AIIMS B.Sc Nursing Biology

Sample Paper – 9

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. The large, rounded organelle shown below, which contains the chromosomes and acts as the control centre of the cell, is the:

control centre

(A) nucleus

(B) mitochondrion

(C) ribosome

(D) vacuole

Q2. The stack of flattened membrane sacs shown below, which packages, processes, and secretes substances like a dispatching unit, is the:

dispatch unit

(A) lysosome

(B) Golgi apparatus

(C) nucleus

(D) centriole

Q3. The rigid, non-living outer covering of a plant cell that lies just outside the cell membrane is the:

(A) plasma membrane

(B) cytoplasm

(C) cell wall

(D) nuclear membrane

Q4. Glucose, a simple sugar that provides quick energy to the body, belongs to the class of biomolecules called:

(A) proteins

(B) fats

(C) nucleic acids

(D) carbohydrates

Q5. An essential amino acid is best described as one that:

(A) must be obtained from the diet because the body cannot synthesise it

(B) is synthesised by the body in large amounts

(C) is required only by plants, not animals

(D) is destroyed completely during digestion

Q6. Insects, which form the largest group of animals on Earth, are placed in the phylum:

(A) Mollusca

(B) Arthropoda

(C) Annelida

(D) Chordata

Q7. Algae and other simple plant-like protists that make their own food using sunlight are described as:

(A) parasitic

(B) saprophytic

(C) autotrophic

(D) heterotrophic

Q8. Water is absorbed by the roots of a plant from the soil mainly by the process of:

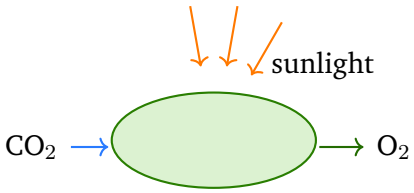
(A) transpiration

(B) active transport

(C) respiration

(D) osmosis

Q9. In the leaf shown below, sunlight, carbon dioxide, and water are used to make food while oxygen is given out. This food-making process is called:



(A) photosynthesis

(B) respiration

(C) transpiration

(D) digestion

Q10. The process in living organisms by which energy is released from food, oxygen is taken in, and carbon dioxide is given out, is called:

(A) photosynthesis

(B) respiration

(C) excretion

(D) transpiration

Q11. The muscular, bag-like organ where the digestion of protein begins with the help of the enzyme pepsin is the:

(A) liver

(B) small intestine

(C) stomach

(D) large intestine

Q12. The organ that produces the hormone insulin and also secretes digestive enzymes into the small intestine is the:

(A) liver

(B) thyroid gland

(C) kidney

(D) pancreas

Q13. The vitamin made by the human skin in the presence of sunlight, whose deficiency causes rickets in children, is:

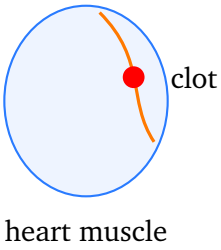
(A) vitamin D

(B) vitamin C

(C) vitamin A

(D) vitamin K

Q14. In the diagram below, a clot blocks an artery supplying blood to the heart muscle. The sudden stoppage of blood supply to the heart muscle that results is called a:



(A) heart murmur

(B) heart attack

(C) anaemia

(D) goitre

Q15. The metal present in the red blood pigment haemoglobin, which is essential for carrying oxygen, is:

(A) calcium

(B) magnesium

(C) iron

(D) sodium

Q16. Besides the kidneys, the skin acts as an excretory organ by removing excess water and salts from the body in the form of:

(A) bile

(B) urine

(C) carbon dioxide

(D) sweat

Q17. The chemical messengers secreted directly into the blood by the endocrine glands, which control many body activities, are called:

(A) hormones

(B) enzymes

(C) vitamins

(D) antibodies

Q18. The strong bony case that encloses and protects the human brain is the:

(A) rib cage

(B) skull (cranium)

(C) backbone

(D) pelvis

Q19. The disorder caused by a deficiency of insulin and marked by a high level of glucose in the blood is:

(A) anaemia

(B) goitre

(C) diabetes mellitus

(D) rickets

Q20. The stage of growth at which the reproductive organs mature and become functional, enabling reproduction, is called:

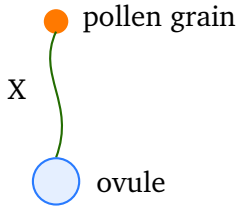
(A) infancy

(B) childhood

(C) old age

(D) puberty

Q21. In the diagram below, the structure that grows out of a pollen grain on the stigma and carries the male gametes down to the ovule is labelled X. This structure is the:



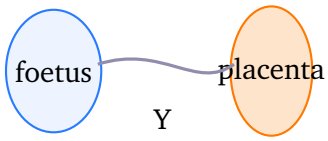
(A) pollen tube

(B) style

(C) filament

(D) anther

Q22. In the diagram below, the structure marked Y connects the developing foetus to the placenta and carries nutrients and oxygen. This structure is the:



(A) fallopian tube

(B) umbilical cord

(C) oviduct

(D) cervix

Q23. A cell or organism that contains only a single set of chromosomes, as in a gamete such as a sperm or an egg, is described as:

(A) diploid

(B) polyploid

(C) haploid

(D) triploid

Q24. The branch of biology that deals with the study of heredity and variation in living organisms is called:

(A) ecology

(B) taxonomy

(C) physiology

(D) genetics

Q25. In humans, the sex of a child is decided by the sex chromosomes. From the chart below, an individual with the chromosome combination XY develops as a:

	X	Y
X	XX	XY
	female	male

(A) male

(B) female

(C) either male or female with equal certainty

(D) neither male nor female

Q26. Charles Darwin's famous observations on the variety of finches, which helped him develop his theory of evolution, were made on the:

(A) Andaman Islands

(B) Galapagos Islands

(C) Maldive Islands

(D) Hawaiian Islands

Q27. The vector that transmits the malarial parasite *Plasmodium* from one human to another is the:

(A) housefly

(B) female *Culex* mosquito

(C) female *Anopheles* mosquito

(D) sandfly

Q28. A deficiency of iodine in the diet, which causes a visible swelling of the thyroid gland in the neck, leads to the disorder called:

(A) scurvy

(B) rickets

(C) anaemia

(D) goitre

Q29. The technique that identifies an individual by analysing the unique pattern present in that person's DNA is called:

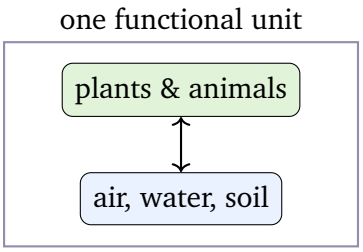
(A) DNA fingerprinting

(B) blood grouping

(C) tissue culture

(D) vaccination

Q30. The diagram below shows all the living organisms of an area together with their non-living surroundings interacting as one unit. Such a self-contained unit is called an:



(A) population

(B) ecosystem

(C) community

(D) biome

Detailed Solutions

Q1.

Solution

Concept — The nucleus: The nucleus is the largest organelle of a typical cell and is bounded by a double nuclear membrane. It holds the chromosomes, which are made of DNA and carry the genetic instructions. Because it directs all cell activities such as growth, metabolism, and division, it is called the control centre of the cell.

Step 1 — Read the figure: the large round body with an inner dense spot (nucleolus) and thread-like chromatin, labelled the control centre, is the nucleus.

Step 2 — Link structure to function: since it stores the chromosomes and issues instructions to the rest of the cell, it must be the nucleus.

Why each other option is wrong:

- (B) The mitochondrion is the powerhouse that makes ATP; it does not store the chromosomes.
- (C) The ribosome is a tiny granule that synthesises proteins.
- (D) The vacuole is a fluid-filled sac for storage, not a control centre.

Key point: Nucleus = control centre that contains chromosomes (DNA). It directs everything the cell does.

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

Answer: (A) Go Back to Q1

Q2.

Solution

Concept — The Golgi apparatus: The Golgi apparatus (Golgi body) is a stack of flattened membrane-bound sacs called cisternae. It receives proteins and lipids made by the cell, modifies and sorts them, and then packs them into vesicles for secretion or transport. This makes it the packaging and dispatching unit of the cell.

Step 1 — Read the figure: the curved stack of flat sacs with small vesicles budding off at the ends is the Golgi apparatus.

Step 2 — Match the role: the question asks for the organelle that packages and secretes substances, which is exactly the Golgi apparatus.

