

AIIMS B.Sc Nursing Biology

Sample Paper – 1

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 organelle shown below, often called the powerhouse of the cell because it produces most of the cell's ATP, is the:



- (A) mitochondrion
- (B) ribosome
- (C) nucleus
- (D) Golgi apparatus

Q2. Which cell organelle is the site of protein synthesis?

- (A) lysosome
- (B) ribosome
- (C) vacuole



(D) centriole

Q3. The cell wall of a plant cell is made up mainly of:

- (A) chitin
- (B) protein
- (C) cellulose
- (D) lipid

Q4. The monomer (building-block) units of proteins are:

- (A) glucose molecules
- (B) fatty acids
- (C) nucleotides
- (D) amino acids

Q5. The enzyme present in human saliva that begins the digestion of starch is:

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

Q6. In the five-kingdom classification, bacteria are placed in the kingdom:

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

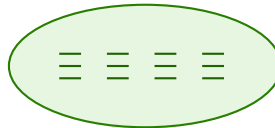
Q7. The basic (smallest) unit of biological classification is the:

- (A) genus



- (B) family
- (C) species
- (D) order

Q8. Photosynthesis in a plant cell takes place inside the organelle shown, which contains stacked green discs (grana). This organelle is the:



- (A) mitochondrion
- (B) nucleus
- (C) ribosome
- (D) chloroplast

Q9. The green pigment in plant leaves that traps light energy for photosynthesis is:

- (A) chlorophyll
- (B) haemoglobin
- (C) carotene
- (D) melanin

Q10. The loss of water in the form of vapour from the aerial parts (mainly leaves) of a plant is called:

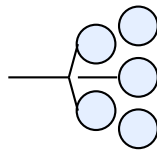
- (A) translocation
- (B) transpiration
- (C) respiration
- (D) guttation

Q11. The enzyme pepsin, secreted in the stomach, acts on:



- (A) carbohydrates
- (B) fats
- (C) proteins
- (D) nucleic acids

Q12. In the human lungs, the exchange of oxygen and carbon dioxide takes place across the thin walls of the tiny air sacs shown below. These air sacs are called:

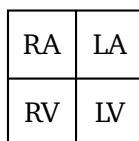


- (A) bronchi
- (B) trachea
- (C) larynx
- (D) alveoli

Q13. The largest gland in the human body, which secretes bile, is the:

- (A) liver
- (B) pancreas
- (C) salivary gland
- (D) thyroid gland

Q14. The human heart, shown schematically below, is divided into how many chambers?



- (A) two
- (B) four

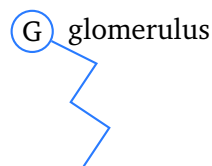


- (C) three
- (D) one

Q15. The red pigment in blood that binds and transports oxygen is:

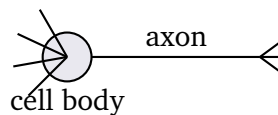
- (A) chlorophyll
- (B) myoglobin
- (C) haemoglobin
- (D) melanin

Q16. The structure shown, the functional and structural unit of the kidney where blood is filtered to form urine, is called the:



- (A) neuron
- (B) alveolus
- (C) villus
- (D) nephron

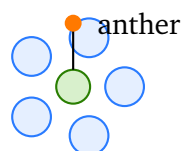
Q17. The structural and functional unit of the nervous system, shown below with its cell body, dendrites, and a long axon, is the:



- (A) neuron
- (B) nephron
- (C) nephridium
- (D) alveolus



- Q18.** The largest part of the human brain, responsible for thinking, memory, and voluntary actions, is the:
- (A) cerebellum
 - (B) cerebrum
 - (C) medulla oblongata
 - (D) pons
- Q19.** The hormone insulin, which lowers blood glucose, is secreted by the:
- (A) thyroid gland
 - (B) adrenal gland
 - (C) pancreas
 - (D) pituitary gland
- Q20.** In humans, fertilization of the egg by the sperm normally takes place in the:
- (A) uterus
 - (B) ovary
 - (C) vagina
 - (D) fallopian tube (oviduct)
- Q21.** In the flower shown, the male reproductive part that produces pollen grains is the:



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



(D) style

Q22. The female reproductive part of a flower, made up of the stigma, style, and ovary, is the:

- (A) stamen
- (B) pistil (carpel)
- (C) petal
- (D) sepal

Q23. The unit of heredity that carries information from parents to offspring is the:

