a protein/lysine-enriched variety.

Final Answer: pro-vitamin A (β -carotene) \Rightarrow

Answer: (C) [Go Back to Q47](#)

Q48.

Solution

Concept — Phosphorus cycle: Unlike the carbon and nitrogen cycles, the phosphorus cycle has no significant gaseous (atmospheric) phase. The main reservoir of phosphorus is the phosphate-bearing rock of the Earth's crust; weathering releases phosphate into the soil and water for uptake by producers.

Step 1 — Recall the reservoir: phosphorus is stored in rocks (as phosphates).

Step 2 — Note the difference: the phosphorus cycle is sedimentary, with no gaseous reservoir.

Why other options are wrong:

- (B) the atmosphere is the reservoir for nitrogen (as N_2), not for phosphorus.
- (C) the ozone layer is unrelated to nutrient cycling.
- (D) lightning fixes atmospheric nitrogen, not phosphorus.

Final Answer: phosphate-bearing rocks \Rightarrow

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

Q49.

Solution

Concept — Ecological succession: Ecological succession is the gradual, orderly and predictable change in the species composition of a community at a given site over time, proceeding through a series of stages (seral communities) until a stable climax community is reached.

Step 1 — Read the clue: gradual, orderly change in community over time, ending



in a climax.

Step 2 — Name the process: ecological succession.

Why other options are wrong:

- (A) predation is one organism feeding on another, not a community-level change over time.
- (B) competitive exclusion is the elimination of one competitor by another, a single interaction.
- (C) carrying capacity is the maximum population an environment can sustain, not a successional change.

Final Answer: ecological succession \Rightarrow

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

Q50.

Solution

Concept — Species–area relationship: The relationship between species richness (S) and area (A) is described by $\log S = \log C + Z \log A$. On a log–log plot it is a straight line whose slope is the regression coefficient Z (typically about 0.1–0.2 for small areas).

Step 1 — Recall the equation: $\log S = \log C + Z \log A$.

Step 2 — Identify the slope: the slope of the line is Z .

Why other options are wrong:

- (A) C is the Y-intercept of the line, not its slope.
- (B) S stands for species richness (the quantity being predicted), not the slope.
- (D) A is the area (the independent variable), not the slope.

Final Answer: Z (slope) \Rightarrow

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



Answer Key

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

