PGIMER BSc Nursing Biology

Sample Paper – 7

Duration: 23 Minutes **Maximum Marks: 25**

Instructions

- This paper contains **25** Multiple Choice Questions (Single Correct Answer), modelled on the Biology portion of the **PGIMER BSc Nursing** entrance exam.
- Each correct answer carries **+1 mark**. **0.25 mark** is deducted for every incorrect answer. Unattempted questions carry **0 marks**.
- Only **one** option is correct. Choose carefully.
- Syllabus level: **Class 11 and 12 (NCERT) Biology**.
- The exam is conducted as a computer-based test. Personal calculators, mobile phones, and other electronic gadgets are strictly prohibited.

Q1. The rhythmic waves of muscular contraction and relaxation of the gut wall that push the swallowed food forward along the alimentary canal are called:

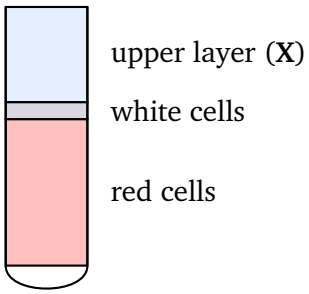
(A) Deglutition

(B) Peristalsis

(C) Digestion

(D) Egestion

Q2. A sample of blood was allowed to settle into layers as shown. The straw-coloured upper layer labelled **X**, which forms about 55% of the blood and contains proteins such as albumin and fibrinogen, is the:



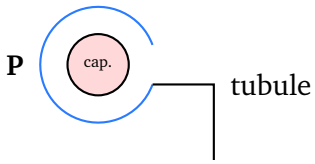
(A) Plasma

(B) Serum

(C) Lymph

(D) Red blood cells

Q3. The diagram shows the beginning of a nephron. The cup-shaped structure labelled **P**, which encloses a ball of capillaries and collects the filtrate, is the:



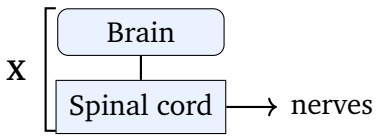
(A) Loop of Henle

(B) Glomerulus

(C) Collecting duct

(D) Bowman's capsule

Q4. In the diagram, the brain and the spinal cord are grouped together by the bracket labelled **X**. Together these two organs form the:



(A) Peripheral nervous system

(B) Autonomic nervous system

(C) Central nervous system

(D) Sympathetic nervous system

Q5. During cellular respiration the chemical energy released by the step-wise oxidation of glucose is trapped and stored in the cell in the form of:

(A) ATP

(B) DNA

(C) Glucose

(D) Starch

Q6. A person shows persistently high blood glucose and the appearance of sugar in the urine because the beta cells of the pancreas secrete too little insulin. This disorder is:

(A) Diabetes insipidus

(B) Goitre

(C) Diabetes mellitus

(D) Hypoglycaemia

Q7. A cross made between an F_1 hybrid and one of its homozygous parents, in order to study the inheritance of a trait, is called a:

(A) Test cross

(B) Dihybrid cross

(C) Reciprocal cross

(D) Back cross

Q8. Erythroblastosis foetalis, in which the mother's antibodies enter the foetal blood and destroy its red blood cells, is most likely to occur when:

(A) the mother is Rh^+ and the foetus is Rh^-

(B) the mother is Rh^- and the foetus is Rh^+

(C) both the mother and the foetus are Rh^+

(D) both the mother and the foetus are Rh^-

Q9. The double-helix model for the structure of DNA, with two anti-parallel strands coiled around each other, was proposed in 1953 by:

(A) Watson and Crick

(B) Mendel and Morgan

(C) Darwin and Wallace

(D) Hershey and Chase

Q10. A sudden, heritable change in the DNA (genetic material) of an organism, which provides the raw material on which natural selection acts, is called a:

(A) Acquired character

(B) Adaptation

(C) Modification

(D) Mutation

Q11. The network of membranous tubules in the cytoplasm that is called "rough" when its surface is studded with ribosomes and "smooth" when it synthesises lipids is the:

(A) Golgi apparatus

(B) Mitochondrion

(C) Endoplasmic reticulum

(D) Lysosome

Q12. Which class of biomolecules acts as the most concentrated store of energy in the body, releasing roughly twice the energy per gram compared with carbohydrates?