Why each other option is wrong:

- (A) The lysosome contains digestive enzymes that break down waste; it does not package secretions.
- (C) The nucleus is the control centre that holds the chromosomes.
- (D) The centriole helps organise the spindle during cell division.

Key point: Golgi apparatus = packaging, processing, and dispatching unit; it ships products in vesicles.

Final Answer: Golgi apparatus $\Rightarrow$ B

Answer: (B) Go Back to Q2

Q3.

Solution

Concept — The plant cell wall: Outside the plasma membrane, a plant cell has an extra rigid, non-living layer called the cell wall. It is made mainly of cellulose and gives the cell a fixed shape, strength, and protection. Animal cells do not have this wall.

Step 1 — Identify the clue: the question asks for the rigid, non-living covering lying just outside the cell membrane.

Step 2 — Name it: that outermost rigid layer is the cell wall.

Why each other option is wrong:

- (A) The plasma membrane is a thin, living layer inside the cell wall; it is not rigid.
- (B) The cytoplasm is the jelly-like fluid filling the cell, not an outer covering.
- (D) The nuclear membrane surrounds the nucleus inside the cell, not the whole cell.

Key point: Cell wall = rigid, non-living, outermost layer of a plant cell, made of cellulose. Only plant (and some other) cells have it.

Final Answer: Cell wall $\Rightarrow$ C

Answer: (C) Go Back to Q3

Q4.

Solution

Concept — Carbohydrates: Carbohydrates are biomolecules made of carbon, hydrogen, and oxygen, and they serve as the body's main quick source of energy. Glucose is the simplest of these sugars (a monosaccharide) and is broken down in respiration to release energy.

Step 1 — Identify the molecule: glucose is a simple sugar that gives quick energy.

Step 2 — Place it in a class: all sugars and starches belong to the carbohydrates.

Why each other option is wrong:

- (A) Proteins are built from amino acids and are used mainly for growth and repair.
- (B) Fats store energy for the long term but are not simple sugars.
- (C) Nucleic acids (DNA and RNA) store and carry genetic information.

Key point: Glucose is a carbohydrate (a monosaccharide); carbohydrates are the body's instant energy source.

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

Answer: (D) Go Back to Q4

Q5.

Solution

Concept — Essential amino acids: Proteins are made of 20 amino acids. The body can build some of these itself (non-essential), but others it cannot make at all. These must come ready-made from the food we eat and are therefore called essential amino acids.

Step 1 — Recall the definition: an essential amino acid is one the body cannot synthesise.

Step 2 — Draw the conclusion: because the body cannot make it, it has to be supplied in the diet.

Why each other option is wrong:

- (B) Amino acids the body makes in plenty are the non-essential ones, the opposite of essential.
- (C) Essential amino acids are needed by animals, including humans, not only plants.

- (D) Amino acids are absorbed and used by the body, not completely destroyed during digestion.

Key point: Essential amino acid = must be eaten because the body cannot make it; non-essential = the body can synthesise it.

Final Answer: Must be obtained from the diet $\Rightarrow$ A

Answer: (A) Go Back to Q5

Q6.

Solution

Concept — Phylum Arthropoda: Arthropoda is the largest phylum in the animal kingdom. Its members have a hard exoskeleton made of chitin, a segmented body, and jointed legs. Insects, spiders, crabs, and centipedes all belong here, and insects alone form the largest group of animals.

Step 1 — Identify the group: insects are animals with jointed legs and an exoskeleton.

Step 2 — Match the phylum: animals with jointed appendages belong to Arthropoda.

Why each other option is wrong:

- (A) Mollusca includes soft-bodied animals like snails and octopuses, often with a shell.
- (C) Annelida includes segmented worms such as the earthworm.
- (D) Chordata includes animals with a notochord, such as fish, birds, and mammals.

Key point: Arthropoda = jointed legs + chitinous exoskeleton; it is the largest animal phylum, and insects are its largest class.

Final Answer: Arthropoda $\Rightarrow$ B

Answer: (B) Go Back to Q6

Q7.

Solution

Concept — Autotrophic nutrition: Organisms that make their own food from simple inorganic substances using light energy are called autotrophs. Green plants, algae, and many plant-like protists carry out photosynthesis and so are autotrophic. They form the producers of an ecosystem.

