PGIMER BSc Nursing Biology

Sample Paper – 6

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 largest gland in the human body, which secretes bile that helps in the digestion of fats, is the:

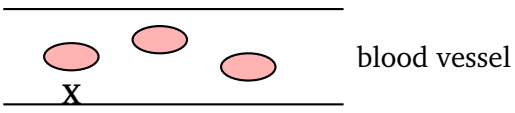
(A) Pancreas

(B) Salivary gland

(C) Liver

(D) Gastric gland

Q2. The diagram shows blood flowing through a blood vessel. The cell labelled **X**, which contains the red pigment haemoglobin and transports oxygen, is the:



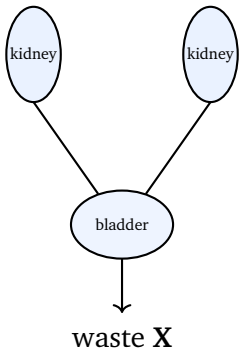
(A) Red blood cell (erythrocyte)

(B) White blood cell (leucocyte)

(C) Blood platelet

(D) Lymph cell

Q3. The diagram shows the human excretory system. The main nitrogenous waste **X** formed in the liver and removed from the blood by the kidneys is:



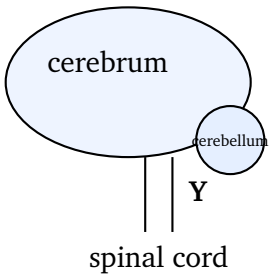
(A) Uric acid

(B) Ammonia

(C) Nitrogen gas

(D) Urea

Q4. The diagram shows the human brain. The part labelled **Y** at its base, which controls involuntary activities such as heartbeat and breathing, is the:



(A) Cerebrum

(B) Medulla oblongata

(C) Cerebellum

(D) Hypothalamus

Q5. In the human respiratory system, the windpipe (trachea) is prevented from collapsing and is kept permanently open for the free flow of air by:

(A) C-shaped rings of cartilage

(B) Rings of hard bone

(C) Bands of smooth muscle only

(D) A thick lining of mucus

Q6. The hormone that raises the level of calcium in the blood by acting on bones, kidneys and the intestine is:

(A) Insulin

(B) Thyroxine

(C) Adrenaline

(D) Parathormone

Q7. A pea plant has the genetic makeup Tt but appears tall. The term used for its observable characteristic, that is, being tall, is its:

(A) Genotype

(B) Phenotype

(C) Karyotype

(D) Genome

Q8. Haemophilia, a disorder in which the blood fails to clot after an injury, is inherited as a:

(A) Y-linked dominant trait

(B) Autosomal dominant trait

(C) X-linked recessive trait

(D) Mitochondrial trait

Q9. A single nucleotide, which is the basic building block of a nucleic acid such as DNA, is made up of:

(A) A nitrogenous base, a pentose sugar and a phosphate group

(B) Only a nitrogenous base and a sugar

(C) Two sugars joined to a single phosphate

(D) An amino acid, a base and a phosphate group

Q10. The preserved remains or impressions of organisms that lived in the remote past, which provide direct evidence for evolution, are called:

(A) Vestigial organs

(B) Analogous organs

(C) Homologous organs

(D) Fossils

Q11. The cell organelle that contains the genetic material (DNA) and controls all the activities of the cell is the:

(A) Mitochondrion

(B) Nucleus

(C) Ribosome

(D) Vacuole

Q12. The chief and most readily available source of energy for cellular respiration in the human body is:

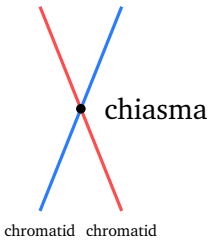
(A) Protein

(B) Fat

(C) Glucose

(D) Vitamin

Q13. The figure shows a pair of homologous chromosomes exchanging segments during meiosis I. This exchange of genetic material between them is called:



(A) Independent assortment

(B) Segregation

(C) Translation

(D) Crossing over

Q14. The type of cell division responsible for the growth of the body and the repair of worn-out tissues, producing two genetically identical diploid daughter cells, is:

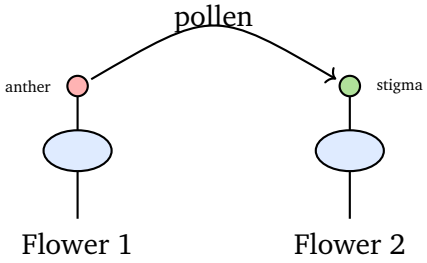
(A) Mitosis

(B) Meiosis

(C) Binary fission

(D) Budding

Q15. The figure shows pollen being transferred from the anther of one flower to the stigma of a flower on a different plant. This type of pollination is:



(A) Self-pollination

(B) Cross-pollination

(C) Absence of pollination

(D) Direct fertilisation

Q16. In human males the testes are held outside the abdominal cavity, in a sac called the scrotum, because the formation of sperm requires a temperature that is:

(A) Higher than the normal body temperature

(B) Exactly equal to the body temperature

(C) Slightly lower than the body temperature

(D) Continuously rising and falling

Q17. The special disc-shaped structure that connects the developing foetus to the wall of the mother's uterus and allows the exchange of nutrients, oxygen and wastes is the:

(A) Placenta

(B) Corpus luteum

(C) Cervix

(D) Fallopian tube

Q18. In the overall reaction of photosynthesis, the raw materials that are used up and the products that are formed are:

(A) Glucose and oxygen used; carbon dioxide and water formed

(B) Oxygen and water used; only glucose formed

(C) Carbon dioxide and oxygen used; water formed

(D) Carbon dioxide and water used; glucose and oxygen formed

Q19. The plant hormone that causes a shoot to bend towards light (phototropism) and maintains the dominance of the growing apical bud over the side buds is:

(A) Abscisic acid

(B) Auxin

(C) Ethylene

(D) Cytokinin

Q20. Viruses are not placed in any of the five kingdoms of Whittaker's classification because they are:

(A) Multicellular decomposers with a chitin wall

(B) Prokaryotic autotrophs that make their own food

(C) Acellular and able to reproduce only inside a living host cell

(D) Eukaryotic and free-living in the soil

Q21. Animals such as Hydra and jellyfish, which show radial symmetry and possess stinging cells (cnidoblasts) for defence and for capturing prey, belong to the phylum:

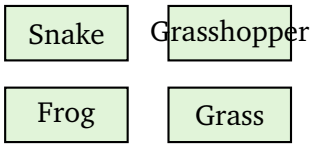
(A) Coelenterata (Cnidaria)

(B) Porifera

(C) Arthropoda

(D) Annelida

Q22. The figure shows four organisms of a grassland ecosystem. Arranged in the correct order of a food chain, showing the flow of energy from the producer to the top consumer, they are:



(A) Snake $\rightarrow$ Frog $\rightarrow$ Grasshopper $\rightarrow$ Grass

(B) Grasshopper $\rightarrow$ Grass $\rightarrow$ Frog $\rightarrow$ Snake

(C) Grass $\rightarrow$ Frog $\rightarrow$ Grasshopper $\rightarrow$ Snake

(D) Grass $\rightarrow$ Grasshopper $\rightarrow$ Frog $\rightarrow$ Snake

Q23. In the nitrogen cycle, nitrifying bacteria such as *Nitrosomonas* and *Nitrobacter* carry out the process of converting:

(A) Atmospheric nitrogen gas directly into ammonia

(B) Nitrate in the soil back into nitrogen gas

(C) Ammonia into nitrites and then into nitrates

(D) Proteins in dead bodies into amino acids

Q24. Tuberculosis, a disease that mainly affects the lungs and spreads through the air by droplets released during coughing and sneezing, is caused by:

(A) A virus

(B) A bacterium (*Mycobacterium tuberculosis*)

(C) A protozoan

(D) A fungus

Q25. The process of producing many identical copies of a particular gene by inserting it into a vector and multiplying it inside a host cell is called:

(A) Transcription

(B) Translation

(C) Mutation

(D) Gene cloning

Detailed Solutions

Q1.

Solution

Concept — Glands that help in digestion: Several glands pour their secretions into the alimentary canal, and they differ greatly in size and in what they produce.

Step 1 — Identify the largest gland: The liver, located in the upper right part of the abdomen, is the largest gland in the human body.

Step 2 — Recall its digestive secretion: The liver secretes bile, which is stored in the gall bladder and released into the small intestine, where it emulsifies fats into tiny droplets for easier digestion.

