AIIMS B.Sc Nursing Biology

Sample Paper – 5

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 membrane network shown below, which threads through the cytoplasm to transport materials inside the cell and whose rough form is studded with ribosomes, is the:

(A) endoplasmic reticulum

(B) Golgi apparatus

(C) lysosome

(D) cell membrane

Q2. The dense, rounded structure found inside the nucleus, which manufactures ribosomes, is the:

(A) centromere

(B) nucleolus

(C) chromatin

(D) nuclear pore

Q3. The scientist who first observed and named "cells" while examining a thin slice of cork under a microscope was:

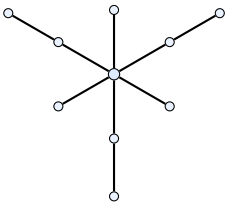
(A) Antonie van Leeuwenhoek

(B) Theodor Schwann

(C) Robert Hooke

(D) Robert Brown

Q4. The branched storage carbohydrate shown below, stored mainly in the liver and muscles of animals, is:



(A) cellulose

(B) starch

(C) sucrose

(D) glycogen

Q5. The main carbohydrate in which plants store their food, found abundantly in potato tubers and rice grains, is:

(A) starch

(B) glycogen

(C) glucose

(D) chitin

Q6. Animals such as the frog, which can live both on land and in water, belong to the class:

(A) Reptilia

(B) Amphibia

(C) Pisces

(D) Aves

Q7. The presence of mammary glands and a body covering of hair or fur is the chief characteristic of the class:

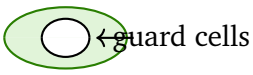
(A) Aves

(B) Amphibia

(C) Mammalia

(D) Reptilia

Q8. The tiny pore shown below on the lower surface of a leaf, bordered by two bean-shaped guard cells and used for exchange of gases, is called a:



(A) lenticel

(B) vein

(C) cuticle

(D) stoma

Q9. The gas that green plants release into the air during photosynthesis is:

(A) oxygen

(B) carbon dioxide

(C) nitrogen

(D) hydrogen

Q10. The plant hormone that promotes the ripening of fruits is:

(A) auxin

(B) ethylene

(C) cytokinin

(D) gibberellin

Q11. The enzyme that digests fats, breaking them down into fatty acids and glycerol, is:

(A) amylase

(B) pepsin

(C) lipase

(D) maltase

Q12. In the flow of digestion shown below, the labelled step X, in which the absorbed digested nutrients are taken up by body cells and used for energy, growth, and repair, is called:

(A) ingestion

(B) egestion

(C) peristalsis

(D) assimilation

Q13. The small, finger-like vestigial organ attached to the junction of the human large intestine is the:

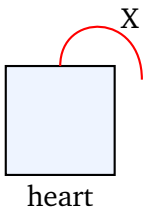
(A) appendix

(B) caecum

(C) rectum

(D) duodenum

Q14. In the diagram below, the largest artery of the body, labelled X, which carries oxygenated blood away from the left ventricle of the heart, is the:



(A) pulmonary vein

(B) aorta

(C) vena cava

(D) capillary

Q15. The pale-yellow liquid part of blood that remains after all the blood cells have been removed is called:

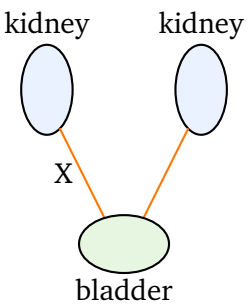
(A) lymph

(B) serum

(C) plasma

(D) platelets

Q16. In the urinary system shown below, the tube labelled X that carries urine from each kidney down to the urinary bladder is the:



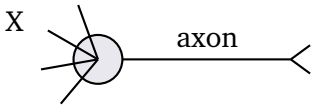
(A) urethra

(B) nephron

(C) renal artery

(D) ureter

Q17. In the neuron shown below, the short, branched part labelled X, which receives nerve impulses and passes them to the cell body, is the:



(A) dendrite

(B) axon

(C) synapse

(D) myelin sheath

Q18. The number of bones in a fully grown adult human skeleton is:

(A) 300

(B) 206

(C) 256

(D) 186

Q19. The male sex hormone secreted by the testes, responsible for the development of male secondary sexual characters, is:

(A) oestrogen

(B) insulin

(C) testosterone

(D) progesterone

Q20. The type of pollination shown below, in which pollen from the anther is transferred to the stigma of the same flower, is called:

(A) cross-pollination

(B) wind pollination

(C) insect pollination

(D) self-pollination

Q21. In flowering plants, after fertilization, the fruit develops from the:

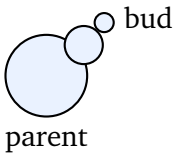
(A) ovary

(B) stigma

(C) anther

(D) petal

Q22. The method of asexual reproduction shown below, in which a small outgrowth (bud) develops on the parent body and later detaches to form a new individual, as seen in yeast and Hydra, is called:



(A) binary fission

(B) budding

(C) fragmentation

(D) spore formation

Q23. The complete set of alleles (genetic make-up) that an organism carries for a trait, such as TT or Tt, is called its:

(A) phenotype

(B) karyotype

(C) genotype

(D) ecotype

Q24. The sex-linked inherited disorder in which a person cannot tell certain colours (usually red and green) apart is:

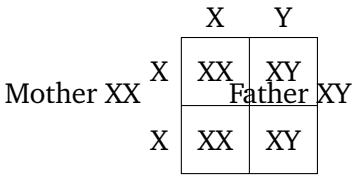
(A) night blindness

(B) cataract

(C) myopia

(D) colour blindness

Q25. In the cross shown below, the sex of a human child is decided by the sex chromosome contributed by the father. A child receiving the father's Y chromosome will be:



(A) a boy (XY)

(B) a girl (XX)

(C) either a boy or a girl with equal certainty from X

(D) neither, as sex is fixed by the mother

Q26. The famous double-helix model of the structure of DNA was proposed in 1953 by:

(A) Gregor Mendel and Charles Darwin

(B) James Watson and Francis Crick

(C) Louis Pasteur and Robert Koch

(D) Hugo de Vries and T. H. Morgan

Q27. Polio (poliomyelitis), a disease that can cause paralysis in children, is caused by a:

(A) bacterium

(B) protozoan

(C) virus

(D) fungus

Q28. The BCG vaccine, usually given to newborn babies, gives protection against the disease:

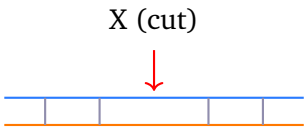
(A) measles

(B) polio

(C) tetanus

(D) tuberculosis

Q29. In genetic engineering, the "molecular scissors" labelled X below, which cut a DNA molecule at specific recognition sites, are called:



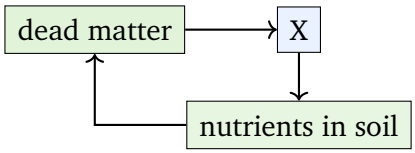
(A) restriction enzymes

(B) DNA ligase

(C) DNA polymerase

(D) amylase

Q30. In the cycle shown below, the organisms labelled X, such as bacteria and fungi, that break down dead plants and animals and return nutrients to the soil, are called:



(A) producers

(B) herbivores

(C) carnivores

(D) decomposers

Detailed Solutions

Q1.

Solution

Concept — The endoplasmic reticulum: The endoplasmic reticulum (ER) is a network of folded membranous tubes and sheets spreading through the cytoplasm and connected to the nuclear membrane. It transports proteins and other materials within the cell. The rough ER bears ribosomes on its surface (for protein synthesis), while the smooth ER lacks ribosomes and makes lipids.

Step 1 — Read the figure: the figure shows a branching membrane network with tiny dots (ribosomes) on it, the hallmark of the rough endoplasmic reticulum.

Step 2 — Match structure to function: a transport network bearing ribosomes can only be the endoplasmic reticulum.

Why each other option is wrong:

- (B) The Golgi apparatus is a stack of flattened sacs that packages and dispatches materials; it is not a branching ribosome-bearing network.
- (C) The lysosome is a small sac of digestive enzymes, not a transport network.
- (D) The cell membrane is the single outer boundary of the cell, not an internal network.

Key point: Rough ER = ribosomes + protein transport; smooth ER = no ribosomes + lipid synthesis.

Final Answer: Endoplasmic reticulum $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q1

Q2.

Solution

Concept — The nucleolus: Inside the nucleus lies a dense, rounded body called the nucleolus. It is the site where ribosomal RNA (rRNA) is made and where the subunits of ribosomes are assembled. A cell that makes many proteins usually has a large, prominent nucleolus.

Step 1 — Identify the function asked: the question wants the structure inside the nucleus that makes ribosomes.

