AIIMS B.Sc Nursing Biology

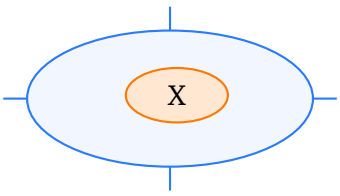
Sample Paper – 10

Duration: 36 Minutes **Maximum Marks: 30**

Instructions

- This paper contains **30 Multiple Choice Questions (single correct answer)**, modelled on the Biology section of the **AIIMS B.Sc Nursing** entrance.
- Each correct answer carries **+1 mark**. $\frac{1}{3}$ **mark is deducted** for every wrong answer, and an unattempted question gets **0 marks**.
- Only **one** option is correct. The paper covers botany, human physiology, genetics, and ecology.
- Personal calculators, mobile phones, and other electronic gadgets are strictly prohibited.

Q1. In the bacterial cell shown below, the shaded region marked X holds the genetic material (DNA) but is *not* bounded by a nuclear membrane. This region is called the:



(A) nucleolus

(B) mitochondrion

(C) nucleoid

(D) vacuole

Q2. In an animal cell, the structure that organizes the microtubules and forms the spindle fibres during cell division is the:

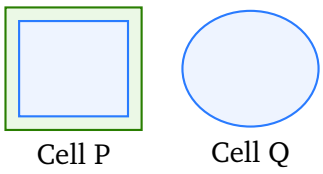
(A) centrosome

(B) lysosome

(C) Golgi apparatus

(D) ribosome

Q3. The two cells below are drawn side by side. Cell P has an extra outer rigid boundary that Cell Q lacks. This outer layer, the main feature distinguishing a plant cell from an animal cell, is the:



(A) plasma membrane

(B) nucleus

(C) cytoplasm

(D) cell wall

Q4. The class of water-insoluble biomolecules that includes fats, oils, and waxes is the:

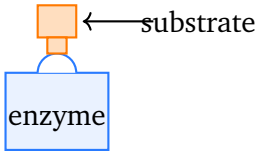
(A) carbohydrates

(B) lipids

(C) proteins

(D) nucleic acids

Q5. According to the lock-and-key model shown below, an enzyme acts only on a substrate whose shape exactly fits its active site. This model best explains an enzyme's:



(A) solubility

(B) colour

(C) specificity

(D) molecular size

Q6. In the five-kingdom system, organisms that are multicellular, autotrophic, and have cellulose cell walls belong to the kingdom:

(A) Monera

(B) Protista

(C) Fungi

(D) Plantae

Q7. The branch of biology that deals with the naming and grouping of organisms on the basis of their similarities and differences is:

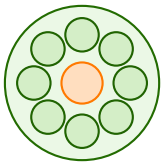
(A) taxonomy

(B) ecology

(C) genetics

(D) physiology

Q8. The leaf cross-section below shows a ring of large bundle-sheath cells around the vascular bundle (the special Kranz anatomy). Plants with this anatomy, adapted for efficient photosynthesis, are called:



bundle sheath ring

(A) C3 plants

(B) C4 plants

(C) parasitic plants

(D) aquatic plants

Q9. The plant hormone that promotes the closing of stomata and induces dormancy in seeds and buds during stress is:

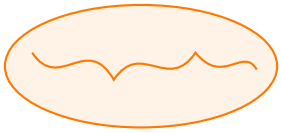
(A) auxin

(B) gibberellin

(C) abscisic acid

(D) cytokinin

Q10. The organelle shown below, with an outer membrane and a folded inner membrane (cristae), is the site of cellular respiration where most of the cell's ATP is produced. It is the:



folded inner membrane

(A) nucleus

(B) chloroplast

(C) ribosome

(D) mitochondrion

Q11. The first part of the small intestine, into which bile from the liver and pancreatic juice from the pancreas are emptied, is the:

(A) duodenum

(B) ileum

(C) jejunum

(D) caecum

Q12. The life process by which living cells take in oxygen, break down food to release energy, and give out carbon dioxide is called:

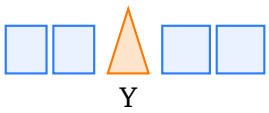
(A) transpiration

(B) respiration

(C) digestion

(D) excretion

Q13. In the set of teeth shown below, the pointed, sharp tooth marked Y is used for tearing and piercing food. This type of tooth is the:



(A) incisors

(B) molars

(C) canines

(D) premolars

Q14. The instrument used by doctors to measure a person's blood pressure is the:

(A) stethoscope

(B) thermometer

(C) barometer

(D) sphygmomanometer

Q15. In the schematic heart below, the chamber marked Z is the lower-left chamber that pumps oxygenated blood out to the whole body through the aorta. This chamber is the:

RA	LA
RV	Z

(A) left ventricle

(B) right ventricle

(C) left atrium

(D) right atrium

Q16. The colourless fluid that leaks out of blood capillaries, bathes the body cells, and is part of both the immune and circulatory systems is:

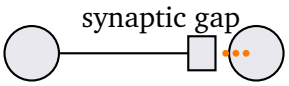
(A) plasma

(B) lymph

(C) serum

(D) bile

Q17. At the junction (synapse) between two nerve cells shown below, the impulse is carried across the gap by a chemical released from the nerve ending. This chemical messenger is a:



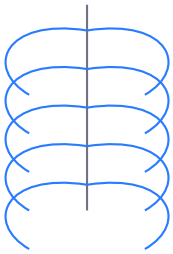
(A) hormone

(B) enzyme

(C) neurotransmitter

(D) antibody

Q18. The curved bones shown below form a protective cage that encloses the heart and the lungs. These bones are the:



(A) femur

(B) sternum

(C) vertebrae

(D) ribs

Q19. The hormone secreted by the thyroid gland that regulates the body's overall metabolic rate is:

(A) thyroxine

(B) insulin

(C) adrenaline

(D) testosterone

Q20. In flowering plants, the event in which one male gamete fuses with the egg to form the zygote while the other fuses with the polar nuclei to form the endosperm is called:

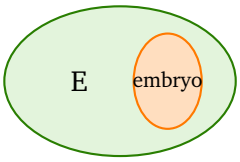
(A) self-pollination

(B) double fertilization

(C) parthenogenesis

(D) budding

Q21. In the seed cut open below, the large shaded region marked E surrounds and nourishes the embryo by storing food for it. In many seeds this food-storing tissue is the:



(A) seed coat

(B) plumule

(C) endosperm

(D) radicle

Q22. Identical (monozygotic) twins are formed when:

(A) two eggs are fertilized by two different sperms

(B) two eggs are fertilized by one sperm

(C) one egg is fertilized by two sperms

(D) a single fertilized egg splits into two

Q23. In the DNA double helix shown below, the two strands are held together at the bases by the weak cross-links marked with dotted lines. These cross-links are:

base pairs

(A) hydrogen bonds

(B) peptide bonds

(C) ionic bonds

(D) glycosidic bonds

Q24. The process of copying the genetic information from a DNA template into a strand of messenger RNA (mRNA) is called:

(A) translation

(B) transcription

(C) replication

(D) mutation

Q25. In a cross between a pure-breeding tall pea plant (TT) and a pure-breeding short pea plant (tt), the Punnett square below shows the F_1 generation. The F_1 plants are:

	T	T
t	Tt	Tt
t	Tt	Tt

(A) all short

(B) half tall and half short

(C) all tall

(D) all medium height

Q26. Structures such as the human appendix and wisdom teeth, which were functional in our ancestors but have lost their use during the course of evolution, are called:

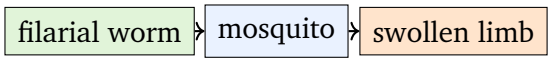
(A) analogous organs

(B) homologous organs

(C) fossils

(D) vestigial organs

Q27. The disease whose transmission cycle is shown below is caused by a thread-like filarial worm spread by mosquitoes and leads to gross swelling of the limbs. This disease is:



(A) filariasis (elephantiasis)

(B) malaria

(C) typhoid

(D) tuberculosis

Q28. The process of giving a vaccine, which contains weakened or killed germs, so that the body builds protective immunity against a future infection, is called:

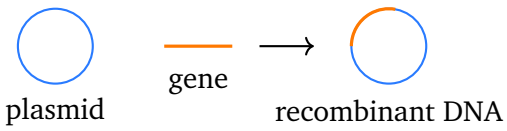
(A) digestion

(B) vaccination (immunisation)

(C) respiration

(D) transfusion

Q29. In the process shown below, a piece of DNA carrying a useful gene is joined to DNA from a different source (a plasmid) to form a new combined DNA molecule. This joining is the basis of:



(A) fermentation

(B) pasteurisation

(C) genetic engineering

(D) vaccination

Q30. The variety of different species of plants, animals, and microorganisms found in a particular region is called its:

(A) food chain

(B) population

(C) food web

(D) biodiversity

Detailed Solutions

Q1.

Solution

Concept — The bacterial nucleoid: A bacterial cell is a prokaryote, which means it has no true membrane-bound nucleus. Its single, circular DNA molecule lies coiled in a region of the cytoplasm called the nucleoid. Because no nuclear membrane surrounds it, the genetic material is in direct contact with the rest of the cell.

Step 1 — Read the figure: the shaded region X lies inside the cell but has no double membrane drawn around it; this irregular DNA-containing area is the nucleoid.

Step 2 — Match the description: "genetic material without a nuclear membrane" is the exact definition of the nucleoid in a prokaryote.