- (A) chromosome
- (B) nucleotide
- (C) gene
- (D) ribosome

Q24. The DNA molecule, shown below as a double helix, is a polymer made up of repeating units called:



- (A) amino acids
- (B) genes
- (C) monosaccharides
- (D) nucleotides

Q25. In a Mendelian monohybrid cross between two heterozygous tall plants ($Tt \times Tt$), shown in the Punnett square, the phenotypic ratio of tall to short plants in the F_2 generation is:

	T	t
T	TT	Tt
t	Tt	tt



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

Q26. The theory of evolution by natural selection was proposed by:

- (A) Jean-Baptiste Lamarck
- (B) Gregor Mendel
- (C) Charles Darwin
- (D) Hugo de Vries

Q27. Malaria in humans is caused by a protozoan parasite of the genus:

- (A) Salmonella
- (B) Plasmodium
- (C) Mycobacterium
- (D) Vibrio

Q28. Which one of the following is a viral disease?

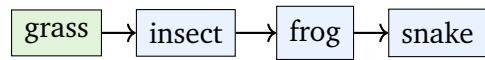
- (A) tuberculosis
- (B) typhoid
- (C) malaria
- (D) AIDS

Q29. The bacterium most commonly used as a host in recombinant DNA technology and genetic engineering is:

- (A) Escherichia coli
- (B) Lactobacillus
- (C) Rhizobium
- (D) Clostridium



Q30. The sequence shown below, through which energy passes from one organism to the next in an ecosystem, is called a:



- (A) food web
- (B) ecological pyramid
- (C) food chain
- (D) trophic level



Detailed Solutions

Q1.

Solution

Concept — Mitochondria, the powerhouse of the cell: The mitochondrion is a double-membrane organelle where aerobic respiration occurs. Its inner membrane is folded into cristae that carry the electron transport chain, where most of the cell's ATP (energy currency) is generated. Because it supplies this energy, 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, matching the "powerhouse" description.

Why each other option is wrong:

- (B) The ribosome is the site of protein synthesis, not energy production.
- (C) The nucleus controls the cell and stores DNA; it does not make ATP.
- (D) The Golgi apparatus packages and dispatches proteins.

Key point: Mitochondria have their own DNA and a double membrane; "powerhouse of the cell" always points to the mitochondrion.

Final Answer: Mitochondrion ⇒

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

Q2.

Solution

Concept — Ribosomes and protein synthesis: Ribosomes are tiny granular structures made of RNA and protein. They read the messenger RNA and join amino acids in order to build polypeptide chains, so they are the site of translation (protein synthesis). They may float free in the cytoplasm or attach to the rough endoplasmic reticulum.

Step 1 — Identify the function asked: the question wants the organelle that makes proteins.

Step 2 — Match it: ribosomes assemble amino acids into proteins, so they are the answer.



Why each other option is wrong:

- (A) The lysosome contains digestive enzymes that break down waste, not build proteins.
- (C) The vacuole stores water, food, or waste.
- (D) The centriole helps form the spindle during cell division.

Key point: Ribosomes are the "protein factories" of the cell; rough ER is studded with them precisely for protein synthesis.

Final Answer: Ribosome ⇒

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

Q3.

Solution

Concept — The plant cell wall: A plant cell has a rigid wall outside its plasma membrane that gives the cell shape and support. This wall is made mainly of cellulose, a polysaccharide of glucose units. Animal cells lack a cell wall.

Step 1 — Recall the composition: the chief structural material of a plant cell wall is cellulose.

Step 2 — Confirm: cellulose fibres make the wall strong yet permeable to water and solutes.

Why each other option is wrong:

- (A) Chitin makes the cell wall of fungi and the exoskeleton of insects, not plant walls.
- (B) Protein is a cell component but not the main wall material.
- (D) Lipids form the plasma membrane, not the cell wall.

Key point: Plant cell wall = cellulose; fungal wall = chitin; bacterial wall = peptidoglycan. Keep these three apart.

Final Answer: Cellulose ⇒

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



Q4.

Solution

Concept — Monomers of proteins: Proteins are large polymers built from small repeating units joined by peptide bonds. These monomer units are amino acids, each carrying an amino group and a carboxyl group. There are 20 standard amino acids.

Step 1 — Identify the polymer: proteins are polypeptides.

Step 2 — Identify the monomer: the repeating unit of a protein is the amino acid.

