

# AIIMS B.Sc Nursing Biology

## Sample Paper – 4

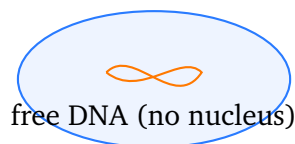
Duration: 36 Minutes

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 simple cell shown below has its genetic material (DNA) lying free in the cytoplasm with no surrounding membrane. An organism made of such cells, lacking a true membrane-bound nucleus, is called a:



- (A) prokaryote
- (B) eukaryote
- (C) protist
- (D) fungus

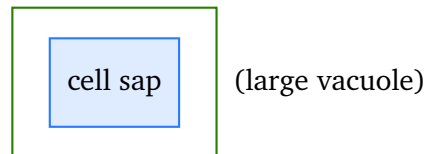
**Q2.** During the division of an animal cell, the organelle that organises the microtubules and helps form the spindle fibres is the:

- (A) ribosome



- (B) centriole
- (C) lysosome
- (D) vacuole

**Q3.** In the plant cell shown, the large central structure (shaded) is filled with cell sap. It stores water and solutes and keeps the cell firm (turgid). This structure is the:



- (A) nucleus
- (B) chloroplast
- (C) central vacuole
- (D) mitochondrion

**Q4.** Glucose, the simple sugar that cannot be broken down into smaller sugar units by hydrolysis, is classified as a:

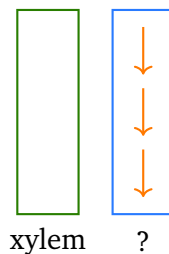
- (A) disaccharide
- (B) polysaccharide
- (C) lipid
- (D) monosaccharide

**Q5.** The water-soluble vitamin found in citrus fruits and amla, known chemically as ascorbic acid, is:

- (A) vitamin C
- (B) vitamin A
- (C) vitamin D
- (D) vitamin K

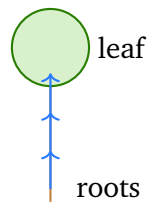


- Q6.** Animals such as fish, frogs, lizards, birds, and mammals all possess a backbone (vertebral column). Such animals are collectively called:
- (A) invertebrates
  - (B) vertebrates
  - (C) arthropods
  - (D) molluscs
- Q7.** Animals that have feathers, a beak, and forelimbs modified into wings, such as the pigeon and the crow, belong to the class:
- (A) Mammalia
  - (B) Reptilia
  - (C) Aves
  - (D) Amphibia
- Q8.** In the plant stem shown below, the food (sugars) made in the leaves is carried to other parts through the tissue marked with the downward arrows. This conducting tissue is the:



- (A) xylem
  - (B) cambium
  - (C) epidermis
  - (D) phloem
- Q9.** Water absorbed by the roots rises all the way up to the leaves of a tall tree. As shown by the upward arrows, this ascent of sap is mainly helped by the suction created when water evaporates from the leaves. This force is called:



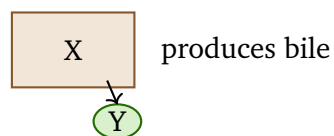


- (A) transpiration pull
- (B) root pressure alone
- (C) gravity
- (D) active transport of water

**Q10.** The plant hormone that causes cells to elongate and makes a shoot bend towards a source of light is:

- (A) abscisic acid
- (B) auxin
- (C) ethylene
- (D) cytokinin

**Q11.** In the figure, organ X makes a greenish-yellow fluid that is then stored in the small sac Y before being released into the intestine. Organ X (which produces bile) is the:



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

**Q12.** When starch is completely digested in the human alimentary canal, the final simple sugar that is absorbed into the blood is:

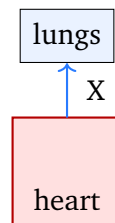


- (A) maltose
- (B) sucrose
- (C) cellulose
- (D) glucose

**Q13.** A complete set of teeth in a normal healthy adult human, counting incisors, canines, premolars, and molars in both jaws, numbers:

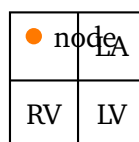
- (A) 32
- (B) 20
- (C) 28
- (D) 16

**Q14.** In the diagram, the vessel marked X carries blood from the right ventricle of the heart to the lungs. Although it is an artery, the blood it carries is deoxygenated. This vessel is the:



- (A) pulmonary vein
- (B) pulmonary artery
- (C) aorta
- (D) vena cava

**Q15.** The heartbeat starts on its own from a small patch of special tissue in the wall of the right atrium, marked in the figure. Because it sets the rhythm of the heart, this natural pacemaker is the:

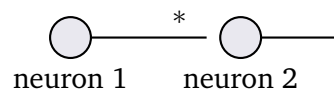


- (A) AV node
- (B) Purkinje fibres
- (C) SA node
- (D) bundle of His

**Q16.** The chief nitrogenous waste product that is filtered out by the kidneys and removed from the human body in urine is:

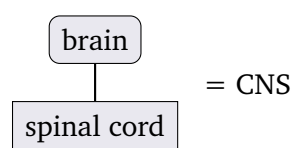
- (A) ammonia
- (B) uric acid
- (C) carbon dioxide
- (D) urea

**Q17.** In the figure, an impulse travels along the first neuron and must cross the tiny gap (marked \*) to reach the next neuron. This functional junction between two neurons is called the:



- (A) synapse
- (B) axon
- (C) dendrite
- (D) nerve

**Q18.** The nervous system is divided into a central part and a peripheral part. As shown below, the central nervous system (CNS) is made up of two organs. These two organs are the:



- (A) heart and lungs

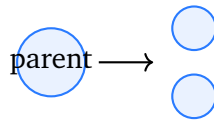


- (B) brain and spinal cord
- (C) brain and nerves
- (D) spinal cord and nerves

**Q19.** Growth hormone, which controls the overall growth of the body and the height of a person, is secreted by the:

- (A) thyroid gland
- (B) adrenal gland
- (C) pituitary gland
- (D) pancreas

**Q20.** In the figure, a single parent organism divides by itself to give rise to new individuals, without the fusion of any gametes. This type of reproduction is called:



- (A) sexual reproduction
- (B) fertilisation
- (C) pollination
- (D) asexual reproduction

**Q21.** After fertilisation in a flowering plant, the part of the flower that develops into the seed is the:

- (A) ovule
- (B) ovary wall
- (C) anther
- (D) petal

**Q22.** The normal length of pregnancy (gestation period) in human beings, counted from fertilisation to birth, is about:

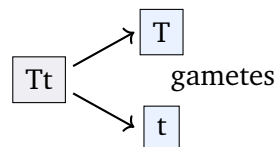


- (A) six months
- (B) nine months
- (C) twelve months
- (D) three months

**Q23.** In genetics, the outward, observable feature of an organism, such as the tallness of a plant or the colour of a flower, is called its:

- (A) genotype
- (B) allele
- (C) phenotype
- (D) chromosome

**Q24.** In the figure, a parent plant with the gene pair (Tt) forms gametes. Each gamete receives only one of the two alleles, so the alleles separate during gamete formation. This is Mendel's law of:



- (A) dominance
- (B) independent assortment
- (C) incomplete dominance
- (D) segregation

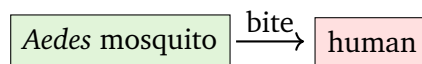
**Q25.** A sudden, heritable change in the DNA (genetic material) of an organism, which can produce a new trait, is called a:

- (A) mutation
- (B) variation by adaptation
- (C) fertilisation
- (D) respiration



- Q26.** The idea that characters acquired by an organism during its lifetime (such as the long neck of a giraffe) can be passed on to its offspring was proposed by:
- (A) Charles Darwin
  - (B) Jean-Baptiste Lamarck
  - (C) Gregor Mendel
  - (D) Hugo de Vries

- Q27.** In the figure, a virus is transmitted to humans through the bite of the *Aedes* mosquito, causing high fever with severe joint pain. This viral disease spread by the *Aedes* mosquito is:

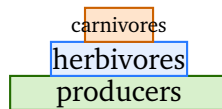


- (A) tuberculosis
  - (B) cholera
  - (C) dengue
  - (D) typhoid
- Q28.** The deficiency disease marked by bleeding, spongy gums and slow healing of wounds, caused by a prolonged lack of vitamin C in the diet, is:
- (A) rickets
  - (B) beri-beri
  - (C) night blindness
  - (D) scurvy
- Q29.** An organism whose genes (DNA) have been deliberately altered in the laboratory using genetic engineering, such as Bt cotton, is called a:
- (A) genetically modified organism (GMO)
  - (B) hybrid by natural breeding



- (C) clone formed naturally
- (D) mutant formed by radiation in the wild

**Q30.** The figure shows the numbers (or biomass or energy) at each feeding level of an ecosystem stacked one above another, narrowing towards the top. Such a graphical representation across trophic levels is called an:



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



**Detailed Solutions**

Q1.

**Solution**

**Concept — Prokaryotic cells:** A prokaryote is an organism whose cell has no true, membrane-bound nucleus. Its single circular DNA lies free in the cytoplasm in a region called the nucleoid, and it also lacks membrane-bound organelles such as mitochondria and chloroplasts. Bacteria and cyanobacteria are prokaryotes.