Why other options are wrong:

- Option A (Pancreas): an important gland, but smaller than the liver, and it secretes digestive enzymes and insulin, not bile.
- Option B (Salivary gland): secretes saliva in the mouth and is much smaller.
- Option D (Gastric gland): a small gland in the stomach wall that secretes gastric juice.

Final Answer: The largest gland, which secretes bile, is the liver $\Rightarrow$ C

Answer: (C) Go Back to Q1

Q2.

Solution

Concept — Cells of the blood: Blood is a fluid connective tissue made of plasma and three kinds of cells, each with a special job.

Step 1 — Recall the oxygen carrier: Red blood cells (erythrocytes) contain the red iron-rich pigment haemoglobin.

Step 2 — Link structure to function: Haemoglobin binds oxygen in the lungs to form oxyhaemoglobin and releases it to the tissues, so the cell **X** carrying oxygen in the vessel is the red blood cell.

Why other options are wrong:

- Option B (White blood cell): fights infection and does not carry oxygen.
- Option C (Blood platelet): a cell fragment that helps in blood clotting.
- Option D (Lymph cell): a type of white cell found in lymph, not an oxygen

carrier.

Final Answer: The haemoglobin-containing oxygen carrier is the red blood cell $\Rightarrow$ A

Answer: (A) Go Back to Q2

Q3.

Solution

Concept — Nitrogenous waste in humans: The breakdown of excess proteins and amino acids produces nitrogen-containing wastes that must be removed by the excretory system.

Step 1 — Trace the formation of the waste: In the liver, toxic ammonia produced by protein breakdown is converted into the far less harmful compound urea.

Step 2 — Follow its removal: Urea is carried by the blood to the kidneys, filtered out, and passed as urine through the ureters to the bladder. Because urea is the chief waste removed, humans are described as ureotelic, so **X** is urea.

Why other options are wrong:

- Option A (Uric acid): the main waste of birds and reptiles, not the chief human waste.
- Option B (Ammonia): very toxic and is quickly converted to urea in the liver.
- Option C (Nitrogen gas): not an excretory product of the human kidney.

Final Answer: The main nitrogenous waste excreted by human kidneys is urea $\Rightarrow$ D

Answer: (D) Go Back to Q3

Q4.

Solution

Concept — Parts of the human brain: The brain has three main regions, the forebrain, midbrain and hindbrain, and each region controls different functions.

Step 1 — Locate the part at the base: At the base of the brain, where it joins the spinal cord, lies the medulla oblongata, part of the hindbrain.

Step 2 — Recall its function: The medulla oblongata controls vital involuntary activities such as heartbeat, breathing, blood pressure, vomiting and swallowing,

so **Y** is the medulla oblongata.

Why other options are wrong:

- Option A (Cerebrum): the largest part; it controls thinking, memory and voluntary actions.
- Option C (Cerebellum): coordinates movement and maintains balance and posture.
- Option D (Hypothalamus): controls body temperature, hunger and thirst, but not the heartbeat directly.

Final Answer: The controller of heartbeat and breathing is the medulla oblongata $\Rightarrow$ B

Answer: (B) Go Back to Q4

Q5.

Solution

Concept — Structure of the trachea: The trachea, or windpipe, is the tube that carries air from the throat towards the lungs and must stay open at all times.

Step 1 — Identify the supporting structure: The wall of the trachea is supported by a series of C-shaped rings of cartilage.

Step 2 — Explain their role: These flexible cartilage rings prevent the trachea from collapsing when air pressure inside falls during breathing, keeping the airway permanently open.

Why other options are wrong:

- Option B (Rings of bone): the support is cartilage, not hard bone, which would be too rigid.
- Option C (Smooth muscle only): muscle alone cannot hold the tube open against pressure.
- Option D (Mucus lining): mucus traps dust but gives no structural support.

Final Answer: The trachea is held open by C-shaped rings of cartilage $\Rightarrow$ A

Answer: (A) Go Back to Q5

Q6.

Solution

Concept — Hormonal control of blood calcium: The level of calcium in the blood is kept within narrow limits by hormones from the parathyroid glands.

Step 1 — Name the hormone: The four small parathyroid glands, embedded in the thyroid, secrete parathormone (parathyroid hormone).