Why each other option is wrong:

- (A) Glucose molecules are the monomers of carbohydrates (polysaccharides).
- (B) Fatty acids (with glycerol) build up fats and lipids.
- (C) Nucleotides are the monomers of nucleic acids (DNA and RNA).

Key point: Match the biomolecule to its monomer: proteins \leftarrow amino acids, carbohydrates \leftarrow monosaccharides, nucleic acids \leftarrow nucleotides, fats \leftarrow fatty acids + glycerol.

Final Answer: Amino acids \Rightarrow

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

Q5.

Solution

Concept — Salivary amylase: Digestion of food begins in the mouth. Saliva contains the enzyme salivary amylase (ptyalin), which breaks down starch into smaller sugars (maltose). Each digestive enzyme acts on one type of food, and amylase is specific for carbohydrates.

Step 1 — Identify the food being digested: the question is about starch (a carbohydrate).

Step 2 — Match the enzyme: the salivary enzyme that digests starch is amylase.

Why each other option is wrong:

- (B) Pepsin acts on proteins in the stomach.
- (C) Trypsin acts on proteins in the small intestine.



- (D) Lipase acts on fats.

Key point: Amylase → starch, pepsin/trypsin → proteins, lipase → fats. Saliva starts carbohydrate digestion with amylase.

Final Answer: Salivary amylase ⇒

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

Q6.

Solution

Concept — Five-kingdom classification: R. H. Whittaker divided living organisms into five kingdoms: Monera, Protista, Fungi, Plantae, and Animalia. Bacteria are prokaryotes (no true nucleus) and are placed in the kingdom Monera.

Step 1 — Identify the feature of bacteria: bacteria are unicellular prokaryotes.

Step 2 — Match the kingdom: all prokaryotes (bacteria, cyanobacteria) belong to Monera.

Why each other option is wrong:

- (A) Protista holds unicellular eukaryotes (e.g. Amoeba, Paramecium).
- (C) Fungi includes moulds, yeasts, and mushrooms.
- (D) Plantae holds multicellular photosynthetic plants.

Key point: Monera = the only kingdom of prokaryotes. If a cell has no true nucleus, it is Monera.

Final Answer: Monera ⇒

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

Q7.

Solution

Concept — The unit of classification: Organisms are classified in a hierarchy: Kingdom → Phylum → Class → Order → Family → Genus → Species. The species is the basic (smallest) unit, a group of similar organisms that can interbreed and produce fertile offspring.

Step 1 — Recall the hierarchy: species sits at the bottom, as the most specific level.



Step 2 — Conclusion: the basic unit of classification is the species.

Why each other option is wrong:

- (A) A genus is a group of related species, so it is broader than a species.
- (B) A family groups related genera.
- (D) An order groups related families, broader still.

Key point: In binomial nomenclature a name has two parts, genus and species (e.g. *Homo sapiens*); the species is the basic unit.

Final Answer: Species ⇒

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

Q8.

Solution

Concept — The chloroplast: Photosynthesis is the process by which green plants make glucose from carbon dioxide and water using light energy. It takes place in the chloroplast, a green organelle containing chlorophyll arranged in stacked discs called grana.

Step 1 — Read the figure: the green oval with stacked discs (grana) is the chloroplast.

Step 2 — Link to function: chlorophyll in the grana captures light, so photosynthesis happens here.

Why each other option is wrong:

- (A) The mitochondrion carries out respiration (releases energy), not photosynthesis.
- (B) The nucleus controls the cell and stores DNA.
- (C) The ribosome makes proteins.

Key point: Chloroplast = photosynthesis (food-making); mitochondrion = respiration (energy-releasing). Do not swap the two.

Final Answer: Chloroplast ⇒

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



Q9.

Solution

Concept — Chlorophyll: Chlorophyll is the green pigment found in the chloroplasts of plant leaves. It absorbs mainly red and blue light and reflects green, which is why leaves look green. The trapped light energy drives photosynthesis.

Step 1 — Identify the role: the pigment that traps light for photosynthesis.

Step 2 — Match it: chlorophyll is that green light-trapping pigment.

Why each other option is wrong:

- (B) Haemoglobin is the red pigment in blood that carries oxygen, found in animals.
- (C) Carotene is an orange accessory pigment; it helps but is not the main one named here.
- (D) Melanin is the dark pigment of skin and hair in animals.