Step 2 — Match it: ribosome manufacture is the special job of the nucleolus.

Why each other option is wrong:

- (A) The centromere is the constricted region that joins the two halves of a chromosome.
- (C) Chromatin is the thread-like mass of DNA and protein; it carries genes but does not build ribosomes.
- (D) A nuclear pore is just an opening in the nuclear membrane for transport.

Key point: Nucleolus = "ribosome factory" within the nucleus; the finished ribosomes then move out into the cytoplasm.

Final Answer: Nucleolus $\Rightarrow$ B

Answer: (B) Go Back to Q2

Q3.

Solution

Concept — Discovery of the cell: In 1665 Robert Hooke examined a thin slice of cork under his self-made microscope. He saw tiny box-like compartments that reminded him of the small rooms (cells) in a monastery, so he named them "cells". He actually saw only the dead cell walls, but the name stuck.

Step 1 — Recall the cork experiment: the observer of cork who coined the word "cell".

Step 2 — Name him: Robert Hooke.

Why each other option is wrong:

- (A) Antonie van Leeuwenhoek first saw living cells (bacteria, sperm), but did not coin the term "cell".
- (B) Theodor Schwann (with Schleiden) gave the cell theory, much later.
- (D) Robert Brown discovered the nucleus, not the cell.

Key point: Hooke = named the cell (cork); Leeuwenhoek = first saw live microbes; Brown = nucleus; Schleiden & Schwann = cell theory.

Final Answer: Robert Hooke $\Rightarrow$ C

Answer: (C) Go Back to Q3

Q4.

Solution

Concept — Glycogen: Glycogen is the storage carbohydrate of animals. It is a large, highly branched polymer of glucose units, stored chiefly in the liver and muscle cells. When the body needs energy, glycogen is quickly broken back down into glucose.

Step 1 — Read the figure: the figure shows a central unit with many branches, the branched shape characteristic of glycogen.

Step 2 — Link the clue: "stored in liver and muscles of animals" points directly to glycogen.

Why each other option is wrong:

- (A) Cellulose is a structural carbohydrate that forms the plant cell wall, not a storage form.
- (B) Starch is the storage carbohydrate of plants, not animals.
- (C) Sucrose is a small sugar (table sugar), not a large branched storage polymer.

Key point: Animal storage carbohydrate = glycogen (liver & muscle); plant storage carbohydrate = starch.

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

Answer: (D) Go Back to Q4

Q5.

Solution

Concept — Starch: Starch is the carbohydrate in which plants store their food. It is a polymer of many glucose units and is found in large amounts in storage organs such as potato tubers, rice, and wheat grains. Iodine solution turns blue-black with starch, a common test for it.

Step 1 — Identify the storage form: the plant's food-storage carbohydrate.

Step 2 — Name it: starch.

Why each other option is wrong:

- (B) Glycogen is the *animal* storage carbohydrate, not the plant one.
- (C) Glucose is the simple sugar made in photosynthesis; plants store it in the polymer form starch, not as free glucose.

- (D) Chitin is a structural carbohydrate in fungal walls and insect skeletons.

Key point: Plants store food as starch and build their walls from cellulose; both are glucose polymers but with different jobs.

Final Answer: Starch $\Rightarrow$ A

Answer: (A) Go Back to Q5

Q6.

Solution

Concept — Amphibians: Amphibians (class Amphibia) are cold-blooded vertebrates such as frogs, toads, and salamanders. They live part of their life in water and part on land. They have moist skin (used in breathing), lay eggs in water, and most begin life as gilled tadpoles before developing lungs.

Step 1 — Read the clue: "can live both on land and in water" and the example "frog".

Step 2 — Name the class: Amphibia.

Why each other option is wrong:

- (A) Reptilia (lizards, snakes) are land animals with dry, scaly skin.
- (C) Pisces (fishes) live only in water and breathe through gills.
- (D) Aves (birds) are feathered animals adapted for flight.

Key point: "Amphi" means "both"; amphibians lead a double life, in water and on land.

Final Answer: Amphibia $\Rightarrow$ B

Answer: (B) Go Back to Q6

Q7.

Solution

Concept — Mammals: Mammals (class Mammalia) are warm-blooded vertebrates. Their two defining features are mammary glands (which produce milk to feed the young) and a body covered with hair or fur. Most mammals give birth to live young. Humans, dogs, whales, and bats are all mammals.