**Step 1 — Read the figure:** the DNA is shown loose in the cytoplasm with no membrane around it, so there is no nucleus.

**Step 2 — Match the term:** a cell with no true nucleus belongs to a prokaryote.

**Why each other option is wrong:**

- (B) A eukaryote does have a true membrane-bound nucleus (e.g. plants, animals, fungi).
- (C) A protist is a eukaryote (e.g. *Amoeba*), so it has a nucleus.
- (D) A fungus is also a eukaryote with a proper nucleus.

**Key point:** Prokaryote = no true nucleus (bacteria); eukaryote = true nucleus present. The dividing line is the nuclear membrane.

**Final Answer:** Prokaryote ⇒

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

Q2.

**Solution**

**Concept — The centriole:** Centrioles are small cylindrical structures found in pairs near the nucleus of an animal cell. During cell division they move to opposite poles and organise the microtubules that form the spindle fibres, which pull the chromosomes apart.

**Step 1 — Identify the function asked:** the organelle that forms the spindle during animal cell division.

**Step 2 — Match it:** centrioles organise the spindle apparatus, so they are the answer.

**Why each other option is wrong:**

- (A) The ribosome is the site of protein synthesis, not spindle formation.



- (C) The lysosome contains digestive enzymes that break down waste.
- (D) The vacuole stores water, food, or waste materials.

**Key point:** Centrioles form the spindle in animal cells; typical plant cells lack centrioles yet still form a spindle by other means.

**Final Answer:** Centriole ⇒

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

Q3.

### Solution

**Concept — The central vacuole:** A mature plant cell has one large central vacuole that may fill most of the cell. It is bounded by a membrane (tonoplast) and is filled with cell sap (water, sugars, salts, and pigments). By taking up water it presses on the cell wall and keeps the cell firm, that is, turgid.

**Step 1 — Read the figure:** the big shaded sac labelled "cell sap" inside the plant cell is the central vacuole.

**Step 2 — Link to function:** it stores cell sap and provides turgidity (firmness) to the cell.

**Why each other option is wrong:**

- (A) The nucleus controls the cell and stores DNA; it does not store cell sap.
- (B) The chloroplast carries out photosynthesis.
- (D) The mitochondrion releases energy through respiration.

**Key point:** The large central vacuole stores cell sap and keeps a plant cell turgid; loss of this water makes the plant wilt.

**Final Answer:** Central vacuole ⇒

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



Q4.

**Solution**

**Concept — Monosaccharides:** Carbohydrates are grouped by how many simple sugar units they contain. A monosaccharide is the simplest carbohydrate; it has a single sugar unit and cannot be broken down further by hydrolysis. Glucose, fructose, and galactose are monosaccharides.

**Step 1 — Recall the definition:** a single sugar unit that cannot be hydrolysed is a monosaccharide.

**Step 2 — Classify glucose:** glucose is one such simple sugar, so it is a monosaccharide.

**Why each other option is wrong:**

- (A) A disaccharide has two sugar units (e.g. sucrose, maltose).
- (B) A polysaccharide has many sugar units (e.g. starch, cellulose).
- (C) A lipid is a fat, not a carbohydrate at all.

**Key point:** Glucose = monosaccharide (1 unit); sucrose = disaccharide (2 units); starch = polysaccharide (many units).

**Final Answer:** Monosaccharide ⇒

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

Q5.

**Solution**

**Concept — Vitamin C (ascorbic acid):** Vitamin C is a water-soluble vitamin whose chemical name is ascorbic acid. It is found in citrus fruits, amla, and green vegetables. It is needed for healthy gums, blood vessels, and the healing of wounds, and its lack causes scurvy.

**Step 1 — Read the clue:** the vitamin "known chemically as ascorbic acid".

**Step 2 — Name it:** ascorbic acid is vitamin C.

**Why each other option is wrong:**

- (B) Vitamin A is retinol; its lack causes night blindness.
- (C) Vitamin D is calciferol; its lack causes rickets.
- (D) Vitamin K is needed for blood clotting.

**Key point:** Vitamin C = ascorbic acid (water-soluble); a deficiency causes scurvy



with bleeding gums.

**Final Answer:** Vitamin C ⇒

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

Q6.

### Solution

**Concept — Vertebrates:** Animals are broadly split into invertebrates (without a backbone) and vertebrates (with a backbone). Vertebrates possess a vertebral column made of small bones called vertebrae, which encloses and protects the spinal cord. Fish, amphibians, reptiles, birds, and mammals are all vertebrates.