Step 1 — Identify the feeding mode: algae make their own food using sunlight.

Step 2 — Name it: self-feeding organisms are autotrophic.

Why each other option is wrong:

- (A) Parasitic organisms take food from a living host and harm it.
- (B) Saprophytic organisms feed on dead and decaying matter.
- (D) Heterotrophic organisms cannot make their own food and depend on others.

Key point: Autotrophs (self-feeders) make food by photosynthesis; heterotrophs depend on ready-made food.

Final Answer: Autotrophic $\Rightarrow$ C

Answer: (C) Go Back to Q7

Q8.

Solution

Concept — Osmosis in roots: Osmosis is the movement of water from a region of higher water concentration to a region of lower water concentration across a semi-permeable membrane. The root hair cells have a more concentrated cell sap than the soil water, so water enters them by osmosis.

Step 1 — Identify the situation: water moving from the soil into root hair cells across a membrane.

Step 2 — Name the process: this passive movement of water across a membrane is osmosis.

Why each other option is wrong:

- (A) Transpiration is the loss of water vapour from leaves, not absorption by roots.
- (B) Active transport moves ions against a gradient using energy; it is not the main way water enters.

- (C) Respiration releases energy from food and is unrelated to water uptake.

Key point: Roots absorb water mainly by osmosis; transpiration pull from the leaves helps the water rise upward.

Final Answer: Osmosis $\Rightarrow$ D

Answer: (D) Go Back to Q8

Q9.

Solution

Concept — Photosynthesis: Photosynthesis is the process by which green plants make their own food. Using the green pigment chlorophyll, they trap sunlight and combine carbon dioxide with water to form glucose, releasing oxygen as a by-product. It takes place mainly in the leaves.

Step 1 — Read the figure: the green leaf taking in sunlight and CO_2 and giving out O_2 shows food being made.

Step 2 — Name the process: making food using sunlight while releasing oxygen is photosynthesis.

Why each other option is wrong:

- (B) Respiration releases energy from food and gives out CO_2, the reverse situation.
- (C) Transpiration is only the loss of water vapour from leaves.
- (D) Digestion is the breakdown of complex food into simpler forms, mainly in animals.

Key point: Photosynthesis: CO_2 + water + sunlight $\rightarrow$ glucose + oxygen. It is a food-making (anabolic) process.

Final Answer: Photosynthesis $\Rightarrow$ A

Answer: (A) Go Back to Q9

Q10.

Solution

Concept — Respiration: Respiration is the process by which living cells break down food, mainly glucose, to release energy in the form of ATP. In aerobic respiration oxygen is taken in and carbon dioxide and water are given out. It happens in all living cells, day and night.

Step 1 — Identify the clues: energy released from food, oxygen taken in, carbon dioxide given out.

Step 2 — Name the process: these are the hallmarks of respiration.

Why each other option is wrong:

- (A) Photosynthesis takes in CO_2 and gives out O_2, the opposite gas exchange.
- (C) Excretion is the removal of metabolic wastes, not energy release from food.
- (D) Transpiration is only the loss of water vapour from a plant.

Key point: Respiration: glucose + oxygen $\rightarrow$ carbon dioxide + water + energy. It is an energy-releasing (catabolic) process.

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

Answer: (B) Go Back to Q10

Q11.

Solution

Concept — The stomach: The stomach is a muscular, bag-like organ of the digestive system. Its gastric glands secrete hydrochloric acid and the enzyme pepsin. In this acidic environment, pepsin begins the digestion of proteins, breaking them into smaller peptides.

Step 1 — Identify the clues: a muscular bag-like organ where protein digestion starts with pepsin.

Step 2 — Name it: this is the stomach.

Why each other option is wrong:

- (A) The liver makes bile; it does not produce pepsin or start protein digestion.
- (B) The small intestine completes digestion but does not begin protein digestion with pepsin.

- (D) The large intestine mainly absorbs water and forms faeces.

Key point: Protein digestion begins in the stomach with pepsin, which needs the acidic medium made by HCl.

Final Answer: Stomach ⇒ C

Answer: (C) Go Back to Q11

Q12.