Step 1 — Read the clue: mammary glands + hair/fur.

Step 2 — Name the class: Mammalia.

Why each other option is wrong:

- (A) Aves (birds) have feathers and beaks, not mammary glands or hair.
- (B) Amphibia (frogs) have moist, naked skin and lack mammary glands.
- (D) Reptilia have dry scales and lay eggs; they do not feed young on milk.

Key point: Only mammals have mammary glands and true hair; these two features define the class.

Final Answer: Mammalia $\Rightarrow$ C

Answer: (C) Go Back to Q7

Q8.

Solution

Concept — Stomata: Stomata (singular: stoma) are tiny pores mainly on the lower surface of a leaf. Each pore is bordered by two bean-shaped guard cells that open and close it. Through stomata the leaf takes in carbon dioxide, gives out oxygen, and loses water vapour in transpiration.

Step 1 — Read the figure: two bean-shaped guard cells surrounding a central pore, the structure of a stoma.

Step 2 — Name it: the pore guarded by guard cells is a stoma.

Why each other option is wrong:

- (A) A lenticel is a pore in woody stems, not a guard-cell-bordered leaf pore.
- (B) A vein carries water and food through the leaf; it is not a gas-exchange pore.
- (C) The cuticle is the waxy waterproof layer on the leaf surface, with no pore.

Key point: Stoma = pore + two guard cells; guard cells swell to open and shrink to close the pore, controlling gas exchange and water loss.

Final Answer: Stoma $\Rightarrow$ D

Answer: (D) Go Back to Q8

Q9.

Solution

Concept — Oxygen in photosynthesis: In photosynthesis, green plants use carbon dioxide and water, with light energy trapped by chlorophyll, to make glucose. The oxygen given off as a by-product comes from the splitting of water molecules and is released into the air through the stomata.

Step 1 — Recall the equation: $6CO_2 + 6H_2O \xrightarrow{\text{light}} C_6H_{12}O_6 + 6O_2$.

Step 2 — Identify the gas released: the product given off is oxygen.

Why each other option is wrong:

- (B) Carbon dioxide is taken *in* for photosynthesis, not released.
- (C) Nitrogen is not involved in the photosynthetic gas exchange.
- (D) Hydrogen from water stays bound in glucose; it is not released as free gas.

Key point: Photosynthesis takes in CO_2 and gives out O_2; respiration does the reverse.

Final Answer: Oxygen $\Rightarrow$ A

Answer: (A) Go Back to Q9

Q10.

Solution

Concept — Ethylene: Ethylene is the only plant hormone that is a gas. It promotes the ripening of fruits, making them softer, sweeter, and more colourful. Farmers and traders often use it to ripen fruits like bananas and mangoes uniformly after harvest.

Step 1 — Identify the effect asked: the hormone that ripens fruit.

Step 2 — Name it: ethylene.

Why each other option is wrong:

- (A) Auxin promotes cell elongation and is involved in bending towards light (phototropism).
- (C) Cytokinin promotes cell division and delays ageing of leaves.
- (D) Gibberellin promotes stem elongation and helps seeds germinate.

Key point: Ethylene = the gaseous ripening hormone; remember it as the "ripen-

ing" hormone of fruits.

Final Answer: Ethylene $\Rightarrow$ B

Answer: (B) Go Back to Q10

Q11.

Solution

Concept — Lipase: Lipase is the fat-digesting enzyme. With the help of bile (which first breaks large fat globules into tiny droplets), lipase breaks fats down into fatty acids and glycerol, which can then be absorbed. It is secreted by the pancreas and the small intestine.

Step 1 — Identify the food digested: fats are being broken into fatty acids and glycerol.

Step 2 — Match the enzyme: the enzyme that digests fats is lipase.

Why each other option is wrong:

- (A) Amylase digests starch (a carbohydrate), not fats.
- (B) Pepsin digests proteins in the stomach.
- (D) Maltase breaks the sugar maltose into glucose; it is a carbohydrate-digesting enzyme.

Key point: Lipase $\rightarrow$ fats $\rightarrow$ fatty acids + glycerol; bile only emulsifies fats, it does not digest them chemically.

Final Answer: Lipase $\Rightarrow$ C

Answer: (C) Go Back to Q11

Q12.