**Step 1 — Read the clue:** animals that "possess a backbone (vertebral column)".

**Step 2 — Name the group:** animals with a backbone are vertebrates.

**Why each other option is wrong:**

- (A) Invertebrates are animals *without* a backbone (e.g. insects, worms).
- (C) Arthropods (insects, spiders) are a group of invertebrates with jointed legs.
- (D) Molluscs (snails, octopus) are soft-bodied invertebrates.

**Key point:** Backbone present = vertebrate; backbone absent = invertebrate. The five vertebrate classes are fish, amphibians, reptiles, birds, and mammals.

**Final Answer:** Vertebrates ⇒

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

Q7.

### Solution

**Concept — Class Aves:** Birds form the class Aves among vertebrates. Their typical features are a body covered with feathers, forelimbs modified into wings for flight, a toothless beak, and the laying of eggs. The pigeon and the crow are common examples.

**Step 1 — Read the clues:** feathers, beak, and wings point to birds.

**Step 2 — Name the class:** birds belong to the class Aves.

**Why each other option is wrong:**



- (A) Mammalia includes hairy animals that feed their young on milk (e.g. humans, cows).
- (B) Reptilia includes scaly, crawling animals (e.g. lizards, snakes).
- (D) Amphibia includes animals that live both in water and on land (e.g. frogs).

**Key point:** Aves = birds: feathers + wings + beak. Feathers are unique to birds.

**Final Answer:** Aves  $\Rightarrow$

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

Q8.

### Solution

**Concept — Phloem:** Plants have two transport tissues. The xylem carries water and minerals upward from the roots, while the phloem carries the food (sugars) made in the leaves to all other parts, both upward and downward. This transport of food is called translocation.

**Step 1 — Read the figure:** the tissue with downward arrows carrying food away from the leaves is marked "?".

**Step 2 — Name it:** the tissue that transports food (sugars) is the phloem.

**Why each other option is wrong:**

- (A) The xylem carries water and minerals, not food.
- (B) The cambium is a layer of dividing cells that adds new xylem and phloem; it does not conduct food.
- (C) The epidermis is the outer protective layer of the plant.

**Key point:** Xylem = water (upward); phloem = food/sugars (both ways). Food transport is called translocation.

**Final Answer:** Phloem  $\Rightarrow$

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



Q9.

**Solution**

**Concept — Transpiration pull:** Water evaporates from the leaves through the stomata (transpiration). As water leaves the cells, it creates a suction that pulls a continuous column of water up through the xylem from the roots. This suction is called the transpiration pull, and it is the main force driving the ascent of sap in tall plants.

**Step 1 — Read the figure:** the upward arrows show water rising from roots to leaf as water evaporates above.

**Step 2 — Name the force:** the suction created by evaporation from leaves is the transpiration pull.

**Why each other option is wrong:**

- (B) Root pressure can push water up only a little; it cannot raise water in tall trees by itself.
- (C) Gravity acts downward and actually opposes the rise of water.
- (D) Water mostly moves up passively in the xylem, not by active transport.

**Key point:** The transpiration pull (suction from leaf evaporation) is the chief force for the upward movement of water (ascent of sap).

**Final Answer:** Transpiration pull  $\Rightarrow$

**Answer: (A)** [Go Back to Q9](#)

Q10.

**Solution**

**Concept — Auxin:** Auxin is a plant growth hormone produced mainly at the tips of shoots. It promotes the elongation of cells. When light falls on one side of a shoot, auxin moves to the shaded side and makes those cells grow longer, so the shoot bends towards the light (phototropism).

**Step 1 — Identify the role:** the hormone that causes cell elongation and bending towards light.

**Step 2 — Name it:** auxin.

**Why each other option is wrong:**

- (A) Abscisic acid promotes dormancy and closes stomata; it is a growth inhibitor.



- (C) Ethylene promotes the ripening of fruits.
- (D) Cytokinin promotes cell division, not elongation and bending.

**Key point:** Auxin → cell elongation and phototropic bending; it gathers on the shaded side, making the shoot curve towards light.

**Final Answer:** Auxin ⇒

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

Q11.

### Solution

**Concept — The liver and bile:** The liver is the largest gland in the body. It produces a greenish-yellow fluid called bile. Bile is then stored and concentrated in a small sac, the gall bladder, before being released into the small intestine, where it helps in the digestion (emulsification) of fats.