Solution

Concept — The pancreas: The pancreas is a dual (mixed) gland. As an exocrine gland it secretes pancreatic juice, containing digestive enzymes, into the small intestine. As an endocrine gland its islets of Langerhans secrete the hormones insulin and glucagon directly into the blood.

Step 1 — Identify the dual role: an organ that makes insulin and also secretes digestive enzymes.

Step 2 — Name it: only the pancreas does both jobs.

Why each other option is wrong:

- (A) The liver secretes bile and stores glycogen but does not make insulin.
- (B) The thyroid is purely an endocrine gland; it secretes thyroxine, not digestive enzymes.
- (C) The kidney filters blood to form urine; it is not a digestive gland.

Key point: The pancreas is both exocrine (digestive enzymes) and endocrine (insulin and glucagon).

Final Answer: Pancreas ⇒ D

Answer: (D) Go Back to Q12

Q13.

Solution

Concept — Vitamin D: Vitamin D is the sunshine vitamin. When sunlight (ultraviolet rays) falls on the skin, the body makes vitamin D. This vitamin helps the body absorb calcium and phosphorus to build strong bones. Its deficiency causes rickets in children and soft bones in adults.

Step 1 — Identify the clues: a vitamin made by the skin in sunlight whose lack causes rickets.

Step 2 — Name it: this is vitamin D.

Why each other option is wrong:

- (B) Vitamin C deficiency causes scurvy; it is obtained from citrus fruits, not from sunlight.
- (C) Vitamin A deficiency causes night blindness.
- (D) Vitamin K helps in blood clotting; its deficiency delays clotting.

Key point: Vitamin D is made in the skin by sunlight, helps absorb calcium, and prevents rickets.

Final Answer: Vitamin D $\Rightarrow$ A

Answer: (A) Go Back to Q13

Q14.

Solution

Concept — Heart attack: The heart muscle gets its own blood supply through the coronary arteries. If one of these arteries is blocked, often by a clot, the muscle beyond the block is suddenly starved of oxygen and may die. This sudden stoppage of blood supply to the heart muscle is a heart attack (myocardial infarction).

Step 1 — Read the figure: a clot blocks an artery on the heart, cutting off blood to part of the heart muscle.

Step 2 — Name the condition: loss of blood supply to the heart muscle is a heart attack.

Why each other option is wrong:

- (A) A heart murmur is an abnormal heart sound, usually from a faulty valve, not a blocked artery.

- (C) Anaemia is a shortage of haemoglobin or red blood cells.
- (D) Goitre is the swelling of the thyroid gland from iodine deficiency.

Key point: Blocked coronary artery → no blood to heart muscle → heart attack.

Final Answer: Heart attack ⇒ B

Answer: (B) Go Back to Q14

Q15.

Solution

Concept — Iron in haemoglobin: Haemoglobin is the red pigment of red blood cells that carries oxygen. Each haemoglobin molecule contains iron atoms, and it is this iron that actually binds oxygen. A lack of iron lowers haemoglobin and causes iron-deficiency anaemia.

Step 1 — Recall the composition: haemoglobin is built around iron-containing heme groups.

Step 2 — Name the metal: the metal in haemoglobin is iron.

Why each other option is wrong:

- (A) Calcium is needed for bones, teeth, and clotting, not for haemoglobin.
- (B) Magnesium is the central metal of chlorophyll in plants, not of haemoglobin.
- (D) Sodium helps in nerve impulses and fluid balance, not in oxygen transport.

Key point: Haemoglobin contains iron; chlorophyll (the plant pigment) contains magnesium. Do not swap the two.

Final Answer: Iron ⇒ C

Answer: (C) Go Back to Q15

Q16.

Solution

Concept — Skin as an excretory organ: Besides the kidneys, the skin helps in excretion. Sweat glands in the skin remove excess water, salts (mainly sodium chloride), and small amounts of urea from the body as sweat. The evaporation of sweat also cools the body.

Step 1 — Identify the product: the skin removes water and salts through its sweat glands.

Step 2 — Name it: the excretory product of the skin is sweat.

Why each other option is wrong:

- (A) Bile is made by the liver to digest fats; it is not removed by the skin.
- (B) Urine is formed by the kidneys, not by the skin.
- (C) Carbon dioxide is removed by the lungs during breathing.

Key point: The skin excretes water and salts as sweat; the kidneys make urine and the lungs remove CO_2.