Why each other option is wrong:

- (A) The nucleolus is a sub-region *inside* a true (eukaryotic) nucleus; bacteria do not have one.
- (B) The mitochondrion is a membrane-bound organelle found in eukaryotes, not in bacteria.
- (D) The vacuole is a fluid-filled storage sac, not the site of DNA.

Key point: Prokaryote = DNA in a nucleoid (no nuclear membrane); eukaryote = DNA in a true, membrane-bound nucleus.

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

Answer: (C) Go Back to Q1

Q2.

Solution

Concept — The centrosome: The centrosome is an organelle found near the nucleus in animal cells. It usually contains a pair of centrioles and acts as the main microtubule-organizing centre. During cell division it organizes the microtubules into the spindle fibres that pull the chromosomes to opposite poles.

Step 1 — Identify the function asked: the structure that forms the spindle during cell division.

Step 2 — Match it: the centrosome (with its centrioles) organizes the spindle, so

it is the answer.

Why each other option is wrong:

- (B) The lysosome contains digestive enzymes for breaking down waste; it has no role in the spindle.
- (C) The Golgi apparatus packages and dispatches proteins.
- (D) The ribosome is the site of protein synthesis.

Key point: The centrosome (centrioles) is the spindle organizer in animal cells; most plant cells form spindles without centrioles.

Final Answer: Centrosome $\Rightarrow$ A

Answer: (A) Go Back to Q2

Q3.

Solution

Concept — The plant cell wall: A plant cell has a rigid cell wall made mainly of cellulose lying *outside* its plasma membrane. This wall gives the plant cell a fixed shape and support. An animal cell has only a flexible plasma membrane and no cell wall, so it is more rounded and changeable in shape.

Step 1 — Read the figure: Cell P (plant) has an extra outer rigid boundary around its membrane, while Cell Q (animal) has only a smooth outer membrane.

Step 2 — Name the distinguishing layer: the extra outer layer present only in the plant cell is the cell wall.

Why each other option is wrong:

- (A) The plasma membrane is present in *both* plant and animal cells, so it cannot be the distinguishing feature.
- (B) The nucleus is present in both types of cells.
- (C) The cytoplasm is present in both types of cells.

Key point: Cell wall (and chloroplasts) = plant cell; their absence = animal cell. The cell wall is the clearest distinguishing structure.

Final Answer: Cell wall $\Rightarrow$ D

Answer: (D) Go Back to Q3

Q4.

Solution

Concept — Lipids: Lipids are a class of biomolecules that do not dissolve in water but dissolve in organic solvents like ether. They include fats (solid at room temperature), oils (liquid), and waxes. A typical fat is made of glycerol joined to fatty acids and serves as a store of energy.

Step 1 — Identify the property: water-insoluble biomolecules that include fats and oils.

Step 2 — Name the class: this class is the lipids.

Why each other option is wrong:

- (A) Carbohydrates (such as glucose and starch) are largely water-soluble or water-dispersible; they are not fats.
- (C) Proteins are made of amino acids; many are soluble in water and are not fats or oils.
- (D) Nucleic acids (DNA, RNA) carry genetic information and are not fats.

Key point: Lipids = fats, oils, waxes; insoluble in water but soluble in organic solvents. They store more energy per gram than carbohydrates.

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

Answer: (B) Go Back to Q4

Q5.

Solution

Concept — The lock-and-key model: Each enzyme has a specially shaped region called the active site. According to the lock-and-key model, only a substrate whose shape exactly fits the active site (like a key fitting a particular lock) can bind and react. Therefore an enzyme acts on one substrate or one type of reaction only.

Step 1 — Read the figure: the substrate fits neatly into the notch of the enzyme, showing a one-to-one shape match.

Step 2 — Decide what this explains: a shape that fits only one substrate explains the enzyme's *specificity*.

Why each other option is wrong:

- (A) Solubility refers to how a substance dissolves; the model is not about dissolving.

- (B) The model says nothing about an enzyme's colour.
- (D) Molecular size alone does not explain why an enzyme picks one particular substrate; the matching *shape* does.

Key point: Lock-and-key → enzyme *specificity*: the active-site shape allows only the correctly shaped substrate to bind.

Final Answer: Specificity ⇒ C

Answer: (C) Go Back to Q5

Q6.

Solution

Concept — Kingdom Plantae: In Whittaker's five-kingdom system, the kingdom Plantae contains organisms that are multicellular and eukaryotic, make their own food by photosynthesis (autotrophic), and have cell walls made of cellulose. Mosses, ferns, and all green plants belong here.

Step 1 — List the three given features: multicellular, autotrophic, cellulose cell walls.

Step 2 — Match the kingdom: these three features together define Plantae.