Key point: Chlorophyll (green, plants) traps light; haemoglobin (red, blood) carries oxygen. Keep plant and animal pigments separate.

Final Answer: Chlorophyll \Rightarrow

[Go Back to Q9](#)

Q10.

Solution

Concept — Transpiration: Transpiration is the loss of water as vapour from the aerial parts of a plant, mainly through the tiny pores (stomata) in the leaves. It creates a pull that helps draw water up from the roots and also cools the plant.

Step 1 — Identify the process: loss of water vapour from leaves.

Step 2 — Name it: this is transpiration.

Why each other option is wrong:

- (A) Translocation is the transport of food (sugars) through the phloem.
- (C) Respiration is the release of energy from food, giving out CO₂.
- (D) Guttation is the loss of liquid water droplets (not vapour) from leaf margins.

Key point: Transpiration loses water as *vapour* through stomata; guttation loses *liquid* water. The transpiration pull drives the ascent of sap.



Final Answer: Transpiration \Rightarrow

Answer: (B) [Go Back to Q10](#)

Q11.

Solution

Concept — Pepsin: Pepsin is a protein-digesting enzyme secreted by the gastric glands of the stomach. It works best in the acidic environment created by hydrochloric acid and breaks proteins into smaller peptides.

Step 1 — Identify the enzyme type: pepsin is a protease (protein-digesting enzyme).

Step 2 — State the substrate: it therefore acts on proteins.

Why each other option is wrong:

- (A) Carbohydrates are digested by amylase, not pepsin.
- (B) Fats are digested by lipase (helped by bile).
- (D) Nucleic acids are digested by nucleases, not pepsin.

Key point: Pepsin needs the acidic stomach to work and digests proteins; HCl activates it from its inactive form pepsinogen.

Final Answer: Proteins \Rightarrow

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

Q12.

Solution

Concept — Alveoli and gas exchange: The lungs end in millions of tiny, thin-walled air sacs called alveoli. Their thin walls and rich blood supply make them the site where oxygen passes into the blood and carbon dioxide passes out, the actual exchange of gases.

Step 1 — Read the figure: the grape-like cluster of tiny sacs at the end of an airway represents the alveoli.

Step 2 — Link to function: their large total surface area and thin walls allow efficient gas exchange.

Why each other option is wrong:



- (A) The bronchi are the two large tubes carrying air into each lung; no exchange there.
- (B) The trachea (windpipe) only conducts air.
- (C) The larynx (voice box) produces sound and conducts air.

Key point: Bronchi and trachea are conducting passages; the alveoli are the only site of actual gas exchange.

Final Answer: Alveoli ⇒

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

Q13.

Solution

Concept — The liver: The liver is the largest gland and the largest internal organ in the human body. It secretes bile, which is stored in the gall bladder and helps emulsify fats. The liver also stores glycogen and detoxifies harmful substances.

Step 1 — Identify the clue: "largest gland" that "secretes bile".

Step 2 — Name it: this is the liver.

Why each other option is wrong:

- (B) The pancreas is a gland but smaller, secreting digestive enzymes and insulin.
- (C) The salivary glands are small glands in the mouth.
- (D) The thyroid is an endocrine gland in the neck.

Key point: Liver = largest gland, makes bile; pancreas = both a digestive (enzymes) and an endocrine (insulin) gland.

Final Answer: Liver ⇒

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



Q14.

Solution

Concept — Chambers of the human heart: The human heart has four chambers: two upper atria (right and left) that receive blood, and two lower ventricles (right and left) that pump it out. This four-chambered design keeps oxygenated and deoxygenated blood completely separate (double circulation).

Step 1 — Read the figure: the heart is divided into four boxes (RA, LA, RV, LV).

Step 2 — Count: two atria + two ventricles = four chambers.

Why each other option is wrong:

- (A) Two chambers describe a fish heart.
- (C) Three chambers describe an amphibian (frog) heart.
- (D) One chamber would not allow separation of blood at all.

Key point: Humans (and other mammals and birds) have a four-chambered heart, which fully separates pure and impure blood.

Final Answer: Four \Rightarrow

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

Q15.

Solution

Concept — Haemoglobin: Haemoglobin is the red, iron-containing pigment present in red blood cells. It binds oxygen in the lungs to form oxyhaemoglobin and carries it to the tissues, also helping carry some carbon dioxide back.