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

Answer: (D) Go Back to Q16

Q17.

Solution

Concept — Hormones: Hormones are chemical messengers secreted by the endocrine (ductless) glands directly into the blood. The blood carries them to target organs, where they control activities such as growth, metabolism, and reproduction. They act slowly but have long-lasting effects.

Step 1 — Identify the clues: chemical messengers poured straight into the blood by endocrine glands.

Step 2 — Name them: these messengers are hormones.

Why each other option is wrong:

- (B) Enzymes are biological catalysts that speed up reactions; they are not blood-borne messengers.
- (C) Vitamins are nutrients needed in small amounts, obtained mainly from food.

- (D) Antibodies are defence proteins made against germs, not control messengers.

Key point: Hormones = chemical messengers secreted into the blood by endocrine glands; they coordinate body functions.

Final Answer: Hormones $\Rightarrow$ A

Answer: (A) Go Back to Q17

Q18.

Solution

Concept — The skull (cranium): The brain is a soft and delicate organ that needs strong protection. It is enclosed in a hard bony case called the skull, whose upper dome-shaped part is the cranium. The skull guards the brain against shocks and injury.

Step 1 — Identify the need: a bony case that protects the brain.

Step 2 — Name it: this protective case is the skull (cranium).

Why each other option is wrong:

- (A) The rib cage protects the heart and lungs in the chest, not the brain.
- (C) The backbone (vertebral column) protects the spinal cord, not the brain.
- (D) The pelvis supports and protects organs in the lower abdomen.

Key point: Skull (cranium) protects the brain; the backbone protects the spinal cord; the rib cage protects the heart and lungs.

Final Answer: Skull (cranium) $\Rightarrow$ B

Answer: (B) Go Back to Q18

Q19.

Solution

Concept — Diabetes mellitus: Insulin is the hormone that lowers blood glucose. When the pancreas does not make enough insulin, glucose cannot be used or stored properly, so its level in the blood rises. This disorder of high blood sugar is called diabetes mellitus, and excess sugar is then passed out in the urine.

Step 1 — Identify the cause: a deficiency of insulin leading to high blood sugar.

Step 2 — Name the disorder: this condition is diabetes mellitus.

Why each other option is wrong:

- (A) Anaemia is a shortage of haemoglobin or red blood cells, unrelated to insulin.
- (B) Goitre is the swelling of the thyroid gland from iodine deficiency.
- (D) Rickets is a bone disorder caused by a lack of vitamin D.

Key point: Low insulin → high blood glucose → diabetes mellitus. Insulin is made by the pancreas.

Final Answer: Diabetes mellitus ⇒ C

Answer: (C) Go Back to Q19

Q20.

Solution

Concept — Puberty: Puberty is the stage of life at which the reproductive organs mature and become functional. It is brought about by sex hormones and is marked by changes such as growth of body hair, voice change in boys, and the start of menstruation in girls. After puberty, the body is capable of reproduction.

Step 1 — Identify the clue: the stage when the reproductive organs become functional.

Step 2 — Name it: this stage is puberty.

Why each other option is wrong:

- (A) Infancy is the earliest stage of life; the reproductive organs are not yet functional.
- (B) In childhood the reproductive organs are still immature.
- (C) Old age is the final stage, when reproductive ability declines.

Key point: Puberty = the stage of sexual maturation when the reproductive organs become functional.

Final Answer: Puberty ⇒ D

Answer: (D) Go Back to Q20

Q21.

Solution

Concept — The pollen tube: After a pollen grain lands on the stigma (pollination), it absorbs nutrients and grows a fine tube downward through the style. This pollen tube carries the male gametes to the ovule, where fertilisation takes place. It is essential for sexual reproduction in flowering plants.

Step 1 — Read the figure: the thin tube (X) growing from the pollen grain down toward the ovule is the pollen tube.

Step 2 — State its role: it delivers the male gametes to the ovule, so X is the pollen tube.

Why each other option is wrong:

- (B) The style is the stalk of the pistil through which the pollen tube grows; it is not the tube itself.
- (C) The filament is the stalk that holds up the anther in the male part.
- (D) The anther is the part that produces pollen grains, not the tube.

Key point: The pollen tube grows from the pollen grain through the style to carry male gametes to the ovule.