Why each other option is wrong:

- (A) Monera are unicellular prokaryotes (bacteria), not multicellular plants.
- (B) Protista are mostly unicellular eukaryotes such as *Amoeba*.
- (C) Fungi have cell walls of chitin (not cellulose) and are heterotrophic, not autotrophic.

Key point: Plantae = multicellular + autotrophic + cellulose wall. Fungi differ by being heterotrophic with chitin walls.

Final Answer: Plantae ⇒ D

Answer: (D) Go Back to Q6

Q7.

Solution

Concept — Taxonomy: Taxonomy is the branch of biology concerned with identifying, naming, and classifying living organisms into groups (taxa) based on their similarities and differences. It arranges organisms in an orderly hierarchy from kingdom down to species.

Step 1 — Identify the activity described: naming organisms and grouping them by similarities.

Step 2 — Name the branch: this branch is taxonomy.

Why each other option is wrong:

- (B) Ecology studies the relationships between organisms and their environment.
- (C) Genetics studies heredity and variation (how traits pass from parents to offspring).
- (D) Physiology studies how the body and its parts function.

Key point: Taxonomy = naming + classifying organisms. Its hierarchy runs Kingdom → Phylum → Class → Order → Family → Genus → Species.

Final Answer: Taxonomy ⇒ $\boxed{\text{A}}$

Answer: (A) Go Back to Q7

Q8.

Solution

Concept — C4 plants and Kranz anatomy: Some plants, such as maize and sugarcane, have a special leaf structure called Kranz anatomy. Here, large bundle-sheath cells form a ring around the vascular bundle. This arrangement lets them fix carbon dioxide more efficiently, especially in hot, dry climates, and such plants are called C4 plants.

Step 1 — Read the figure: the ring of large cells around the central vascular bundle is the Kranz anatomy.

Step 2 — Name the plant type: plants showing Kranz anatomy for efficient photosynthesis are C4 plants.

Why each other option is wrong:

- (A) C3 plants (such as rice and wheat) lack Kranz anatomy and a distinct

bundle-sheath ring.

- (C) Parasitic plants depend on a host for food; the term is unrelated to leaf anatomy.
- (D) Aquatic plants are defined by their watery habitat, not by Kranz anatomy.

Key point: Kranz anatomy (bundle-sheath ring) = C4 plants, which photosynthesise efficiently in hot, dry conditions.

Final Answer: C4 plants $\Rightarrow$ B

Answer: (B) Go Back to Q8

Q9.

Solution

Concept — Abscisic acid: Abscisic acid (ABA) is a plant hormone that acts mainly as a growth inhibitor and "stress hormone". When a plant faces water shortage, ABA causes the guard cells to lose water so the stomata close, reducing water loss. It also promotes dormancy in seeds and buds.

Step 1 — Identify the two clues: closing of stomata and inducing dormancy during stress.

Step 2 — Name the hormone: both effects are produced by abscisic acid.

Why each other option is wrong:

- (A) Auxin promotes cell elongation and apical dominance; it does not close stomata.
- (B) Gibberellin promotes stem elongation and breaks dormancy (the opposite effect).
- (D) Cytokinin promotes cell division and delays ageing of leaves.

Key point: ABA = "stress hormone": closes stomata and enforces dormancy. Gibberellin breaks dormancy, the reverse of ABA.

Final Answer: Abscisic acid $\Rightarrow$ C

Answer: (C) Go Back to Q9

Q10.

Solution

Concept — The mitochondrion: The mitochondrion is a double-membrane organelle in which cellular respiration takes place. Its inner membrane is folded into cristae that carry the electron transport chain, where most of the cell's ATP (energy currency) is produced. This is why it is called the powerhouse of the cell.

Step 1 — Read the figure: the oval organelle with a folded inner membrane (cristae) is the mitochondrion.

Step 2 — Link structure to function: the folds increase the surface area for ATP production during respiration.

Why each other option is wrong:

- (A) The nucleus controls the cell and stores DNA; it does not produce ATP.
- (B) The chloroplast carries out photosynthesis (makes food), not respiration.
- (C) The ribosome is the site of protein synthesis.

Key point: Mitochondrion = respiration and ATP (powerhouse); chloroplast = photosynthesis. Do not swap the two.

Final Answer: Mitochondrion $\Rightarrow$ D

Answer: (D) Go Back to Q10

Q11.

Solution

Concept — The duodenum: The small intestine has three parts in order: the duodenum, the jejunum, and the ileum. The duodenum is the first, C-shaped part just after the stomach. Bile from the liver (stored in the gall bladder) and pancreatic juice from the pancreas are emptied into the duodenum, where most digestion is completed.

Step 1 — Identify the clue: the *first* part of the small intestine receiving bile and pancreatic juice.

Step 2 — Name it: this is the duodenum.

Why each other option is wrong:

- (B) The ileum is the last part of the small intestine, mainly for absorption.
- (C) The jejunum is the middle part, after the duodenum.