Step 2 — Explain its action: When blood calcium falls, parathormone releases calcium from bones, increases its reabsorption in the kidneys, and promotes its uptake from the intestine, thereby raising blood calcium.

Why other options are wrong:

- Option A (Insulin): lowers blood glucose, not linked to calcium regulation.
- Option B (Thyroxine): controls the overall rate of metabolism.
- Option C (Adrenaline): the emergency hormone that prepares the body for fight or flight.

Final Answer: The hormone that raises blood calcium is parathormone $\Rightarrow$ $\boxed{\text{D}}$

Answer: (D) Go Back to Q6

Q7.

Solution

Concept — Genotype and phenotype: An organism can be described both by the genes it carries and by the traits that can actually be seen.

Step 1 — Define the two terms: The genotype is the genetic constitution (here Tt), while the phenotype is the outward, observable appearance of the organism.

Step 2 — Apply to the plant: The plant carries the genotype Tt, but because T is dominant it looks tall. This visible tallness is its phenotype.

Why other options are wrong:

- Option A (Genotype): refers to the genetic makeup Tt, not the visible trait.
- Option C (Karyotype): the complete set of chromosomes seen under a microscope.
- Option D (Genome): the entire genetic material of an organism.

Final Answer: The observable characteristic of an organism is its phenotype $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q7

Q8.

Solution

Concept — Sex-linked inheritance: Some genes lie on the sex chromosomes, so the disorders they cause are inherited along with sex.

Step 1 — Locate the gene: The gene for normal blood clotting lies on the X chromosome, and its defective form is recessive.

Step 2 — Explain the pattern: A male (XY) with a single defective X shows haemophilia, while a female (XX) needs both X chromosomes to carry the defect, so haemophilia is an X-linked recessive disorder that appears far more often in males.

Why other options are wrong:

- Option A (Y-linked dominant): the gene is on the X, not the Y chromosome.
- Option B (Autosomal dominant): the defect is recessive and is not on an autosome.
- Option D (Mitochondrial trait): haemophilia is not inherited through mitochondrial DNA.

Final Answer: Haemophilia is an X-linked recessive disorder $\Rightarrow$ C

Answer: (C) Go Back to Q8

Q9.

Solution

Concept — Building blocks of nucleic acids: DNA and RNA are long chains built from repeating units called nucleotides.

Step 1 — List the three parts: Each nucleotide is made of three components joined together: a nitrogenous base, a pentose (five-carbon) sugar, and a phosphate group.

Step 2 — Assemble the chain: Many such nucleotides link through their sugar and phosphate groups to form the backbone of the nucleic acid, with the bases projecting inward.

Why other options are wrong:

- Option B (Only base and sugar): leaves out the essential phosphate group.
- Option C (Two sugars and a phosphate): a nucleotide has one sugar, not two, and must include a base.
- Option D (Amino acid, base and phosphate): amino acids are units of proteins, not of nucleotides.

Final Answer: A nucleotide is a base plus a sugar plus a phosphate $\Rightarrow$ A

Answer: (A) Go Back to Q9

Q10.

Solution

Concept — Evidences of evolution: Evolution is supported by several lines of evidence, one of the most direct being the study of ancient life.

Step 1 — Define the term: Fossils are the preserved remains, impressions or traces of organisms that lived in the distant past, usually found in sedimentary rock layers.

Step 2 — Explain the evidence: By comparing fossils of different ages, scientists can trace how organisms changed over time, so fossils give direct (paleontological) evidence for evolution.

Why other options are wrong:

- Option A (Vestigial organs): reduced, functionless remnants such as the appendix; they are anatomical, not paleontological, evidence.
- Option B (Analogous organs): have the same function but different structure, showing convergent evolution.
- Option C (Homologous organs): share a common structure but differ in function, showing divergent evolution.

Final Answer: The preserved remains of past organisms are fossils $\Rightarrow$ D

Answer: (D) Go Back to Q10

Q11.

Solution

Concept — Control centre of the cell: Each organelle has a role, but one of them stores the genetic information and directs the others.

Step 1 — Identify the organelle: The nucleus is a large, membrane-bound organelle that contains the chromosomes made of DNA.