Step 1 — Identify the role: the blood pigment that transports oxygen.

Step 2 — Name it: haemoglobin.

Why each other option is wrong:

- (A) Chlorophyll is the green pigment in plants, not blood.
- (B) Myoglobin stores oxygen in muscle, but the main oxygen carrier in blood is haemoglobin.
- (D) Melanin is the dark pigment of skin and hair.

Key point: Haemoglobin contains iron; a low haemoglobin level causes anaemia, reducing the blood's oxygen-carrying capacity.



Final Answer: Haemoglobin \Rightarrow

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

Q16.

Solution

Concept — The nephron: Each kidney contains about a million microscopic units called nephrons. A nephron has a cup-shaped Bowman's capsule enclosing a ball of capillaries (the glomerulus) followed by a long tubule. Blood is filtered in the glomerulus and the filtrate is processed along the tubule to form urine.

Step 1 — Read the figure: the ball of capillaries (glomerulus) leading into a coiled tubule is one nephron.

Step 2 — State its role: the nephron is the structural and functional unit of the kidney.

Why each other option is wrong:

- (A) The neuron is the unit of the nervous system.
- (B) The alveolus is the gas-exchange unit of the lung.
- (C) The villus increases absorption surface in the small intestine.

Key point: Take care: neuron (nervous system) and nephron (kidney) sound alike but are completely different units.

Final Answer: Nephron \Rightarrow

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

Q17.

Solution

Concept — The neuron: The neuron (nerve cell) is the structural and functional unit of the nervous system. It has a cell body with branched dendrites that receive impulses and a long axon that carries the impulse away to the next cell across a synapse.

Step 1 — Read the figure: a cell body with dendrites and a single long axon is a neuron.

Step 2 — State its role: it conducts nerve impulses, so it is the unit of the nervous system.



Why each other option is wrong:

- (B) The nephron is the unit of the kidney.
- (C) A nephridium is an excretory organ in earthworms, not a nerve cell.
- (D) The alveolus is the gas-exchange unit of the lung.

Key point: Dendrites receive, the axon transmits; the neuron is the nervous system's basic unit. Do not confuse neuron with nephron.

Final Answer: Neuron \Rightarrow

Answer: (A) [Go Back to Q17](#)

Q18.

Solution

Concept — The cerebrum: The human brain has three main parts: cerebrum, cerebellum, and medulla oblongata. The cerebrum is the largest part and controls thinking, memory, intelligence, and all voluntary actions.

Step 1 — Identify the largest part: the cerebrum forms most of the brain's bulk.

Step 2 — Confirm by function: thinking and voluntary control are cerebral functions.

Why each other option is wrong:

- (A) The cerebellum controls balance and coordinates muscular activity.
- (C) The medulla oblongata controls involuntary actions such as heartbeat and breathing.
- (D) The pons relays signals between parts of the brain.

Key point: Cerebrum = thinking/voluntary; cerebellum = balance/coordination; medulla = involuntary vital functions.

Final Answer: Cerebrum \Rightarrow

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



Q19.

Solution

Concept — Insulin: Insulin is a hormone secreted by the beta cells of the islets of Langerhans in the pancreas. It lowers blood glucose by helping cells take up glucose and by storing it as glycogen. Too little insulin causes the disease diabetes mellitus.

Step 1 — Identify the hormone's job: insulin lowers blood sugar.

Step 2 — Name the gland: it is made in the pancreas.

Why each other option is wrong:

- (A) The thyroid secretes thyroxine, which controls metabolism.
- (B) The adrenal gland secretes adrenaline, the emergency hormone.
- (D) The pituitary is the master gland and secretes growth hormone.

Key point: The pancreas is a dual gland: it makes digestive enzymes (exocrine) and the hormones insulin and glucagon (endocrine).

Final Answer: Pancreas ⇒ C

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

Q20.

Solution

Concept — Site of fertilization: In humans, the egg released from the ovary travels into the fallopian tube (oviduct). Sperm swim up to meet it there, so fertilization normally occurs in the fallopian tube. The resulting zygote then moves to the uterus and implants.

Step 1 — Trace the path: ovary releases the egg into the fallopian tube.

Step 2 — Locate fertilization: sperm and egg meet in the fallopian tube.

Why each other option is wrong:

- (A) The uterus is where the embryo implants and develops, after fertilization.
- (B) The ovary produces and releases the egg but is not where fertilization happens.
- (C) The vagina receives the sperm but is not the site of fertilization.