**Step 1 — Read the figure:** organ X makes bile, and sac Y (the gall bladder) stores it.

**Step 2 — Name organ X:** the organ that produces bile is the liver.

**Why each other option is wrong:**

- (A) The pancreas makes digestive enzymes and insulin, not bile.
- (B) The stomach makes gastric juice (HCl and pepsin), not bile.
- (D) The spleen stores and filters blood; it does not make bile.

**Key point:** Liver makes bile → gall bladder stores it → bile emulsifies fats in the intestine.

**Final Answer:** Liver ⇒

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



Q12.

**Solution**

**Concept — Final product of starch digestion:** Starch is a polysaccharide. Its digestion begins in the mouth with salivary amylase and is completed in the small intestine by pancreatic amylase and intestinal enzymes. Step by step, starch is broken into maltose and finally into the simple sugar glucose, which is absorbed into the blood.

**Step 1 — Trace the breakdown:** starch  $\rightarrow$  smaller sugars (maltose)  $\rightarrow$  glucose.

**Step 2 — Name the final product:** the end product absorbed into the blood is glucose.

**Why each other option is wrong:**

- (A) Maltose is only an intermediate; it is further broken down into glucose.
- (B) Sucrose is a different disaccharide, not the product of starch digestion.
- (C) Cellulose is undigested fibre in humans; it is not a product of digestion.

**Key point:** Starch  $\rightarrow$  maltose  $\rightarrow$  glucose. The final absorbable product of carbohydrate digestion is glucose.

**Final Answer:** Glucose  $\Rightarrow$

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

Q13.

**Solution**

**Concept — Teeth of an adult human:** A normal adult human has 32 permanent teeth, with 16 in each jaw. In one half of a jaw there are 2 incisors, 1 canine, 2 premolars, and 3 molars, giving 8 teeth per quadrant; four quadrants make  $4 \times 8 = 32$  teeth. (A young child has only 20 milk teeth.)

**Step 1 — Count one quadrant:**  $2 + 1 + 2 + 3 = 8$  teeth.

**Step 2 — Total all four quadrants:**  $8 \times 4 = 32$ .

**Why each other option is wrong:**

- (B) 20 is the number of milk (temporary) teeth in a child, not in an adult.
- (C) 28 leaves out the four wisdom teeth (third molars).
- (D) 16 is the number of teeth in only one jaw.

**Key point:** Adult = 32 permanent teeth; child = 20 milk teeth. The dental formula



per half-jaw is 2-1-2-3.

**Final Answer:** 32 ⇒

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

Q14.

### Solution

**Concept — The pulmonary artery:** Arteries usually carry oxygenated blood, but the pulmonary artery is an exception. It carries deoxygenated blood from the right ventricle of the heart to the lungs, where the blood picks up oxygen and gives off carbon dioxide. (The pulmonary vein then returns oxygenated blood to the heart.)

**Step 1 — Read the figure:** vessel X leaves the heart and goes to the lungs.

**Step 2 — Name it:** the vessel taking deoxygenated blood from the heart to the lungs is the pulmonary artery.

**Why each other option is wrong:**

- (A) The pulmonary vein carries oxygenated blood *from* the lungs back to the heart, the opposite direction.
- (C) The aorta carries oxygenated blood from the heart to the whole body, not to the lungs.
- (D) The vena cava brings deoxygenated blood from the body *into* the heart.

**Key point:** Pulmonary artery = heart → lungs (deoxygenated); pulmonary vein = lungs → heart (oxygenated). It is the only artery carrying impure blood.

**Final Answer:** Pulmonary artery ⇒

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

Q15.

### Solution

**Concept — The SA node:** The heart beats on its own (myogenic) because of a small patch of special tissue in the wall of the right atrium called the sinoatrial (SA) node. It generates electrical impulses on its own and sets the rate and rhythm of the heartbeat, so it is called the natural pacemaker of the heart.

**Step 1 — Read the figure:** the marked node lies in the right atrium and starts each heartbeat.



**Step 2 — Name it:** the natural pacemaker is the SA (sinoatrial) node.

**Why each other option is wrong:**

- (A) The AV node relays the impulse from the atria to the ventricles; it does not normally start the beat.
- (B) Purkinje fibres spread the impulse through the ventricle walls.
- (D) The bundle of His conducts the impulse from the AV node into the ventricles.

**Key point:** SA node = natural pacemaker (sets the rhythm). Impulse path: SA node → AV node → bundle of His → Purkinje fibres.

**Final Answer:** SA node ⇒  C

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

Q16.

### Solution

**Concept — Urea, the main nitrogenous waste:** When proteins are broken down in the body, toxic ammonia is formed. The liver converts this ammonia into the less harmful waste urea. The kidneys filter urea out of the blood and remove it from the body in urine, so urea is the chief nitrogenous waste of humans.