Solution

Concept — Assimilation: Nutrition involves several steps: ingestion (taking in food), digestion (breaking it down), absorption (passing digested food into the blood), assimilation (using the absorbed nutrients in body cells for energy, growth, and repair), and egestion (removing undigested waste). Assimilation is the step where the nutrients are actually put to use inside the cells.

Step 1 — Read the figure: the flow is digestion $\rightarrow$ absorption $\rightarrow$ X, so X is the step right after absorption.

Step 2 — Identify X: taking up and using absorbed nutrients in body cells is assimilation.

Why each other option is wrong:

- (A) Ingestion is the very first step, the intake of food.
- (B) Egestion is the removal of undigested waste, the last step.
- (C) Peristalsis is the wave-like muscle movement that pushes food along the gut, not a nutrition step.

Key point: Order of nutrition: ingestion → digestion → absorption → assimilation → egestion.

Final Answer: Assimilation ⇒ D

Answer: (D) Go Back to Q12

Q13.

Solution

Concept — The appendix: The vermiform appendix is a small, narrow, finger-like tube attached to the caecum, at the start of the large intestine. In humans it is a vestigial organ, a structure that has lost most of its original function (it once helped digest cellulose-rich food in our ancestors).

Step 1 — Identify the clue: a vestigial, finger-like organ at the large intestine.

Step 2 — Name it: the appendix.

Why each other option is wrong:

- (B) The caecum is a small pouch at the start of the large intestine, but it is the appendix (attached to it) that is the vestigial finger-like organ.
- (C) The rectum is the last part of the large intestine that stores faeces; it is functional, not vestigial.
- (D) The duodenum is the first part of the small intestine, not part of the large intestine.

Key point: The appendix is a classic human vestigial organ; its inflammation is called appendicitis.

Final Answer: Appendix ⇒ A

Answer: (A) Go Back to Q13

Q14.

Solution

Concept — The aorta: The aorta is the largest artery in the human body. It arises from the left ventricle and carries oxygenated (pure) blood to the rest of the body. From the aorta, smaller arteries branch off to supply every organ.

Step 1 — Read the figure: the large vessel X leaving the heart and arching away carries blood out of the left ventricle.

Step 2 — Name it: the largest artery carrying oxygenated blood from the heart is the aorta.

Why each other option is wrong:

- (A) The pulmonary vein brings oxygenated blood *from the lungs to the heart*, not out of the heart to the body.
- (C) The vena cava is the large *vein* that brings deoxygenated blood back to the heart.
- (D) A capillary is a microscopic vessel where exchange occurs, not the largest artery.

Key point: Aorta = largest artery, carries oxygenated blood from the left ventricle to the body; the vena cava is its venous counterpart.

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

Answer: (B) Go Back to Q14

Q15.

Solution

Concept — Plasma: Blood is made of a liquid part and cells. The liquid part, left after the red cells, white cells, and platelets are removed, is plasma. Plasma is a pale-yellow fluid (about 90% water) that carries dissolved nutrients, wastes, hormones, and proteins around the body.

Step 1 — Identify the part asked: the liquid that remains once all blood cells are taken out.

Step 2 — Name it: plasma.

Why each other option is wrong:

- (A) Lymph is a separate colourless fluid in the lymphatic vessels, not the liquid part of blood.

- (B) Serum is plasma *minus* the clotting protein fibrinogen, what is left after blood has clotted; it is not the simple cell-free liquid asked here.
- (D) Platelets are tiny cell fragments that help clotting; they are removed along with the cells.

Key point: Blood = plasma (liquid) + cells. Plasma without clotting factors = serum.

Final Answer: Plasma $\Rightarrow$ C

Answer: (C) Go Back to Q15

Q16.

Solution

Concept — The ureter: Each kidney filters blood and makes urine. The urine drains out of the kidney through a muscular tube called the ureter, which carries it down to the urinary bladder for storage. There are two ureters, one from each kidney.

Step 1 — Read the figure: the tube X runs from each kidney down to the bladder, so it carries urine away from the kidney.

Step 2 — Name it: the kidney-to-bladder tube is the ureter.

Why each other option is wrong:

- (A) The urethra carries urine from the *bladder out of the body*, not from kidney to bladder.
- (B) The nephron is the microscopic filtering unit inside the kidney, not a connecting tube.
- (C) The renal artery brings blood *into* the kidney; it does not carry urine.