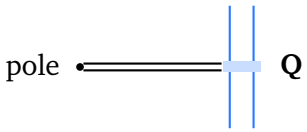
(A) Proteins

(B) Fats (lipids)

(C) Nucleic acids

(D) Vitamins

Q13. The figure shows a duplicated chromosome to which the spindle fibres are attached during cell division. The constricted point labelled **Q**, where the two sister chromatids are joined and the spindle fibres attach, is the:



(A) Chromatid

(B) Telomere

(C) Chromomere

(D) Centromere

Q14. The uncontrolled and unregulated division of cells, in which the cells lose the property of contact inhibition and form a mass called a tumour, is characteristic of:

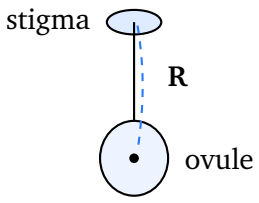
(A) Cancer

(B) Apoptosis

(C) Regeneration

(D) Differentiation

Q15. The figure shows a pistil after pollination. The pollen grain on the stigma has germinated and produced the structure labelled **R**, which grows down the style and carries the male gametes to the ovule. **R** is the:



(A) Style

(B) Filament

(C) Pollen tube

(D) Micropyle

Q16. Semen, the fluid released during ejaculation, is made up of sperms suspended in a fluid that is contributed mainly by the:

(A) Testes only

(B) Accessory glands (seminal vesicles and prostate)

(C) Epididymis only

(D) Urinary bladder

Q17. The hormone secreted by the anterior pituitary that stimulates the growth and maturation of the ovarian (Graafian) follicle during the first half of the menstrual cycle is:

(A) Follicle-stimulating hormone (FSH)

(B) Luteinising hormone (LH)

(C) Progesterone

(D) Oxytocin

Q18. The carbon dioxide required for photosynthesis diffuses into the interior of the leaf mainly through the tiny pores present in the epidermis, called the:

(A) Cuticle

(B) Xylem

(C) Stomata

(D) Root hairs

Q19. The plant hormone that promotes elongation of the internodes and can make genetically dwarf plants grow tall (bolting) is:

(A) Abscisic acid

(B) Cytokinin

(C) Auxin

(D) Gibberellin

Q20. The correct sequence of taxonomic categories, arranged from the largest (most inclusive) to the smallest, is:

(A) Species → Genus → Family → Order → Class → Phylum → Kingdom

(B) Kingdom → Phylum → Class → Order → Family → Genus → Species

(C) Kingdom → Class → Phylum → Family → Order → Genus → Species

(D) Phylum → Kingdom → Class → Order → Family → Genus → Species

Q21. The largest phylum of the animal kingdom, whose members possess jointed appendages and a hard chitinous exoskeleton, is:

(A) Arthropoda

(B) Chordata

(C) Mollusca

(D) Annelida

Q22. The figure shows a pond (aquatic) food chain. The organism labelled **S**, which feeds on the phytoplankton and occupies the primary-consumer trophic level, is the:

Phytoplankton ⟶ **S** → Small fish ➛ Big fish

(A) Big fish

(B) Small fish

(C) Zooplankton

(D) Phytoplankton

Q23. The biogeochemical cycle that involves evaporation of water from oceans and lakes, its condensation into clouds, and its return to the earth as precipitation is the:

(A) Carbon cycle

(B) Nitrogen cycle

(C) Oxygen cycle

(D) Water cycle

Q24. Penicillin, first obtained by Alexander Fleming from a fungus, cures many infections because it acts against:

(A) Viruses

(B) Bacteria

(C) Fungi

(D) Protozoa

Q25. Bt cotton is a transgenic crop that resists attack by bollworm insects because it carries an insecticidal (cry) gene taken from the bacterium:

(A) Escherichia coli

(B) Rhizobium leguminosarum

(C) Bacillus thuringiensis

(D) Agrobacterium tumefaciens

Detailed Solutions

Q1.