Key point: Fertilization → fallopian tube; implantation and development →



uterus. Keep these two locations distinct.

Final Answer: Fallopian tube \Rightarrow

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

Q21.

Solution

Concept — The anther: In a flower the stamen (male part) has two regions: a stalk called the filament and a sac-like tip called the anther. The anther produces pollen grains, which carry the male gametes.

Step 1 — Read the figure: the small sac at the top of a stalk, set among the petals, is the anther.

Step 2 — State its role: the anther makes pollen, so it is the male reproductive part.

Why each other option is wrong:

- (B) The stigma is the sticky tip of the female part that receives pollen.
- (C) The ovary is the female part that contains ovules.
- (D) The style is the stalk of the female part connecting stigma to ovary.

Key point: Male part = stamen = anther + filament; the anther is where pollen forms. Female part = pistil = stigma + style + ovary.

Final Answer: Anther \Rightarrow

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

Q22.

Solution

Concept — The pistil: The female reproductive part of a flower is the pistil (or carpel). It has three regions: the stigma (which receives pollen), the style (a stalk), and the ovary (which holds the ovules that become seeds).

Step 1 — Identify the female part: the structure with stigma, style, and ovary.

Step 2 — Name it: this is the pistil (carpel).

Why each other option is wrong:

- (A) The stamen is the *male* part (anther + filament).



- (C) The petal is a colourful, non-reproductive part that attracts pollinators.
- (D) The sepal is the green, leaf-like part that protects the bud.

Key point: Pistil (female) = stigma + style + ovary; stamen (male) = anther + filament. Petals and sepals are accessory whorls.

Final Answer: Pistil \Rightarrow

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

Q23.

Solution

Concept — The gene: A gene is a segment of DNA that carries the information for a particular trait. It is the unit of heredity, passed from parents to offspring, and many genes lie along each chromosome.

Step 1 — Identify the unit of heredity: the smallest part of DNA coding a trait.

Step 2 — Name it: the gene.

Why each other option is wrong:

- (A) A chromosome is a long thread of DNA carrying many genes; it is larger than a single hereditary unit.
- (B) A nucleotide is the chemical building block of DNA, not the unit of heredity.
- (D) The ribosome is an organelle for protein synthesis.

Key point: DNA \rightarrow genes \rightarrow traits. A gene is a length of DNA; an allele is one form of a gene.

Final Answer: Gene \Rightarrow

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



Q24.

Solution

Concept — Structure of DNA: DNA (deoxyribonucleic acid) is a double helix made of two strands. Each strand is a chain of repeating units called nucleotides. A nucleotide has three parts: a deoxyribose sugar, a phosphate group, and a nitrogenous base (A, T, G, or C).

Step 1 — Read the figure: the two twisted strands with cross-rungs represent the DNA double helix.

Step 2 — Name the repeating unit: each strand is a polymer of nucleotides.

Why each other option is wrong:

- (A) Amino acids are the monomers of proteins, not DNA.
- (B) Genes are segments of DNA (made of many nucleotides), not the basic monomer.
- (C) Monosaccharides are the monomers of carbohydrates.

Key point: DNA monomer = nucleotide = sugar + phosphate + base. The bases pair A–T and G–C across the two strands.

Final Answer: Nucleotides \Rightarrow

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

Q25.

Solution

Concept — Monohybrid cross: Mendel crossed plants differing in one trait. Crossing two heterozygotes ($Tt \times Tt$) gives offspring in the genotype ratio 1 TT : 2 Tt : 1 tt. Since T (tall) is dominant over t (short), TT and Tt are both tall, giving a phenotypic ratio of 3 tall : 1 short.

Step 1 — Fill the Punnett square: the four boxes are TT, Tt, Tt, tt.

Step 2 — Group by phenotype: TT, Tt, Tt are tall (3) and tt is short (1).

Step 3 — Write the ratio: tall : short = 3 : 1.

Why each other option is wrong:

- (B) 1 : 1 is the ratio from a test cross ($Tt \times tt$).
- (C) 9 : 3 : 3 : 1 is the F_2 ratio of a *dihybrid* cross (two traits).
- (D) 1 : 2 : 1 is the *genotype* ratio, not the phenotype ratio.



Key point: Monohybrid F_2 : genotype 1 : 2 : 1, phenotype 3 : 1. Dihybrid F_2 phenotype is 9 : 3 : 3 : 1.