Key point: Kidney $\rightarrow$ ureter $\rightarrow$ bladder $\rightarrow$ urethra $\rightarrow$ outside. Do not confuse ureter (kidney to bladder) with urethra (bladder to outside).

Final Answer: Ureter $\Rightarrow$ D

Answer: (D) Go Back to Q16

Q17.

Solution

Concept — The dendrite: A neuron has a cell body, several short branched extensions called dendrites, and one long fibre called the axon. Dendrites receive nerve impulses from other neurons or receptors and carry them *towards* the cell body. The axon then carries the impulse *away* to the next cell.

Step 1 — Read the figure: X is the set of short branches on the cell body, the receiving end of the neuron.

Step 2 — Name it: the branched part that receives impulses and passes them to the cell body is the dendrite.

Why each other option is wrong:

- (B) The axon is the single long fibre that carries the impulse *away* from the cell body, not the receiving branch.
- (C) The synapse is the gap (junction) between two neurons, not a part of one neuron.
- (D) The myelin sheath is the fatty insulating cover around the axon.

Key point: Dendrites receive (impulse in), axon transmits (impulse out). The flow is dendrite $\rightarrow$ cell body $\rightarrow$ axon.

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

Answer: (A) Go Back to Q17

Q18.

Solution

Concept — Bones in the adult human: A newborn baby has about 300 bones, but as the child grows, many of these fuse together. By adulthood, the human skeleton contains 206 bones. These make up the axial skeleton (skull, vertebral column, ribs) and the appendicular skeleton (limbs and girdles).

Step 1 — Recall the adult figure: the fully grown skeleton.

Step 2 — State the number: 206 bones.

Why each other option is wrong:

- (A) About 300 is the number of bones in a *newborn baby*, before fusion.
- (C) 256 is not the recognised count for either a baby or an adult.

- (D) 186 is too few; the adult skeleton has 206 bones.

Key point: Newborn $\approx$ 300 bones; adult = 206 bones, because many bones fuse during growth.

Final Answer: 206 $\Rightarrow$ B

Answer: (B) Go Back to Q18

Q19.

Solution

Concept — Testosterone: Testosterone is the chief male sex hormone, secreted by the testes (specifically by the Leydig cells). It controls the development of the male reproductive organs and the secondary sexual characters, such as a deep voice, facial and body hair, and broad shoulders, that appear at puberty.

Step 1 — Identify the source: a hormone made by the testes.

Step 2 — Name it: testosterone.

Why each other option is wrong:

- (A) Oestrogen is a *female* sex hormone secreted by the ovaries.
- (B) Insulin is a hormone of the pancreas that lowers blood sugar; it is not a sex hormone.
- (D) Progesterone is a *female* hormone that maintains pregnancy.

Key point: Male hormone = testosterone (testes); female hormones = oestrogen and progesterone (ovaries).

Final Answer: Testosterone $\Rightarrow$ C

Answer: (C) Go Back to Q19

Q20.

Solution

Concept — Self-pollination: Pollination is the transfer of pollen from the anther to the stigma. When this transfer happens within the same flower (or between two flowers of the same plant), it is called self-pollination. When pollen is carried to a flower on a *different* plant of the same kind, it is cross-pollination.

Step 1 — Read the figure: the arrow carries pollen from the anther to the stigma of the *same* flower.

Step 2 — Name it: transfer within the same flower is self-pollination.

Why each other option is wrong:

- (A) Cross-pollination needs two *different* plants; the figure shows only one flower.
- (B) Wind pollination and (C) insect pollination describe the *agent* that carries pollen, not whether it is self or cross; they do not name the type shown here.

Key point: Self-pollination = same flower/plant; cross-pollination = different plant. Wind and insects are just carrying agents.

Final Answer: Self-pollination $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q20

Q21.

Solution

Concept — Fruit from the ovary: After fertilization in a flower, the ovary grows and ripens into the fruit, while the ovules inside it become the seeds. So the fruit is the matured ovary, and it protects the seeds and often helps in their dispersal.

Step 1 — Recall the change after fertilization: the ovary $\rightarrow$ fruit and ovules $\rightarrow$ seeds.

Step 2 — Name the part: the fruit develops from the ovary.

Why each other option is wrong:

- (B) The stigma only receives the pollen; it does not become the fruit.
- (C) The anther produces pollen (male part); it withers after pollination.
- (D) The petal is a non-reproductive part that attracts pollinators and usually falls off.