- (D) The caecum is part of the large intestine, not the small intestine.

Key point: Order of the small intestine: duodenum → jejunum → ileum. Bile and pancreatic juice enter at the duodenum.

Final Answer: Duodenum ⇒ A

Answer: (A) Go Back to Q11

Q12.

Solution

Concept — Respiration: Respiration is the life process in which living cells take in oxygen and break down food (mainly glucose) to release energy, giving out carbon dioxide and water. The energy released is stored as ATP and used to run all life activities.

Step 1 — Identify the description: taking in oxygen, releasing energy from food, and giving out carbon dioxide.

Step 2 — Name the process: this is respiration.

Why each other option is wrong:

- (A) Transpiration is the loss of water vapour from the leaves of a plant.
- (C) Digestion is the breakdown of large food molecules into absorbable ones, before they reach the cells.
- (D) Excretion is the removal of nitrogenous and other wastes from the body.

Key point: Respiration releases energy by oxidising food; it takes in O_2 and gives out CO_2. It occurs mainly in the mitochondria.

Final Answer: Respiration ⇒ B

Answer: (B) Go Back to Q12

Q13.

Solution

Concept — Canine teeth: Human teeth are of four types, each shaped for a job. The canines are the pointed, sharp teeth on either side of the incisors. Their sharp tips are used for tearing and piercing food, which is especially useful for meat-eating.

Step 1 — Read the figure: the pointed, triangular tooth marked Y, set between the flat front teeth and the broad back teeth, is a canine.

Step 2 — Match the function: a pointed tooth for tearing food is a canine.

Why each other option is wrong:

- (A) Incisors are the flat, chisel-shaped front teeth used for cutting and biting.
- (B) Molars are the broad back teeth used for grinding and chewing.
- (D) Premolars are flat-topped teeth used for crushing and grinding.

Key point: Incisors cut, canines tear, premolars and molars grind. The pointed tooth is always the canine.

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

Answer: (C) Go Back to Q13

Q14.

Solution

Concept — The sphygmomanometer: Blood pressure is the force exerted by blood against the walls of the arteries. It is measured with an instrument called the sphygmomanometer, which uses an inflatable cuff around the arm and records the systolic and diastolic pressure (for example, 120/80 mm Hg).

Step 1 — Identify the quantity measured: blood pressure.

Step 2 — Name the instrument: blood pressure is measured by the sphygmomanometer.

Why each other option is wrong:

- (A) A stethoscope is used to *listen* to heart and lung sounds, not to read the pressure value.
- (B) A thermometer measures body temperature.
- (C) A barometer measures atmospheric (air) pressure, not blood pressure.

Key point: Sphygmomanometer = blood pressure; a stethoscope is used alongside it to hear the pulse but does not give the reading.

Final Answer: Sphygmomanometer ⇒ D

Answer: (D) Go Back to Q14

Q15.

Solution

Concept — The left ventricle: The human heart has four chambers. The left ventricle is the lower-left chamber. It receives oxygenated blood from the left atrium and pumps it out through the aorta to the whole body. Because it must pump blood the longest distance, its wall is the thickest and most muscular of all four chambers.

Step 1 — Read the figure: chamber Z is the lower-right box in the diagram, which represents the *left* ventricle (the heart is drawn as if facing you, so its left side is on your right).

Step 2 — Match the function: the chamber pumping oxygenated blood to the whole body is the left ventricle.

Why each other option is wrong:

- (B) The right ventricle pumps deoxygenated blood to the lungs, not to the whole body.
- (C) The left atrium only *receives* oxygenated blood from the lungs; it does not pump it to the body.
- (D) The right atrium receives deoxygenated blood returning from the body.

Key point: Left ventricle = thickest wall; pumps oxygenated blood to the whole body via the aorta.

Final Answer: Left ventricle ⇒ A

Answer: (A) Go Back to Q15

Q16.

Solution

Concept — Lymph: Lymph is a colourless fluid formed when plasma (minus most proteins and red cells) leaks out of the blood capillaries into the spaces around the cells. It bathes the body cells, carries nutrients and wastes, and contains white blood cells, so it takes part in both circulation and the body's defence (immune) system.

Step 1 — Identify the clues: colourless, bathes the cells, part of both immune and circulatory systems.

Step 2 — Name the fluid: this fluid is lymph.

Why each other option is wrong:

- (A) Plasma is the liquid part of *blood* that stays inside the vessels; it is straw-coloured.
- (C) Serum is plasma without the clotting proteins; it is obtained after blood clots.
- (D) Bile is a digestive juice made by the liver, not a fluid that bathes all body cells.

Key point: Lymph = colourless tissue fluid that returns to blood through lymph vessels and helps fight infection.

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

Answer: (B) Go Back to Q16

Q17.