Solution

Concept — Movement of food through the gut: The wall of the alimentary canal contains layers of smooth muscle that keep the food moving in one direction.

Step 1 — Describe the muscular action: Just behind the swallowed food (bolus), the circular muscles contract while the muscles ahead relax, producing a travelling wave.

Step 2 — Name the process: This coordinated wave of contraction and relaxation that pushes the food forward is called peristalsis, and it occurs all along the gut from the oesophagus to the intestine.

Why other options are wrong:

- Option A (Deglutition): is simply the act of swallowing food, not the wave that moves it along the whole gut.
- Option C (Digestion): is the chemical and mechanical breakdown of food, not its movement.
- Option D (Egestion): is the removal of undigested waste (faeces) from the body.

Final Answer: The muscular waves that push food along the gut are peristalsis $\Rightarrow$ B

Answer: (B) Go Back to Q1

Q2.

Solution

Concept — Composition of blood: When blood is prevented from clotting and spun or allowed to settle, it separates into a fluid part and a cellular part.

Step 1 — Read the layers: The heavy red cells sink to the bottom, a thin whitish layer of white cells and platelets (buffy coat) lies in the middle, and a clear straw-coloured fluid rises to the top.

Step 2 — Identify the top layer: This upper straw-coloured fluid, about 55% of the blood volume, is the plasma. It is mostly water and carries plasma proteins such as albumin, globulins and fibrinogen. Layer **X** is therefore the plasma.

Why other options are wrong:

- Option B (Serum): is plasma from which the clotting protein fibrinogen has been removed, obtained only after clotting.
- Option C (Lymph): is a separate tissue fluid found in lymph vessels, not the top layer of settled blood.
- Option D (Red blood cells): form the heavy lower layer, not the straw-coloured top.

Final Answer: The straw-coloured upper layer with plasma proteins is plasma $\Rightarrow$ A

Answer: (A) Go Back to Q2

Q3.

Solution

Concept — Start of the nephron: Each nephron begins as a cup that surrounds a knot of capillaries where filtration of blood takes place.

Step 1 — Identify the cup: The cup-shaped, double-walled structure at the start of the nephron is the Bowman's capsule.

Step 2 — Relate structure to function: The Bowman's capsule encloses the ball of capillaries (the glomerulus) and collects the fluid that is filtered out of the blood. The labelled cup **P** is therefore the Bowman's capsule.

Why other options are wrong:

- Option A (Loop of Henle): is the hairpin loop deeper in the nephron that concentrates the urine, not the initial cup.
- Option B (Glomerulus): is the ball of capillaries held inside the cup, not the cup itself.
- Option C (Collecting duct): receives the final urine from many nephrons; it is not the filtering cup.

Final Answer: The cup enclosing the glomerulus is the Bowman's capsule $\Rightarrow$ D

Answer: (D) Go Back to Q3

Q4.

Solution

Concept — Divisions of the nervous system: The nervous system is divided into a central part that processes information and a peripheral part that connects it to the body.

Step 1 — Identify the two grouped organs: The bracket **X** groups the brain and the spinal cord.

Step 2 — Name the division: The brain and the spinal cord together form the central nervous system (CNS), the main coordinating centre of the body. The nerves that branch out from them make up the peripheral nervous system.

Why other options are wrong:

- Option A (Peripheral nervous system): is made of the nerves outside the brain and spinal cord, not the two organs themselves.
- Option B (Autonomic nervous system): is a functional part of the PNS that controls involuntary actions.
- Option D (Sympathetic nervous system): is only one branch of the autonomic system, not the brain-plus-cord unit.