Key point: Ovary $\rightarrow$ fruit; ovule $\rightarrow$ seed. The fruit is simply the ripened ovary.

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

Answer: (A) Go Back to Q21

Q22.

Solution

Concept — Budding: Budding is a form of asexual reproduction in which a small outgrowth, the bud, develops on the body of the parent. The bud grows, and in organisms like yeast it pinches off, while in Hydra it detaches to live independently. The offspring is genetically identical to the parent.

Step 1 — Read the figure: a small bud grows out of the larger parent body, the picture of budding.

Step 2 — Name it: the example "yeast and Hydra" with a bud confirms budding.

Why each other option is wrong:

- (A) Binary fission is splitting of the parent into two equal cells, as in Amoeba and bacteria, not budding.
- (C) Fragmentation is breaking of the body into pieces that each grow (e.g. Spirogyra), not a single bud.
- (D) Spore formation produces many tiny spores (e.g. in fungi like Rhizopus), not a single attached bud.

Key point: Budding = Hydra and yeast; binary fission = Amoeba; fragmentation = Spirogyra; spores = Rhizopus.

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

Answer: (B) Go Back to Q22

Q23.

Solution

Concept — Genotype: The genotype is the genetic make-up of an organism, the actual set of alleles it carries for a trait (such as TT, Tt, or tt). The phenotype, in contrast, is the visible expression of those genes (such as a tall or short plant). Two organisms can look the same (same phenotype) yet have different genotypes (TT and Tt are both tall).

Step 1 — Read the clue: "the set of alleles such as TT or Tt".

Step 2 — Name it: a description in terms of alleles is the genotype.

Why each other option is wrong:

- (A) The phenotype is the *outward appearance*, not the allele combination.

- (B) The karyotype is the full picture of an organism's chromosomes (their number and shape), not its alleles for a single trait.
- (D) "Ecotype" refers to a population adapted to a local environment, not the allele make-up.

Key point: Genotype = the genes (TT/Tt/tt); phenotype = the look (tall/short).

Final Answer: Genotype ⇒ C

Answer: (C) Go Back to Q23

Q24.

Solution

Concept — Colour blindness: Colour blindness is a sex-linked (X-linked) recessive disorder in which a person cannot distinguish certain colours, most often red and green. Because the gene lies on the X chromosome, it is far more common in males, who have only one X chromosome.

Step 1 — Read the clue: a sex-linked disorder with inability to tell colours apart.

Step 2 — Name it: colour blindness.

Why each other option is wrong:

- (A) Night blindness is poor vision in dim light, usually caused by a deficiency of vitamin A, not a sex-linked colour defect.
- (B) A cataract is a clouding of the eye lens that blurs vision; it is not a colour-distinguishing disorder.
- (C) Myopia (short-sightedness) is a focusing defect corrected by a concave lens; it is not about colour.

Key point: Colour blindness and haemophilia are the classic X-linked recessive disorders, commoner in males.

Final Answer: Colour blindness ⇒ D

Answer: (D) Go Back to Q24

Q25.

Solution

Concept — Sex determination in humans: A mother has two X chromosomes (XX) and can pass on only an X. A father has one X and one Y (XY) and can pass on either. If the child gets the father's X, it is XX (a girl); if it gets the father's Y, it is XY (a boy). So the father's contribution decides the child's sex.

Step 1 — Read the Punnett square: the father supplies X or Y; the mother always supplies X.

Step 2 — Trace the Y: a child receiving the father's Y chromosome becomes XY, which is a boy.

Why each other option is wrong:

- (B) A girl (XX) results when the child gets the father's *X*, not his Y.
- (C) The X case gives a girl, so this is incorrect for the Y case asked.
- (D) Sex is determined by the chromosome from the *father*, not the mother (the mother always gives X).

Key point: Father's X $\rightarrow$ girl (XX); father's Y $\rightarrow$ boy (XY). The father, not the mother, determines the child's sex.

Final Answer: A boy (XY) $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q25

Q26.

Solution

Concept — The DNA double helix: In 1953, James Watson and Francis Crick proposed that DNA is shaped like a double helix, two strands twisted around each other like a spiral ladder. The bases on the two strands pair specifically (A with T, G with C), holding the strands together. They built on the X-ray work of Rosalind Franklin and Maurice Wilkins.

Step 1 — Recall the model: the double-helix structure of DNA.

Step 2 — Name its proposers: James Watson and Francis Crick.