Final Answer: 3 : 1 \Rightarrow

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

Q26.

Solution

Concept — Natural selection: Charles Darwin, in his book *On the Origin of Species*, proposed that evolution occurs through natural selection: individuals with favourable variations survive and reproduce more, so those traits become common over generations.

Step 1 — Recall the theory: "survival of the fittest" through natural selection.

Step 2 — Name its author: Charles Darwin.

Why each other option is wrong:

- (A) Lamarck proposed inheritance of acquired characters, a different (and now rejected) idea.
- (B) Mendel is the father of genetics, known for inheritance laws, not natural selection.
- (D) Hugo de Vries proposed the mutation theory of evolution.

Key point: Darwin = natural selection; Lamarck = acquired characters; de Vries = mutations; Mendel = genetics.

Final Answer: Charles Darwin \Rightarrow

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

Q27.

Solution

Concept — Cause of malaria: Malaria is caused by a protozoan parasite of the genus *Plasmodium*. It is transmitted by the bite of an infected female *Anopheles* mosquito, which acts as the vector.

Step 1 — Identify the pathogen type: malaria is caused by a protozoan, not a bacterium or virus.

Step 2 — Name the genus: *Plasmodium*.



Why each other option is wrong:

- (A) *Salmonella* is a bacterium that causes typhoid.
- (C) *Mycobacterium* causes tuberculosis (a bacterial disease).
- (D) *Vibrio* causes cholera (a bacterial disease).

Key point: Malaria = *Plasmodium* (protozoan), spread by the female *Anopheles* mosquito. The mosquito is only the carrier (vector).

Final Answer: *Plasmodium* ⇒

[Go Back to Q27](#)

Q28.

Solution

Concept — Viral diseases: Diseases are grouped by the type of pathogen that causes them. AIDS (acquired immunodeficiency syndrome) is caused by the human immunodeficiency virus (HIV), so it is a viral disease.

Step 1 — Classify each option by pathogen: tuberculosis (bacterium), typhoid (bacterium), malaria (protozoan), AIDS (virus).

Step 2 — Pick the viral one: only AIDS is caused by a virus.

Why each other option is wrong:

- (A) Tuberculosis is a bacterial disease (*Mycobacterium tuberculosis*).
- (B) Typhoid is a bacterial disease (*Salmonella typhi*).
- (C) Malaria is a protozoan disease (*Plasmodium*).

Key point: AIDS, influenza, dengue, polio, and the common cold are viral; tuberculosis, typhoid, cholera, and tetanus are bacterial.

Final Answer: AIDS ⇒

[Go Back to Q28](#)



Q29.

Solution

Concept — Host in genetic engineering: In recombinant DNA technology, a desired gene is inserted into a vector (often a plasmid) and introduced into a host bacterium that multiplies and expresses it. The bacterium *Escherichia coli* (*E. coli*) is the most commonly used host because it grows fast and is well studied.

Step 1 — Identify the need: a fast-growing, well-understood host cell.

Step 2 — Name it: *Escherichia coli*.

Why each other option is wrong:

- (B) *Lactobacillus* is used to make curd, not as the standard gene-cloning host.
- (C) *Rhizobium* fixes nitrogen in legume roots.
- (D) *Clostridium* is associated with fermentation and certain diseases.

Key point: *E. coli* is the workhorse host of genetic engineering; human insulin was first made commercially using *E. coli*.

Final Answer: *Escherichia coli* ⇒

Answer: (A) [Go Back to Q29](#)

Q30.

Solution

Concept — Food chain: A food chain is a straight-line sequence showing how energy and nutrients pass from one organism to the next: from producers (green plants) to herbivores to carnivores. Each step is a trophic level, and energy flows one way along the chain.

Step 1 — Read the figure: grass → insect → frog → snake is a single linear sequence.

Step 2 — Name it: such a single linear sequence is a food chain.

Why each other option is wrong:

- (A) A food web is a network of many interconnected food chains, not a single line.
- (B) An ecological pyramid is a graphical representation of numbers, biomass, or energy.
- (D) A trophic level is one feeding step within a chain, not the whole sequence.



Key point: Food chain = one linear path; food web = many chains linked together.
Only about 10% of energy passes to the next level.

Final Answer: Food chain ⇒

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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	C	27	B	28	D	29	A	30	C