Final Answer: Brain plus spinal cord form the central nervous system $\Rightarrow$ C

Answer: (C) Go Back to Q4

Q5.

Solution

Concept — Energy currency of the cell: Cellular respiration oxidises glucose in a series of steps and captures the released energy in a usable chemical form.

Step 1 — Follow the energy: As glucose is broken down through glycolysis, the Krebs cycle and the electron transport chain, energy is released gradually.

Step 2 — Identify the storage molecule: This energy is used to make adenosine triphosphate (ATP) from ADP and phosphate. ATP is the ready energy currency that powers cell activities.

Why other options are wrong:

- Option B (DNA): is the hereditary material; it stores genetic information, not respiratory energy.
- Option C (Glucose): is the fuel that is oxidised, not the form in which the

released energy is stored.
- Option D (Starch): is a storage carbohydrate in plants, not the energy currency produced in respiration.

Final Answer: Energy from oxidising glucose is stored as ATP $\Rightarrow$ A

Answer: (A) Go Back to Q5

Q6.

Solution

Concept — Insulin and blood sugar: Insulin from the beta cells of the pancreatic islets lowers blood glucose; a shortage of it disturbs sugar balance.

Step 1 — Link the symptoms to the cause: Too little insulin means glucose is not taken up by the cells, so it builds up in the blood (hyperglycaemia) and spills over into the urine (glycosuria).

Step 2 — Name the disorder: This condition of high blood sugar and sugar in the urine due to insulin deficiency is diabetes mellitus.

Why other options are wrong:

- Option A (Diabetes insipidus): is caused by lack of ADH and gives large volumes of dilute urine, but without high blood sugar.
- Option B (Goitre): is the swelling of the thyroid gland due to iodine deficiency, unrelated to insulin.
- Option D (Hypoglycaemia): is abnormally low blood sugar, the opposite of the described condition.

Final Answer: High blood glucose from insulin deficiency is diabetes mellitus $\Rightarrow$ C

Answer: (C) Go Back to Q6

Q7.

Solution

Concept — Types of genetic crosses: Breeders use particular crosses to reveal or confirm the genotype of an individual.

Step 1 — Read the definition given: The cross described is between an F_1 hybrid and one of its parents (either the dominant or the recessive parent).

Step 2 — Name the cross: A cross of an offspring back with one of its parents is called a back cross. When the parent chosen is the homozygous recessive one, the back cross is also known as a test cross.

Why other options are wrong:

- Option A (Test cross): is only the special back cross with the homozygous recessive parent, so it is narrower than the general term asked for.
- Option B (Dihybrid cross): involves two pairs of traits, not a cross with a parent.
- Option C (Reciprocal cross): swaps the sexes of the parents in two crosses; it is not a cross with a parent.

Final Answer: A cross of an F_1 hybrid with a parent is a back cross $\Rightarrow \boxed{D}$

Answer: (D) Go Back to Q7

Q8.

Solution

Concept — Rh incompatibility: The Rh antigen on red cells can trigger antibody production in an Rh^- person exposed to Rh^+ blood.

Step 1 — Set up the situation: If the mother is Rh^- and the foetus is Rh^+ (inheriting the father's Rh factor), some foetal cells can leak into the mother, especially at the first delivery.

Step 2 — Trace the harm: The mother then makes anti-Rh antibodies. In a later Rh^+ pregnancy these antibodies cross the placenta and destroy the foetal red cells, causing erythroblastosis foetalis.

Why other options are wrong:

- Option A (mother Rh^+, foetus Rh^-): an Rh^+ mother makes no anti-Rh antibodies, so no destruction occurs.
- Option C (both Rh^+): the mother already carries the Rh antigen and does

not treat it as foreign.
- Option D (both Rh^-): neither carries the Rh antigen, so no anti-Rh antibodies are formed.