Solution

Concept — Neurotransmitters: A synapse is the tiny gap between two nerve cells. A nerve impulse cannot jump the gap as electricity, so when it reaches the nerve ending it releases a chemical messenger called a neurotransmitter (for example, acetylcholine). This chemical crosses the gap and starts a new impulse in the next neuron.

Step 1 — Read the figure: the small dots released into the synaptic gap between the two neurons are the chemical messenger.

Step 2 — Name it: the chemical released at the nerve ending to carry the impulse across the synapse is a neurotransmitter.

Why each other option is wrong:

- (A) A hormone is a chemical messenger carried in the *blood* to distant organs, not across a synapse.
- (B) An enzyme is a biological catalyst that speeds up reactions, not a synaptic messenger.
- (D) An antibody is a defence protein that fights germs.

Key point: Across a synapse the message is carried chemically by a neurotransmitter; hormones travel through the bloodstream.

Final Answer: Neurotransmitter $\Rightarrow$ C

Answer: (C) Go Back to Q17

Q18.

Solution

Concept — The rib cage: The ribs are twelve pairs of curved, flat bones that join the backbone behind and (most of them) the sternum in front. Together they form the rib cage, a bony framework that protects the heart and the lungs and also helps in breathing by moving up and out.

Step 1 — Read the figure: the set of curved bones arching out from the backbone and forming a cage is the ribs.

Step 2 — Match the function: the bones forming a protective cage around the heart and lungs are the ribs.

Why each other option is wrong:

- (A) The femur is the long thigh bone of the leg; it is not part of the chest cage.
- (B) The sternum (breastbone) is the single flat bone in front to which the ribs attach; it is one bone, not the cage of curved bones shown.
- (C) The vertebrae make up the backbone (the straight central line in the figure), not the curved cage.

Key point: The rib cage (ribs + sternum + thoracic vertebrae) protects the heart and lungs; the curved bones themselves are the ribs.

Final Answer: Ribs $\Rightarrow$ D

Answer: (D) Go Back to Q18

Q19.

Solution

Concept — Thyroxine: Thyroxine is the hormone secreted by the thyroid gland, which lies in the neck. It controls the body's overall metabolic rate, that is, the speed at which cells use energy. Thyroxine contains iodine, so a lack of iodine in the diet can cause the thyroid to enlarge (goitre).

Step 1 — Identify the gland and the role: a thyroid hormone that regulates metabolic rate.

Step 2 — Name the hormone: this is thyroxine.

Why each other option is wrong:

- (B) Insulin is secreted by the pancreas and lowers blood glucose.
- (C) Adrenaline is secreted by the adrenal gland and prepares the body for emergencies.
- (D) Testosterone is the male sex hormone made by the testes.

Key point: Thyroid $\rightarrow$ thyroxine $\rightarrow$ controls metabolic rate. It needs iodine; its deficiency causes goitre.

Final Answer: Thyroxine $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q19

Q20.

Solution

Concept — Double fertilization: In flowering plants, a pollen tube delivers two male gametes into the embryo sac. One male gamete fuses with the egg cell to form the zygote (which grows into the embryo). The other fuses with the two polar nuclei to form the triploid endosperm, the food tissue. Because two fusions occur, the event is called double fertilization, and it is unique to flowering plants.

Step 1 — Read the description: two male gametes used, one making the zygote and the other the endosperm.

Step 2 — Name the event: this is double fertilization.

Why each other option is wrong:

- (A) Self-pollination is the transfer of pollen to the stigma of the same flower; it happens *before* fertilization.

- (C) Parthenogenesis is the development of an offspring from an unfertilized egg, with no male gamete.
- (D) Budding is an asexual method of reproduction (as in yeast and *Hydra*).

Key point: Double fertilization = syngamy (egg + gamete → zygote) + triple fusion (polar nuclei + gamete → endosperm). It is unique to angiosperms.

Final Answer: Double fertilization ⇒ B

Answer: (B) Go Back to Q20

Q21.

Solution

Concept — The endosperm: After fertilization, a seed develops. In many seeds a tissue called the endosperm surrounds the embryo and stores food (starch, proteins, oils) to nourish it during germination. Seeds such as maize and wheat are endospermic. In some seeds (like the pea) this food is instead stored in the thick cotyledons of the embryo.

Step 1 — Read the figure: the large shaded region E surrounding the small embryo is the food-storing tissue.

Step 2 — Name it: the food-storing tissue around the embryo is the endosperm.

Why each other option is wrong:

- (A) The seed coat is the protective outer covering of the seed; it does not store food for the embryo.
- (B) The plumule is the part of the embryo that grows into the shoot, not a food store.
- (D) The radicle is the part of the embryo that grows into the root, not a food store.

Key point: The endosperm (or, in many dicots, the cotyledon) stores food for the developing embryo. Plumule → shoot, radicle → root.