**Step 1 — Identify the waste filtered into urine:** the main nitrogen-containing waste in human urine.

**Step 2 — Name it:** urea.

**Why each other option is wrong:**

- (A) Ammonia is highly toxic and is converted to urea before excretion; only a trace is excreted.
- (B) Uric acid is the chief nitrogenous waste of birds and reptiles, not the main one in humans.
- (C) Carbon dioxide is a respiratory waste removed by the lungs, and it is not nitrogenous.

**Key point:** Humans are ureotelic: the main nitrogenous waste is urea, made in the liver and removed by the kidneys.

**Final Answer:** Urea ⇒  D

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



Q17.

**Solution**

**Concept — The synapse:** A nerve impulse travels along a neuron from the dendrites to the tip of the axon. Between the axon ending of one neuron and the next neuron there is a tiny gap called the synapse. The impulse crosses this junction with the help of chemicals called neurotransmitters.

**Step 1 — Read the figure:** the gap marked \* lies between neuron 1 and neuron 2.

**Step 2 — Name it:** the junction across which the impulse passes to the next neuron is the synapse.

**Why each other option is wrong:**

- (B) The axon is the long fibre of a single neuron that carries the impulse away; it is not the junction.
- (C) A dendrite is a short branch that receives impulses, not the gap between neurons.
- (D) A nerve is a bundle of many nerve fibres, not the junction between two neurons.

**Key point:** The synapse is the tiny gap where one neuron passes its signal to the next, using neurotransmitter chemicals.

**Final Answer:** Synapse ⇒

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

Q18.

**Solution**

**Concept — The central nervous system:** The nervous system has two main divisions. The central nervous system (CNS) is made of the brain and the spinal cord, which together process information and control the body. The peripheral nervous system is made of the nerves that connect the CNS to the rest of the body.

**Step 1 — Read the figure:** the brain joined to the spinal cord is labelled " = CNS".

**Step 2 — Name the two organs:** the CNS consists of the brain and the spinal cord.

**Why each other option is wrong:**

- (A) The heart and lungs are organs of circulation and breathing, not the



nervous system.

- (C) The brain and nerves are not the CNS; the nerves form the peripheral nervous system.
- (D) The spinal cord and nerves mix a central organ with peripheral nerves, so it is incorrect.

**Key point:** CNS = brain + spinal cord; the nerves outside them form the peripheral nervous system (PNS).

**Final Answer:** Brain and spinal cord ⇒

[Go Back to Q18](#)

Q19.

### Solution

**Concept — Growth hormone and the pituitary:** The pituitary gland, located at the base of the brain, is called the master gland because it controls many other glands. It secretes growth hormone (GH, or somatotropin), which controls the growth of bones and the overall body, and hence a person's height.

**Step 1 — Identify the hormone's job:** growth hormone controls body growth and height.

**Step 2 — Name the gland:** growth hormone is secreted by the pituitary gland.

**Why each other option is wrong:**

- (A) The thyroid secretes thyroxine, which controls the rate of metabolism.
- (B) The adrenal gland secretes adrenaline, the emergency (fight-or-flight) hormone.
- (D) The pancreas secretes insulin and glucagon to control blood sugar.

**Key point:** Pituitary = master gland = source of growth hormone. Too much GH in childhood causes gigantism; too little causes dwarfism.

**Final Answer:** Pituitary gland ⇒

[Go Back to Q19](#)



Q20.

**Solution**

**Concept — Asexual reproduction:** In asexual reproduction a single parent produces new individuals without forming or fusing gametes (no fertilisation). The offspring are genetically identical to the parent. Binary fission in *Amoeba*, budding in *Hydra*, and spore formation in fungi are all examples.

**Step 1 — Read the figure:** one parent divides on its own into new individuals, with no gamete fusion.

**Step 2 — Name it:** reproduction by a single parent with no gametes is asexual reproduction.

**Why each other option is wrong:**

- (A) Sexual reproduction needs two parents and the fusion of gametes.
- (B) Fertilisation is the fusion of male and female gametes, a step of *sexual* reproduction.
- (C) Pollination is the transfer of pollen in flowering plants, again part of sexual reproduction.

**Key point:** Asexual = one parent, no gametes, identical offspring; sexual = two parents, gamete fusion, variation in offspring.

**Final Answer:** Asexual reproduction ⇒

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

Q21.

**Solution**

**Concept — Seed develops from the ovule:** In a flowering plant the ovary contains ovules. After fertilisation, each ovule grows and changes into a seed (which contains the embryo), while the ovary as a whole ripens into the fruit. So the seed comes from the ovule.