Final Answer: Trouble arises when the mother is Rh^- and the foetus is $Rh^+ \Rightarrow \boxed{B}$

Answer: (B) Go Back to Q8

Q9.

Solution

Concept — Structure of DNA: The three-dimensional shape of DNA was worked out from X-ray data and base-pairing rules.

Step 1 — Recall the model: The molecule is a double helix: two anti-parallel sugar-phosphate strands wound around each other, with base pairs (A–T, G–C) forming the rungs.

Step 2 — Credit the scientists: This double-helix model was proposed in 1953 by James Watson and Francis Crick, using Rosalind Franklin's X-ray images and Chargaff's base-pairing data.

Why other options are wrong:

- Option B (Mendel and Morgan): Mendel founded genetics with pea plants and Morgan worked on fruit-fly chromosomes, but neither built the DNA model.
- Option C (Darwin and Wallace): proposed natural selection, not the structure of DNA.
- Option D (Hershey and Chase): proved that DNA is the genetic material, but did not give the double-helix model.

Final Answer: The DNA double helix was proposed by Watson and Crick $\Rightarrow \boxed{A}$

Answer: (A) Go Back to Q9

Q10.

Solution

Concept — Source of variation for evolution: Evolution needs heritable differences among individuals on which natural selection can act.

Step 1 — Define the change: A sudden, permanent and heritable change in the DNA or the genes of an organism is called a mutation.

Step 2 — Link it to evolution: Because mutations alter the genetic material, they can be passed to the offspring and become the raw material (source of new variation) for evolution.

Why other options are wrong:

- Option A (Acquired character): is a change gained during a lifetime (like muscle from exercise) and is not inherited.
- Option B (Adaptation): is a feature that suits an organism to its environment; it results from selection acting on variation, it is not the source of the change in DNA.
- Option C (Modification): is a non-heritable change caused by the environment, not a change in the genes.

Final Answer: A heritable change in DNA that supplies variation is a mutation $\Rightarrow$ D

Answer: (D) Go Back to Q10

Q11.

Solution

Concept — The endoplasmic reticulum: This is a system of interconnected membranous tubules and sheets running through the cytoplasm, and it comes in two forms.

Step 1 — Recognise the two forms: Rough endoplasmic reticulum carries ribosomes on its surface and helps in protein synthesis. Smooth endoplasmic reticulum has no ribosomes and makes lipids and steroids.

Step 2 — Match the description: The organelle described as "rough" with ribosomes and "smooth" when making lipids is the endoplasmic reticulum.

Why other options are wrong:

- Option A (Golgi apparatus): modifies, packages and dispatches materials; it

is not described as rough or smooth.
- Option B (Mitochondrion): is the site of ATP synthesis, and it is not studded with ribosomes on the outside.
- Option D (Lysosome): is a sac of digestive enzymes, not a ribosome-bearing tubule network.

Final Answer: The rough/smooth membranous network is the endoplasmic reticulum $\Rightarrow$ C

Answer: (C) Go Back to Q11

Q12.

Solution

Concept — Energy value of biomolecules: Different classes of food molecules release different amounts of energy when oxidised.

Step 1 — Compare the energy yields: Carbohydrates yield about 4 kcal per gram, whereas fats yield about 9 kcal per gram, roughly twice as much.

Step 2 — Identify the concentrated store: Because they pack more energy per gram and are stored in a nearly water-free form, fats (lipids) act as the most concentrated store of energy in the body.

Why other options are wrong:

- Option A (Proteins): are mainly structural and functional molecules and are used for energy only as a last resort.
- Option C (Nucleic acids): store genetic information; they are not energy reserves.
- Option D (Vitamins): are needed in tiny amounts as helpers (co-factors); they do not store bulk energy.

Final Answer: The most concentrated energy store is fats (lipids) $\Rightarrow$ B

Answer: (B) Go Back to Q12

Q13.