Final Answer: Endosperm ⇒ C

Answer: (C) Go Back to Q21

Q22.

Solution

Concept — Identical (monozygotic) twins: Identical twins arise from a *single* egg fertilized by a *single* sperm. The resulting fertilized egg (zygote) divides and then splits into two separate embryos. Because they come from the same zygote, identical twins have the same genes and are always of the same sex.

Step 1 — Recall how identical twins form: one fertilized egg splitting into two.

Step 2 — Match the option: the choice describing a single fertilized egg splitting into two is correct.

Why each other option is wrong:

- (A) Two eggs fertilized by two sperms gives *fraternal* (non-identical) twins, who can differ in sex.
- (B) Two eggs fertilized by one sperm is not the normal way twins form, and would not give identical twins.
- (C) One egg fertilized by two sperms is an abnormal event and does not produce healthy identical twins.

Key point: Identical twins = one zygote splitting in two (same genes, same sex); fraternal twins = two eggs, two sperms.

Final Answer: A single fertilized egg splits into two $\Rightarrow \boxed{\text{D}}$

Answer: (D) Go Back to Q22

Q23.

Solution

Concept — Hydrogen bonds in DNA: A DNA molecule is a double helix of two strands. The strands are held together at their bases, which pair in a fixed way: adenine (A) with thymine (T), and guanine (G) with cytosine (C). Each base pair is joined by weak hydrogen bonds (two between A–T, three between G–C). Being weak, they let the strands separate easily during replication.

Step 1 — Read the figure: the dotted cross-links between the two strands represent the bonds joining the base pairs.

Step 2 — Name the bonds: the bonds holding the two strands together at the bases are hydrogen bonds.

Why each other option is wrong:

- (B) Peptide bonds join amino acids in proteins, not bases in DNA.
- (C) Ionic bonds form between oppositely charged ions (as in common salt), not between DNA bases.
- (D) Glycosidic bonds join sugar units in carbohydrates.

Key point: DNA base pairs are held by hydrogen bonds (A–T two, G–C three). Their weakness allows the helix to unzip for replication.

Final Answer: Hydrogen bonds $\Rightarrow$ A

Answer: (A) Go Back to Q23

Q24.

Solution

Concept — Transcription: Transcription is the first step of gene expression. In it, the information in a DNA segment (a gene) is copied into a complementary strand of messenger RNA (mRNA) by the enzyme RNA polymerase. The mRNA then carries the message out to the ribosomes, where the protein is actually built.

Step 1 — Identify the description: copying genetic information from DNA into mRNA.

Step 2 — Name the process: this is transcription.

Why each other option is wrong:

- (A) Translation is the *next* step, where the mRNA message is read to join amino acids into a protein.
- (C) Replication is the copying of DNA to make an identical DNA molecule, not RNA.
- (D) Mutation is a change in the DNA sequence, not the copying of information into RNA.

Key point: Central dogma: DNA $\xrightarrow{\text{transcription}}$ mRNA $\xrightarrow{\text{translation}}$ protein. Transcription makes RNA from DNA.

Final Answer: Transcription $\Rightarrow$ B

Answer: (B) Go Back to Q24

Q25.

Solution

Concept — Monohybrid cross, F_1 generation: When a pure-breeding tall plant (TT) is crossed with a pure-breeding short plant (tt), every offspring receives one T from the tall parent and one t from the short parent, giving the genotype Tt. Since T (tall) is dominant over t (short), all Tt plants are tall. So the F_1 generation is all tall.

Step 1 — Fill the Punnett square: every box shows the same genotype, Tt.

Step 2 — Apply dominance: Tt expresses the dominant tall trait, so all F_1 plants are tall.

Why each other option is wrong:

- (A) "All short" is wrong because tall is dominant and is always shown when T is present.
- (B) "Half tall, half short" is the result of a test cross (Tt $\times$ tt), not of TT $\times$ tt.
- (D) "All medium height" would need incomplete dominance; in Mendel's peas tallness is completely dominant, so there is no blending.

Key point: Pure tall $\times$ pure short $\rightarrow$ F_1 all tall (Tt). The 3:1 ratio appears only in the F_2 generation.

Final Answer: All tall $\Rightarrow$ $\boxed{\text{C}}$

Answer: (C) Go Back to Q25

Q26.

Solution

Concept — Vestigial organs: Vestigial organs are body structures that were fully developed and useful in our ancestors but have become reduced and functionless during evolution. In humans, the appendix and the wisdom teeth are classic examples. Their presence is taken as evidence that humans evolved from earlier ancestors.

Step 1 — Identify the clue: organs that have *lost their function* during evolution.

Step 2 — Name them: such reduced, functionless organs are vestigial organs.

Why each other option is wrong:

- (A) Analogous organs do different developmental origins but the *same function* (e.g. wings of insect and bird); they are not functionless.