Step 2 — Explain its control: Through the genes in its DNA, the nucleus directs protein synthesis and thereby controls growth, metabolism and reproduction of the cell.

Why other options are wrong:

- Option A (Mitochondrion): releases energy as ATP but does not control cell activities.
- Option C (Ribosome): the site where proteins are actually assembled.
- Option D (Vacuole): stores water, food and wastes, mainly for support.

Final Answer: The DNA-containing controller of the cell is the nucleus $\Rightarrow$ B

Answer: (B) Go Back to Q11

Q12.

Solution

Concept — Fuel for respiration: Cells oxidise food molecules to release energy, but they prefer one molecule as their ready fuel.

Step 1 — Identify the main fuel: Glucose, a simple six-carbon sugar, is the chief and most readily usable source of energy in cells.

Step 2 — Trace its use: During cellular respiration glucose is broken down step by step, releasing energy that is stored as ATP for the cell to use.

Why other options are wrong:

- Option A (Protein): mainly used for growth and repair; used for energy only when other fuels run short.
- Option B (Fat): a store of energy, but it is used more slowly and is not the first choice.
- Option D (Vitamin): needed in tiny amounts to help reactions, not as an energy source.

Final Answer: The chief ready energy source for cells is glucose $\Rightarrow$ C

Answer: (C) Go Back to Q12

Q13.

Solution

Concept — Events of meiosis I: During the first meiotic division, homologous chromosomes pair up and can exchange parts, creating new gene combinations.

Step 1 — Read the figure: The two homologous chromosomes are shown crossing over each other at a point called the chiasma, where segments are being exchanged.

Step 2 — Name the process: This mutual exchange of corresponding segments between non-sister chromatids of homologous chromosomes is called crossing over, and it increases genetic variation.

Why other options are wrong:

- Option A (Independent assortment): the random distribution of different chromosomes into gametes, not the exchange of segments.
- Option B (Segregation): the separation of alleles into different gametes.
- Option C (Translation): the synthesis of protein from mRNA, unrelated to chromosomes pairing.

Final Answer: The exchange of segments between homologous chromosomes is crossing over $\Rightarrow$ D

Answer: (D) Go Back to Q13

Q14.

Solution

Concept — Types of cell division: Body cells and reproductive cells divide by different processes suited to their purpose.

Step 1 — Recall mitosis: Mitosis is an equational division in which one parent cell gives two daughter cells with the same number of chromosomes as the parent.

Step 2 — Link it to growth and repair: Because the daughter cells are genetically identical and diploid, mitosis is used to add new cells during growth and to replace worn-out or injured cells during repair.

Why other options are wrong:

- Option B (Meiosis): halves the chromosome number to form gametes; it is not used for body growth.
- Option C (Binary fission): asexual division seen in bacteria and Amoeba, not in tissue repair of higher animals.
- Option D (Budding): an asexual method seen in yeast and Hydra, not the way human tissues grow.

Final Answer: Growth and repair of the body occur by mitosis $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q14

Q15.

Solution

Concept — Types of pollination: Pollination is the transfer of pollen from an anther to a stigma, and it is named by where the pollen ends up.

Step 1 — Read the figure: Pollen from the anther of Flower 1 is being carried to the stigma of Flower 2, which is on a different plant.

Step 2 — Name the type: Transfer of pollen from the anther of one flower to the stigma of a flower on a different plant of the same species is cross-pollination.

Why other options are wrong:

- Option A (Self-pollination): pollen would reach the stigma of the same flower or another flower on the same plant.
- Option C (Absence of pollination): pollen is clearly being transferred, so pollination is taking place.
- Option D (Direct fertilisation): fertilisation is the fusion of gametes later, not the transfer of pollen.

Final Answer: Pollen carried to a different plant means cross-pollination $\Rightarrow$ $\boxed{\text{B}}$

Answer: (B) Go Back to Q15

Q16.

Solution

Concept — Position of the testes: In males the testes lie outside the main body cavity, and this position has a clear physiological reason.

Step 1 — Note the location: The testes are held in a pouch of skin called the scrotum, which hangs outside the abdomen.

Step 2 — Explain the reason: The scrotum keeps the testes at a temperature about two to three degrees lower than the core body temperature, and this slightly cooler environment is needed for normal sperm formation.