**Step 1 — Identify the structure before fertilisation:** the ovule inside the ovary.

**Step 2 — Trace its fate:** after fertilisation the ovule develops into the seed.

**Why each other option is wrong:**

- (B) The ovary wall develops into the fruit wall (pericarp), not the seed.
- (C) The anther produces pollen grains; it has no role in forming the seed.



- (D) The petal is a non-reproductive part that attracts pollinators and usually falls off.

**Key point:** Ovule → seed; ovary → fruit. The seed forms from the ovule after fertilisation.

**Final Answer:** Ovule ⇒

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

Q22.

### Solution

**Concept — Human gestation period:** The gestation (pregnancy) period is the time from fertilisation of the egg until the birth of the baby. In humans this period is about nine months, roughly 280 days (about 40 weeks). During this time the embryo develops in the mother's uterus.

**Step 1 — Recall the duration:** human pregnancy lasts about 280 days.

**Step 2 — Express in months:** 280 days is about nine months.

**Why each other option is wrong:**

- (A) Six months is too short; a baby born this early is very premature.
- (C) Twelve months is far longer than the normal human gestation.
- (D) Three months is only about one trimester of the full pregnancy.

**Key point:** Human gestation  $\approx$  nine months (about 280 days or 40 weeks). The fetus develops in the uterus during this time.

**Final Answer:** Nine months ⇒

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

Q23.

### Solution

**Concept — Phenotype:** The phenotype is the visible, observable expression of a gene, such as the height of a plant or the colour of a flower. It results from the genotype (the genetic make-up) acting together with the environment. So tallness that you can actually see is part of the phenotype.

**Step 1 — Identify what is asked:** the outward, observable feature of an organism.



**Step 2 — Name it:** the visible expression of a gene is the phenotype.

**Why each other option is wrong:**

- (A) The genotype is the genetic make-up (the alleles present), which may not be directly visible.
- (B) An allele is one form of a gene, not the visible feature itself.
- (D) A chromosome is a thread of DNA that carries many genes.

**Key point:** Genotype = genetic make-up (e.g. TT or Tt); phenotype = visible trait (e.g. tall). The phenotype is what you can observe.

**Final Answer:** Phenotype  $\Rightarrow$

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

Q24.

### Solution

**Concept — Mendel's law of segregation:** Mendel's law of segregation states that the two alleles of a gene, present together in a parent, separate (segregate) from each other during the formation of gametes, so that each gamete carries only one allele of the pair. They come together again at fertilisation.

**Step 1 — Read the figure:** the parent (Tt) forms two kinds of gametes, one carrying T and the other carrying t.

**Step 2 — Name the law:** the two alleles separating into different gametes is the law of segregation.

**Why each other option is wrong:**

- (A) The law of dominance explains why one allele masks the other, not how alleles separate.
- (B) Independent assortment concerns how *two different* gene pairs assort, not the splitting of one pair.
- (C) Incomplete dominance is a pattern where the hybrid shows a blended trait; it is not about gamete formation.

**Key point:** Law of segregation: the two alleles of a gene separate during gamete formation, so each gamete gets only one.

**Final Answer:** Segregation  $\Rightarrow$

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



Q25.

**Solution**

**Concept — Mutation:** A mutation is a sudden, heritable change in the DNA (genetic material) of an organism. It may alter a gene or a chromosome and can produce a new trait. Mutations are a raw source of variation and may be caused by radiation, chemicals, or errors during DNA copying.

**Step 1 — Read the clue:** a "sudden, heritable change in the DNA".

**Step 2 — Name it:** such a change is called a mutation.

**Why each other option is wrong:**

- (B) Variation by adaptation describes a feature suited to the environment; it is not a sudden DNA change.
- (C) Fertilisation is the fusion of gametes, not a change in DNA.
- (D) Respiration is the release of energy from food and has nothing to do with changing DNA.

**Key point:** A mutation is a sudden, inheritable change in DNA; it provides new variations on which evolution can act.

**Final Answer:** Mutation ⇒

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

Q26.

**Solution**

**Concept — Inheritance of acquired characters:** Jean-Baptiste Lamarck proposed that characters which an organism develops (acquires) during its lifetime by use or disuse of organs can be passed on to its offspring. His classic example was the giraffe stretching its neck to reach high leaves and passing on a longer neck. This idea is now rejected, but the proposal was Lamarck's.

**Step 1 — Read the clue:** acquired characters such as the giraffe's long neck being inherited.

**Step 2 — Name the scientist:** this theory was proposed by Lamarck.

**Why each other option is wrong:**

- (A) Charles Darwin proposed evolution by natural selection, not the inheritance of acquired characters.