Solution

Concept — Structure of a duplicated chromosome: A chromosome that has replicated consists of two identical sister chromatids joined together at one point.

Step 1 — Locate the joining point: The constricted region where the two sister chromatids are held together is the centromere.

Step 2 — Relate it to the spindle: During cell division the spindle fibres attach to a protein disc (the kinetochore) at the centromere and pull the chromatids apart. The labelled point **Q** is therefore the centromere.

Why other options are wrong:

- Option A (Chromatid): is one of the two threads of the duplicated chromosome, not the point of attachment.
- Option B (Telomere): is the protective cap at the tip (end) of a chromosome, not the middle constriction.
- Option C (Chromomere): is a bead-like thickening along the chromosome thread, not the spindle-attachment point.

Final Answer: The spindle fibres attach at the centromere $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q13

Q14.

Solution

Concept — Control of cell division: Normal cells divide in a regulated way and stop when they touch neighbours (contact inhibition).

Step 1 — Describe the loss of control: When the controls fail, cells keep dividing without limit and lose contact inhibition, piling up into a mass of tissue called a tumour.

Step 2 — Name the condition: This uncontrolled, unregulated division of cells forming tumours is the disease cancer.

Why other options are wrong:

- Option B (Apoptosis): is programmed cell death, the opposite of uncontrolled multiplication.
- Option C (Regeneration): is the orderly, controlled replacement of lost parts, not tumour formation.

- Option D (Differentiation): is the process by which cells become specialised, not uncontrolled division.

Final Answer: Uncontrolled cell division forming tumours is cancer ⇒ A

Answer: (A) Go Back to Q14

Q15.

Solution

Concept — Events after pollination: Once pollen reaches the stigma, it must deliver the male gametes to the egg deep inside the ovule.

Step 1 — Germination of pollen: The pollen grain absorbs nutrients from the sticky stigma and germinates, putting out a slender outgrowth.

Step 2 — Identify the structure: This outgrowth, the pollen tube, grows down through the style and carries the two male gametes to the ovule for fertilisation. The labelled **R** is the pollen tube.

Why other options are wrong:

- Option A (Style): is the stalk of the pistil through which the tube grows; it is not the tube itself.
- Option B (Filament): is the stalk of the stamen (male part), unrelated to this female-side structure.
- Option D (Micropyle): is the small pore in the ovule through which the pollen tube finally enters, not the growing tube.

Final Answer: The tube carrying male gametes to the ovule is the pollen tube ⇒ C

Answer: (C) Go Back to Q15

Q16.

Solution

Concept — Composition of semen: Semen is more than just sperm; it is a mixture of sperm cells and nourishing fluid.

Step 1 — Recall the sources of the fluid: The seminal vesicles, the prostate gland and the bulbourethral glands are the accessory glands of the male reproductive system.

Step 2 — Combine sperm and fluid: These accessory glands add most of the fluid that nourishes the sperm, activates their movement and neutralises acidity. Sperms suspended in this fluid make up the semen.

Why other options are wrong:

- Option A (Testes only): produce the sperm but contribute very little of the seminal fluid.
- Option C (Epididymis only): stores and matures sperm; it is not the main source of the fluid.
- Option D (Urinary bladder): stores urine and has no role in producing semen.

Final Answer: Semen is sperm plus the secretions of the accessory glands ⇒ B

Answer: (B) Go Back to Q16

Q17.

Solution

Concept — Hormones of the menstrual cycle: The anterior pituitary releases two gonadotropins, FSH and LH, that control the ovary.

Step 1 — Identify the early-cycle event: During the first half of the cycle (the follicular phase), one ovarian follicle grows and matures into a Graafian follicle.

Step 2 — Match the hormone: This growth and maturation of the follicle is stimulated by the follicle-stimulating hormone (FSH) from the anterior pituitary.