Why each other option is wrong:

- (A) Mendel founded genetics and Darwin proposed natural selection; neither gave the DNA structure.

- (C) Pasteur and Koch are famous for the germ theory of disease, not DNA structure.
- (D) De Vries proposed the mutation theory and Morgan worked on fruit-fly genetics; they did not propose the double helix.

Key point: Watson & Crick (1953) = DNA double helix; base pairing A–T and G–C holds the two strands together.

Final Answer: Watson and Crick $\Rightarrow$ B

Answer: (B) Go Back to Q26

Q27.

Solution

Concept — Polio: Poliomyelitis (polio) is caused by the poliovirus. It attacks the nervous system and can cause paralysis, mainly in young children. It spreads through contaminated food and water. It is prevented by the oral polio vaccine (OPV), the basis of the "Pulse Polio" programme.

Step 1 — Classify the pathogen: polio is caused by the poliovirus.

Step 2 — Pick the type: therefore it is a viral disease.

Why each other option is wrong:

- (A) Bacterial diseases include tuberculosis, typhoid, and cholera, not polio.
- (B) Protozoan diseases include malaria and amoebic dysentery, not polio.
- (D) Fungal diseases include ringworm and athlete's foot, not polio.

Key point: Polio = virus, prevented by the polio vaccine (OPV). Other viral diseases include AIDS, dengue, and influenza.

Final Answer: Virus $\Rightarrow$ C

Answer: (C) Go Back to Q27

Q28.

Solution

Concept — The BCG vaccine: BCG (Bacillus Calmette–Guérin) is a vaccine given soon after birth to protect against tuberculosis (TB), a bacterial disease caused by *Mycobacterium tuberculosis* that mainly affects the lungs. The vaccine helps the body build immunity against the TB bacterium.

Step 1 — Recall what BCG targets: the BCG vaccine is the TB vaccine.

Step 2 — Name the disease: tuberculosis.

Why each other option is wrong:

- (A) Measles is prevented by the measles (MMR) vaccine, not BCG.
- (B) Polio is prevented by the oral/injectable polio vaccine, not BCG.
- (C) Tetanus is prevented by the tetanus (DPT) vaccine, not BCG.

Key point: BCG $\rightarrow$ tuberculosis; DPT $\rightarrow$ diphtheria, whooping cough, tetanus; OPV $\rightarrow$ polio.

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

Answer: (D) Go Back to Q28

Q29.

Solution

Concept — Restriction enzymes: In genetic engineering, restriction enzymes (also called restriction endonucleases) act as "molecular scissors". Each one recognises a specific short sequence of DNA and cuts the DNA at that site. This lets scientists cut out a desired gene so it can be joined into a vector.

Step 1 — Read the figure: X cuts the DNA strand at a particular point, the action of molecular scissors.

Step 2 — Name it: the enzymes that cut DNA at specific sites are restriction enzymes.

Why each other option is wrong:

- (B) DNA ligase does the opposite job: it *joins* (glues) DNA pieces together, acting as "molecular glue".
- (C) DNA polymerase *builds* new DNA strands during replication; it does not cut DNA.

- (D) Amylase is a digestive enzyme that breaks down starch, unrelated to DNA.

Key point: Restriction enzymes = molecular scissors (cut DNA); DNA ligase = molecular glue (joins DNA).

Final Answer: Restriction enzymes $\Rightarrow$ A

Answer: (A) Go Back to Q29

Q30.

Solution

Concept — Decomposers: Decomposers are organisms, chiefly bacteria and fungi, that feed on dead plants and animals and on waste matter. By breaking down this dead organic matter, they release simple nutrients back into the soil, where plants can use them again. This keeps nutrients cycling through the ecosystem.

Step 1 — Read the figure: X breaks down dead matter and returns nutrients to the soil, the role of a decomposer.

Step 2 — Name them: bacteria and fungi that break down dead matter are decomposers.

Why each other option is wrong:

- (A) Producers are green plants that make their own food by photosynthesis; they do not break down dead matter.
- (B) Herbivores are plant-eating animals (consumers), not decomposers.
- (C) Carnivores are flesh-eating animals (consumers), not decomposers.

Key point: Decomposers (bacteria & fungi) recycle nutrients from dead matter, acting as nature's cleaners.

Final Answer: Decomposers $\Rightarrow$ D

Answer: (D) 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	D