- (C) Gregor Mendel is the father of genetics, known for the laws of inheritance.
- (D) Hugo de Vries proposed the mutation theory of evolution.

**Key point:** Lamarck = inheritance of acquired characters; Darwin = natural selection; de Vries = mutations.

**Final Answer:** Lamarck ⇒

**Answer: (B)** [Go Back to Q26](#)

Q27.

### Solution

**Concept — Dengue:** Dengue fever is caused by the dengue virus. It is spread to humans through the bite of an infected female *Aedes* (*Aedes aegypti*) mosquito, which breeds in clean, stagnant water. Symptoms include high fever, severe joint and muscle pain, and a fall in platelet count.

**Step 1 — Read the figure:** a virus is passed by the *Aedes* mosquito to a human, causing fever with joint pain.

**Step 2 — Name the disease:** the viral disease spread by the *Aedes* mosquito is dengue.

**Why each other option is wrong:**

- (A) Tuberculosis is a bacterial disease (*Mycobacterium*) spread through air, not by mosquitoes.
- (B) Cholera is a bacterial disease spread by contaminated water and food.
- (D) Typhoid is a bacterial disease (*Salmonella typhi*) spread by contaminated food and water.

**Key point:** Dengue = virus + *Aedes* mosquito vector. The *Aedes* mosquito also spreads chikungunya and Zika.

**Final Answer:** Dengue ⇒

**Answer: (C)** [Go Back to Q27](#)



Q28.

**Solution**

**Concept — Scurvy:** Scurvy is a deficiency disease caused by a prolonged lack of vitamin C (ascorbic acid) in the diet. Because vitamin C is needed to make collagen, its lack leads to swollen, bleeding (spongy) gums, loosening of teeth, and slow healing of wounds. Eating citrus fruits and amla prevents it.

**Step 1 — Read the symptoms:** bleeding, spongy gums and poor wound healing.

**Step 2 — Link to the missing vitamin:** these result from a lack of vitamin C, the disease being scurvy.

**Why each other option is wrong:**

- (A) Rickets is caused by a lack of vitamin D, leading to soft, bent bones.
- (B) Beri-beri is caused by a lack of vitamin B1 (thiamine), affecting the nerves.
- (C) Night blindness is caused by a lack of vitamin A.

**Key point:** Scurvy ← vitamin C deficiency (bleeding gums). Match: A → night blindness, D → rickets, B1 → beri-beri, C → scurvy.

**Final Answer:** Scurvy ⇒

**Answer: (D)** [Go Back to Q28](#)

Q29.

**Solution**

**Concept — Genetically modified organisms:** A genetically modified organism (GMO) is one whose genes have been deliberately changed in the laboratory using genetic engineering, for example by inserting a useful gene from another species. Bt cotton, which carries a bacterial gene that makes it resistant to certain pests, is a well-known GMO.

**Step 1 — Read the clue:** genes "deliberately altered in the laboratory using genetic engineering".

**Step 2 — Name it:** such an organism is a genetically modified organism (GMO).

**Why each other option is wrong:**

- (B) A hybrid produced by ordinary breeding is not engineered at the gene level in the lab.



- (C) A naturally formed clone arises without any laboratory gene change.
- (D) A mutant arising from radiation in the wild is a natural, accidental change, not a deliberate engineered one.

**Key point:** GMO = genes changed on purpose by genetic engineering in the lab (e.g. Bt cotton, golden rice).

**Final Answer:** Genetically modified organism ⇒

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

Q30.

### Solution

**Concept — Ecological pyramid:** An ecological pyramid is a graphical (diagrammatic) representation showing the numbers, the biomass, or the amount of energy present at each trophic (feeding) level of an ecosystem. The levels are stacked one above another, and the pyramid usually narrows towards the top because energy decreases at each higher level.

**Step 1 — Read the figure:** the stacked bars (producers, herbivores, carnivores) narrowing upward form a pyramid shape.

**Step 2 — Name it:** a graph of numbers/biomass/energy across trophic levels is an ecological pyramid.

**Why each other option is wrong:**

- (A) A food web is a network of interconnected food chains, not a stacked graph of levels.
- (B) A food chain is a single linear sequence of who eats whom, not a graphical representation.
- (D) A trophic level is just one feeding step; it is not the whole graphical pyramid.

**Key point:** Ecological pyramid = graph of numbers, biomass, or energy at each trophic level; only about 10% of energy passes to the next level.

**Final Answer:** Ecological pyramid ⇒

**Answer: (C)** [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	C