- (B) Homologous organs share the same basic structure but may do different jobs (e.g. forelimbs of human and bat); they are still functional.
- (C) Fossils are the preserved remains or impressions of organisms from the past, not organs in a living body.

Key point: Vestigial organs = once useful, now functionless (appendix, wisdom teeth). They are evidence of evolution.

Final Answer: Vestigial organs $\Rightarrow$ D

Answer: (D) Go Back to Q26

Q27.

Solution

Concept — Filariasis (elephantiasis): Filariasis is caused by tiny thread-like filarial worms (*Wuchereria bancrofti*) that live in the lymph vessels. The worm is spread from person to person by the bite of infected mosquitoes. The worms block the lymph vessels, so lymph collects in the limbs and they swell enormously, a condition called elephantiasis.

Step 1 — Read the figure: filarial worm $\rightarrow$ mosquito (vector) $\rightarrow$ swollen limb describes the transmission of filariasis.

Step 2 — Name the disease: a filarial-worm disease spread by mosquitoes that causes swollen limbs is filariasis (elephantiasis).

Why each other option is wrong:

- (B) Malaria is also spread by mosquitoes but is caused by the protozoan *Plasmodium*, not a worm, and causes fever, not limb swelling.
- (C) Typhoid is a bacterial disease spread by contaminated food and water, not by a worm.
- (D) Tuberculosis is a bacterial lung disease spread through the air.

Key point: Filariasis = filarial worm + mosquito vector $\rightarrow$ blocked lymph vessels $\rightarrow$ swollen limbs (elephantiasis).

Final Answer: Filariasis (elephantiasis) $\Rightarrow$ A

Answer: (A) Go Back to Q27

Q28.

Solution

Concept — Vaccination (immunisation): Vaccination is the process of introducing a vaccine, which contains weakened or killed germs (or their parts), into the body. The body responds by making antibodies and memory cells against that germ, so that if the real germ attacks later, the person is already protected. This builds active, long-lasting immunity.

Step 1 — Identify the description: giving a vaccine to build immunity against a disease.

Step 2 — Name the process: this is vaccination (immunisation).

Why each other option is wrong:

- (A) Digestion is the breakdown of food into absorbable units; it has nothing to do with immunity.
- (C) Respiration is the release of energy from food in the cells.
- (D) Transfusion is the transfer of *blood* from one person to another, not the giving of a vaccine.

Key point: Vaccination trains the immune system using harmless germs so memory cells protect against future infection. Smallpox was wiped out this way.

Final Answer: Vaccination (immunisation) $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q28

Q29.

Solution

Concept — Genetic engineering: Genetic engineering is the deliberate altering of an organism's DNA. A central step is joining a piece of DNA carrying a useful gene to DNA from another source (often a plasmid vector) using enzymes, to form a new combined molecule called recombinant DNA. This recombinant DNA is then put into a host cell to make a desired product, such as human insulin.

Step 1 — Read the figure: a gene is cut out and joined into a plasmid to make a new combined (recombinant) DNA molecule.

Step 2 — Name the field: making recombinant DNA by joining DNA from different sources is the basis of genetic engineering.

Why each other option is wrong:

- (A) Fermentation is the anaerobic breakdown of sugars by microbes (as in making curd or alcohol); it does not join DNA pieces.
- (B) Pasteurisation is the mild heating of milk to kill germs; it is unrelated to DNA.
- (D) Vaccination gives immunity against disease; it is not about combining DNA molecules.

Key point: Joining DNA from different sources → recombinant DNA → genetic engineering. Human insulin is a famous product of this technology.

Final Answer: Genetic engineering ⇒ C

Answer: (C) Go Back to Q29

Q30.

Solution

Concept — Biodiversity: Biodiversity means the variety of different kinds of living organisms, the many species of plants, animals, and microorganisms, found in a particular region or on the whole Earth. A region with many different species (such as a rainforest) is said to have high biodiversity. It keeps ecosystems healthy and stable.

Step 1 — Identify the description: the variety of different species of plants and animals in a region.

Step 2 — Name it: this variety is called biodiversity.

Why each other option is wrong:

- (A) A food chain is a single linear sequence of who-eats-whom, not the variety of species.
- (B) A population is the number of individuals of *one* species in an area, not the variety of many species.
- (C) A food web is a network of interconnected food chains, again not the count of different species.

Key point: Biodiversity = the variety of all species in a region. High biodiversity makes an ecosystem more stable and resilient.

Final Answer: Biodiversity ⇒ D

Answer: (D) Go Back to Q30

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	A	8	B	9	C	10	D
11	A	12	B	13	C	14	D	15	A
16	B	17	C	18	D	19	A	20	B
21	C	22	D	23	A	24	B	25	C
26	D	27	A	28	B	29	C	30	D