Why other options are wrong:

- Option A (Higher temperature): a higher temperature actually harms sperm production.
- Option B (Equal to body temperature): if it equalled body temperature, sperm formation would be impaired.
- Option D (Continuously rising and falling): sperm formation needs a steady, slightly cool temperature, not a fluctuating one.

Final Answer: The scrotum keeps the testes slightly below body temperature $\Rightarrow$ C

Answer: (C) Go Back to Q16

Q17.

Solution

Concept — Support of the foetus: The developing foetus cannot eat or breathe on its own, so it depends on a special connecting structure.

Step 1 — Identify the structure: The placenta is a disc-shaped organ that develops in the uterine wall and is joined to the foetus by the umbilical cord.

Step 2 — Explain its function: Through the placenta, oxygen and nutrients pass from the mother's blood to the foetus, while carbon dioxide and other wastes pass back to the mother for removal.

Why other options are wrong:

- Option B (Corpus luteum): an ovarian structure that secretes progesterone; it does not connect the foetus to the uterus.
- Option C (Cervix): the narrow lower opening of the uterus into the vagina.

- Option D (Fallopian tube): the site of fertilisation, not of foetal exchange.

Final Answer: The organ linking foetus and mother for exchange is the placenta $\Rightarrow$ A

Answer: (A) Go Back to Q17

Q18.

Solution

Concept — Overall equation of photosynthesis: Green plants make food using simple raw materials in the presence of sunlight and chlorophyll.

Step 1 — Write the reaction: $6CO_2 + 6H_2O \xrightarrow{\text{light, chlorophyll}} C_6H_{12}O_6 + 6O_2$.

Step 2 — Read off materials and products: The raw materials used are carbon dioxide and water, and the products formed are glucose (food) and oxygen, which is released into the air.

Why other options are wrong:

- Option A (Glucose and oxygen used): that is the reverse process, respiration, not photosynthesis.
- Option B (Oxygen and water used): oxygen is released, not used, in photosynthesis.
- Option C (Carbon dioxide and oxygen used; water formed): oxygen is a product, not a raw material.

Final Answer: Photosynthesis uses carbon dioxide and water to make glucose and oxygen $\Rightarrow$ D

Answer: (D) Go Back to Q18

Q19.

Solution

Concept — Plant growth hormones: Plants respond to their surroundings with the help of chemical messengers called phytohormones.

Step 1 — Identify the hormone: Auxin is a growth-promoting hormone produced mainly at the shoot tip.

Step 2 — Explain its effects: When light falls from one side, auxin collects on the shaded side and makes those cells elongate more, bending the shoot towards

light (phototropism). Auxin from the apical bud also suppresses the growth of side buds, giving apical dominance.

Why other options are wrong:

- Option A (Abscisic acid): a growth inhibitor that promotes dormancy and closes stomata.
- Option C (Ethylene): a gaseous hormone that mainly promotes the ripening of fruits.
- Option D (Cytokinin): promotes cell division and delays ageing of leaves.

Final Answer: The hormone causing phototropism and apical dominance is auxin $\Rightarrow$ B

Answer: (B) Go Back to Q19

Q20.

Solution

Concept — Position of viruses: Whittaker's five-kingdom system is based on cell structure and nutrition, and viruses do not fit any kingdom.

Step 1 — Recall the nature of viruses: Viruses are acellular, meaning they lack a true cell; each is just a piece of nucleic acid (DNA or RNA) wrapped in a protein coat.

Step 2 — Explain the exclusion: Outside a host they are inert, and they can multiply only inside a living host cell, behaving as obligate parasites. Because they are non-cellular and cannot live independently, they are kept outside the five kingdoms.

Why other options are wrong:

- Option A (Multicellular decomposers): viruses are neither multicellular nor decomposers.
- Option B (Prokaryotic autotrophs): viruses have no cell and cannot make their own food.
- Option D (Eukaryotic and free-living): viruses are neither eukaryotic nor able to live freely.

Final Answer: Viruses are acellular obligate parasites of living cells $\Rightarrow$ C

Answer: (C) Go Back to Q20

Q21.

Solution

Concept — Phylum Coelenterata (Cnidaria): Animals are grouped into phyla by features such as symmetry, body organisation and special cells.