Final Answer: Pollen tube $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q21

Q22.

Solution

Concept — The umbilical cord: Inside the mother's uterus, the developing foetus is joined to the placenta by a flexible structure called the umbilical cord. Through its blood vessels the cord brings oxygen and nutrients from the mother to the foetus and carries away the foetal waste.

Step 1 — Read the figure: the cord-like structure (Y) linking the foetus to the placenta is the umbilical cord.

Step 2 — State its role: it connects the foetus to the placenta and exchanges materials, so Y is the umbilical cord.

Why each other option is wrong:

- (A) The fallopian tube carries the egg from the ovary toward the uterus; it does not connect the foetus to the placenta.

- (C) The oviduct is another name for the fallopian tube, again not the foetus-placenta link.
- (D) The cervix is the narrow lower opening of the uterus into the vagina.

Key point: The umbilical cord connects the foetus to the placenta and supplies it with oxygen and nutrients.

Final Answer: Umbilical cord $\Rightarrow$ B

Answer: (B) Go Back to Q22

Q23.

Solution

Concept — Haploid cells: The number of chromosome sets in a cell describes its ploidy. A cell with two sets of chromosomes is diploid (2n), while a cell with a single set is haploid (n). Gametes such as sperm and egg are haploid, so that when they fuse the normal diploid number is restored.

Step 1 — Identify the clue: a cell, such as a gamete, with only a single set of chromosomes.

Step 2 — Name it: a single-set cell is haploid.

Why each other option is wrong:

- (A) A diploid cell has two sets of chromosomes (2n), as in most body cells.
- (B) A polyploid cell has more than two complete sets of chromosomes.
- (D) A triploid cell has three sets of chromosomes (3n).

Key point: Haploid = one set (n), as in gametes; diploid = two sets (2n), as in body cells.

Final Answer: Haploid $\Rightarrow$ C

Answer: (C) Go Back to Q23

Q24.

Solution

Concept — Genetics: Genetics is the branch of biology that studies heredity (how characters pass from parents to offspring) and variation (the differences among individuals). Gregor Mendel, through his work on pea plants, is regarded as the father of genetics.

Step 1 — Identify the field: the study of heredity and variation.

Step 2 — Name it: this branch is genetics.

Why each other option is wrong:

- (A) Ecology studies the relationship of organisms with one another and their environment.
- (B) Taxonomy deals with the classification and naming of organisms.
- (C) Physiology studies the functions and working of body parts.

Key point: Genetics = the study of heredity and variation; Mendel is its father.

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

Answer: (D) Go Back to Q24

Q25.

Solution

Concept — Sex determination in humans: Humans have two sex chromosomes. A female has two X chromosomes (XX), while a male has one X and one Y (XY). The mother always gives an X; the father gives either an X (making a girl, XX) or a Y (making a boy, XY). So the chromosome combination XY develops into a male.

Step 1 — Read the chart: the XX column is labelled female and the XY column is labelled male.

Step 2 — Match the genotype: an individual with XY falls in the male column, so XY develops as a male.

Why each other option is wrong:

- (B) XX, not XY, is the female combination.
- (C) The sex is decided by the chromosomes, so XY is definitely male, not uncertain.
- (D) Every individual with a normal XX or XY pair is either female or male; XY is not sexless.

Key point: XX = female, XY = male; the father's sperm (X or Y) decides the sex of the child.

Final Answer: Male $\Rightarrow$ A

Answer: (A) Go Back to Q25

Q26.

Solution

Concept — Darwin and the Galapagos finches: On his voyage aboard HMS Beagle, Charles Darwin visited the Galapagos Islands. There he noticed that the finches differed mainly in the shape of their beaks, suited to different foods. These observations helped him develop the idea of evolution by natural selection.

Step 1 — Recall the voyage: Darwin studied finches on a group of islands in the Pacific.

Step 2 — Name the place: these were the Galapagos Islands.

Why each other option is wrong:

- (A) The Andaman Islands lie in the Bay of Bengal and are not linked to Darwin's finches.
- (C) The Maldive Islands are in the Indian Ocean, not the site of Darwin's study.
- (D) The Hawaiian Islands are also in the Pacific but are not where Darwin observed his finches.