Why other options are wrong:

- Option B (Luteinising hormone): peaks later and triggers ovulation and the formation of the corpus luteum, not the early follicle growth.
- Option C (Progesterone): is released after ovulation to prepare and maintain the uterine lining.
- Option D (Oxytocin): causes uterine contractions during childbirth and has no role in follicle growth.

Final Answer: The follicle is stimulated to grow by FSH ⇒ A

Answer: (A) Go Back to Q17

Q18.

Solution

Concept — Gas exchange in leaves: Photosynthesis needs carbon dioxide, which must reach the mesophyll cells inside the leaf.

Step 1 — Locate the entry route: The leaf epidermis has many tiny pores, each bounded by two guard cells; these pores are the stomata.

Step 2 — Trace the diffusion: Carbon dioxide from the air diffuses in through the open stomata into the air spaces and reaches the photosynthesising cells. So CO_2 enters mainly through the stomata.

Why other options are wrong:

- Option A (Cuticle): is a waxy waterproof layer on the leaf surface that blocks, rather than allows, gas entry.
- Option B (Xylem): conducts water and minerals upward; it does not take in carbon dioxide.
- Option D (Root hairs): absorb water and minerals from the soil, not carbon dioxide for the leaf.

Final Answer: Carbon dioxide enters the leaf mainly through the stomata $\Rightarrow$ C

Answer: (C) Go Back to Q18

Q19.

Solution

Concept — Plant growth hormones: Several hormones regulate plant growth, each with a typical effect.

Step 1 — Recall the elongation hormone: Gibberellins are hormones that strongly promote the elongation of stems and internodes.

Step 2 — Note the striking effect: When applied to genetically dwarf plants, gibberellins can make them grow as tall as normal plants, and they cause bolting (sudden stem elongation before flowering).

Why other options are wrong:

- Option A (Abscisic acid): is a growth inhibitor that promotes dormancy and closes stomata, the opposite of elongation.
- Option B (Cytokinin): mainly promotes cell division and delays ageing of leaves, not internode elongation.

- Option C (Auxin): promotes cell elongation and apical dominance, but the hormone specifically known for stem elongation and bolting is gibberellin.

Final Answer: The hormone causing internode elongation and bolting is gibberellin $\Rightarrow$ D

Answer: (D) Go Back to Q19

Q20.

Solution

Concept — Taxonomic hierarchy: Living organisms are classified into a ranked series of categories, from the broadest to the most specific.

Step 1 — Recall the ranks in order: From the largest to the smallest, the categories are Kingdom, Phylum, Class, Order, Family, Genus and Species.

Step 2 — Pick the correct sequence: The option that lists Kingdom $\rightarrow$ Phylum $\rightarrow$ Class $\rightarrow$ Order $\rightarrow$ Family $\rightarrow$ Genus $\rightarrow$ Species is the right descending order.

Why other options are wrong:

- Option A: lists the ranks from smallest to largest, the reverse of what is asked.
- Option C: wrongly places Class before Phylum.
- Option D: wrongly starts with Phylum before Kingdom.

Final Answer: The correct descending order is Kingdom to Species $\Rightarrow$ B

Answer: (B) Go Back to Q20

Q21.

Solution

Concept — The largest animal phylum: Animals are grouped into phyla by their body plan; one phylum contains more species than any other.

Step 1 — Recall the key features: Members with jointed legs (appendages), a segmented body and a hard exoskeleton made of chitin belong to the phylum Arthropoda.

Step 2 — Note its size: Arthropoda (insects, spiders, crabs, centipedes) is the largest phylum, containing more than three-quarters of all known animal species.

Why other options are wrong:

- Option B (Chordata): have a notochord and a dorsal nerve cord; they are far fewer than the arthropods.
- Option C (Mollusca): are soft-bodied animals often with a shell, and lack jointed appendages.
- Option D (Annelida): are segmented worms with soft bodies and no chitinous exoskeleton.

Final Answer: The largest phylum with jointed legs is Arthropoda $\Rightarrow$ A

Answer: (A) Go Back to Q21

Q22.

Solution

Concept — Trophic levels in an aquatic food chain: Energy flows in a pond from the tiny plant-like producers up through successive consumers.

Step 1 — Identify the levels: Phytoplankton are the producers. The animals that feed on them are the primary consumers (herbivores).

Step 2 — Match position S: In the chain Phytoplankton $\rightarrow$ **S** $\rightarrow$ Small fish $\rightarrow$ Big fish, **S** feeds on phytoplankton and is eaten by the small fish. The zooplankton fit this primary-consumer position.

Why other options are wrong:

- Option A (Big fish): is the top carnivore at the last trophic level, not a primary consumer.
- Option B (Small fish): is the secondary consumer, shown later in the chain.
- Option D (Phytoplankton): is the producer at the base of the chain, not a consumer.

Final Answer: The primary consumer feeding on phytoplankton is the zooplankton $\Rightarrow$ C

Answer: (C) Go Back to Q22

Q23.

Solution

Concept — Biogeochemical cycles: Substances move between the living world and the physical environment in cycles named after the material involved.

Step 1 — Read the steps described: Evaporation from water bodies, condensation of vapour into clouds, and precipitation as rain or snow are the stages given.

Step 2 — Name the cycle: These stages describe the circulation of water between the earth and the atmosphere, which is the water (hydrological) cycle.

Why other options are wrong:

- Option A (Carbon cycle): moves carbon through photosynthesis, respiration and combustion, not through evaporation and rainfall.
- Option B (Nitrogen cycle): involves fixation, nitrification and denitrification of nitrogen, not the movement of water.
- Option C (Oxygen cycle): tracks oxygen through respiration and photosynthesis, not evaporation and precipitation.

Final Answer: Evaporation, condensation and precipitation make the water cycle $\Rightarrow$ D

Answer: (D) Go Back to Q23

Q24.

Solution

Concept — Action of antibiotics: Antibiotics are chemicals, often obtained from microbes, that check the growth of certain disease-causing organisms.

Step 1 — Recall the origin of penicillin: Penicillin was discovered by Alexander Fleming from the mould (fungus) *Penicillium*.

Step 2 — Identify its target: Penicillin works by blocking the making of the bacterial cell wall, so it acts against bacteria and cures bacterial infections.

Why other options are wrong:

- Option A (Viruses): have no cell wall and are not affected by penicillin; antibiotics do not cure viral diseases.
- Option C (Fungi): are treated with antifungal drugs, not with penicillin, which itself comes from a fungus.
- Option D (Protozoa): are targeted by antiprotozoal drugs, not by penicillin.

Final Answer: Penicillin (an antibiotic) acts against bacteria $\Rightarrow$ B

Answer: (B) Go Back to Q24

Q25.

Solution

Concept — Transgenic (Bt) crops: Genetic engineering can transfer a useful gene from a bacterium into a crop plant to give it a new property.

Step 1 — Identify the source of the gene: The soil bacterium *Bacillus thuringiensis* produces cry proteins (Bt toxins) that kill certain insect larvae.

Step 2 — Explain the transgenic plant: The cry gene from this bacterium is inserted into cotton to make Bt cotton, which then produces the toxin itself and resists bollworm attack.

Why other options are wrong:

- Option A (*Escherichia coli*): is a gut bacterium used as a laboratory host, not the source of the insect-resistance gene.
- Option B (*Rhizobium leguminosarum*): fixes nitrogen in root nodules; it does not provide the Bt toxin gene.
- Option D (*Agrobacterium tumefaciens*): is used as a vector to carry genes into plants, but the cry gene itself comes from *Bacillus thuringiensis*.

Final Answer: The Bt gene in Bt cotton comes from *Bacillus thuringiensis* $\Rightarrow$ C

Answer: (C) Go Back to Q25

Answer Key

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