Key point: Darwin's finches of the Galapagos Islands are a classic example that shaped the theory of natural selection.

Final Answer: Galapagos Islands $\Rightarrow$ B

Answer: (B) Go Back to Q26

Q27.

Solution

Concept — Vector of malaria: Malaria is caused by the protozoan parasite *Plasmodium*. It is spread from one person to another by the bite of an infected female *Anopheles* mosquito, which acts as the carrier (vector). Only the female mosquito bites, since it needs blood for its eggs.

Step 1 — Identify the disease and carrier: malaria is carried by a particular mosquito.

Step 2 — Name the vector: the vector is the female *Anopheles* mosquito.

Why each other option is wrong:

- (A) The housefly spreads diseases like cholera and typhoid through contaminated food, not malaria.
- (B) The female *Culex* mosquito spreads filariasis (elephantiasis), not malaria.
- (D) The sandfly transmits kala-azar (leishmaniasis), not malaria.

Key point: Malaria → *Plasmodium*, carried by the female *Anopheles* mosquito. The mosquito is only the vector.

Final Answer: Female *Anopheles* mosquito ⇒ C

Answer: (C) Go Back to Q27

Q28.

Solution

Concept — Goitre: Iodine is needed by the thyroid gland to make the hormone thyroxine. When the diet lacks iodine, the thyroid cannot make enough thyroxine and enlarges in an effort to do so. This visible swelling of the thyroid gland in the neck is called goitre.

Step 1 — Identify the cause: a deficiency of iodine affecting the thyroid gland.

Step 2 — Name the disorder: the resulting swelling of the thyroid is goitre.

Why each other option is wrong:

- (A) Scurvy is caused by a deficiency of vitamin C and affects the gums.
- (B) Rickets is caused by a deficiency of vitamin D and affects the bones.
- (C) Anaemia is caused by a shortage of iron or haemoglobin.

Key point: Iodine deficiency → enlarged thyroid → goitre. Iodised salt helps

prevent it.

Final Answer: Goitre $\Rightarrow$ D

Answer: (D) Go Back to Q28

Q29.

Solution

Concept — DNA fingerprinting: Every person (except identical twins) has a unique pattern in certain regions of their DNA. DNA fingerprinting is a technique that reads this unique pattern to identify an individual. It is widely used in forensic science, in solving crimes, and in settling parentage disputes.

Step 1 — Identify the clue: a technique that identifies a person from a unique DNA pattern.

Step 2 — Name it: this technique is DNA fingerprinting.

Why each other option is wrong:

- (B) Blood grouping only classifies blood into groups like A, B, AB, and O; it cannot pinpoint one individual.
- (C) Tissue culture is the growth of cells or tissues in the laboratory, not a method of identification.
- (D) Vaccination is the use of a vaccine to build immunity against a disease.

Key point: DNA fingerprinting identifies an individual from a unique DNA pattern; it is a key tool in forensics.

Final Answer: DNA fingerprinting $\Rightarrow$ A

Answer: (A) Go Back to Q29

Q30.

Solution

Concept — Ecosystem: An ecosystem is a unit in which all the living organisms (the biotic community) of an area interact with one another and with their non-living surroundings (the abiotic factors such as air, water, and soil). Energy and nutrients flow through this self-supporting unit. A pond or a forest is an example.

Step 1 — Read the figure: living things and the non-living surroundings are enclosed together as one interacting unit.

Step 2 — Name it: living organisms plus their non-living surroundings make an ecosystem.

Why each other option is wrong:

- (A) A population is a group of individuals of a single species in an area, with no non-living part.
- (C) A community is all the different living populations together, but still without the non-living surroundings.
- (D) A biome is a very large region with a characteristic climate and life, larger than a single ecosystem.

Key point: Ecosystem $=$ biotic community $+$ abiotic surroundings interacting as one unit.

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

Answer: (B) Go Back to Q30

Answer Key

Q	Ans	Q	Ans	Q	Ans	Q	Ans	Q	Ans
1	A	2	B	3	C	4	D	5	A
6	B	7	C	8	D	9	A	10	B
11	C	12	D	13	A	14	B	15	C
16	D	17	A	18	B	19	C	20	D
21	A	22	B	23	C	24	D	25	A
26	B	27	C	28	D	29	A	30	B