Step 1 — Note the features given: The animals show radial symmetry and possess special stinging cells called cnidoblasts (nematocysts).

Step 2 — Match the phylum: These features, together with a hollow body cavity (coelenteron), place Hydra and jellyfish in the phylum Coelenterata, also called Cnidaria.

Why other options are wrong:

- Option B (Porifera): the sponges, which have pores and no stinging cells.
- Option C (Arthropoda): animals with jointed legs and an exoskeleton, showing bilateral symmetry.
- Option D (Annelida): segmented worms with bilateral symmetry and no cnidoblasts.

Final Answer: Radial animals with stinging cells belong to Coelenterata $\Rightarrow$ $\boxed{\text{A}}$

Answer: (A) Go Back to Q21

Q22.

Solution

Concept — Order of a food chain: A food chain shows the flow of energy from the producer through a series of consumers, each feeding on the one before it.

Step 1 — Classify the organisms: Grass is the producer, the grasshopper is a herbivore (primary consumer), the frog eats the grasshopper (secondary consumer), and the snake eats the frog (tertiary consumer).

Step 2 — Arrange in order: Starting from the producer and moving to the top consumer, the correct sequence is Grass $\rightarrow$ Grasshopper $\rightarrow$ Frog $\rightarrow$ Snake.

Why other options are wrong:

- Option A (Snake first): reverses the chain, starting with the top consumer.
- Option B (Grasshopper first): a herbivore cannot come before the producer it feeds on.
- Option C (Grass, Frog, Grasshopper, Snake): places the frog before its food, the grasshopper, which is wrong.

Final Answer: The correct order is Grass → Grasshopper → Frog → Snake ⇒ D

Answer: (D) Go Back to Q22

Q23.

Solution

Concept — Nitrification in the nitrogen cycle: Soil bacteria carry out several steps that change nitrogen from one form to another.

Step 1 — Identify the process: Nitrification is the conversion of ammonia into nitrites and then into nitrates by nitrifying bacteria.

Step 2 — Name the bacteria: *Nitrosomonas* first oxidises ammonia to nitrites, and *Nitrobacter* then oxidises the nitrites to nitrates, which plants can absorb through their roots.

Why other options are wrong:

- Option A (Nitrogen to ammonia): this is nitrogen fixation, done by bacteria such as *Rhizobium*.
- Option B (Nitrate to nitrogen gas): this is denitrification, done by denitrifying bacteria.
- Option D (Proteins to amino acids): this is decomposition, not nitrification.

Final Answer: Nitrifying bacteria convert ammonia into nitrites and then nitrates ⇒ C

Answer: (C) Go Back to Q23

Q24.

Solution

Concept — Cause of tuberculosis: Communicable diseases are caused by different kinds of microorganisms, and identifying the type guides the treatment.

Step 1 — Name the pathogen: Tuberculosis is caused by the bacterium *Mycobacterium tuberculosis*.

Step 2 — Note its spread and cure: It is an airborne disease spread by droplets from the coughs and sneezes of an infected person, and because it is bacterial it can be treated with antibiotics.

Why other options are wrong:

- Option A (A virus): viral diseases such as influenza are not treated with antibiotics; TB is bacterial.
- Option C (A protozoan): protozoans cause diseases such as malaria, not tuberculosis.
- Option D (A fungus): fungi cause diseases such as ringworm, not tuberculosis.

Final Answer: Tuberculosis is caused by a bacterium, *Mycobacterium tuberculosis* $\Rightarrow$ B

Answer: (B) Go Back to Q24

Q25.

Solution

Concept — Gene cloning: Biotechnology often needs many copies of a single gene, and this is achieved by growing it inside living cells.

Step 1 — Describe the process: Gene cloning means isolating a desired gene, inserting it into a vector such as a plasmid, and placing this into a host cell.

Step 2 — Follow the multiplication: As the host cell divides again and again, the inserted gene is copied along with it, so a large number of identical copies of that gene are produced.

Why other options are wrong:

- Option A (Transcription): the copying of a gene into mRNA inside the cell, not the making of many gene copies.
- Option B (Translation): the building of a protein from mRNA.
- Option C (Mutation): a change in the DNA sequence, not a way to multiply a gene.

Final Answer: Making many identical copies of a gene in a host cell is gene cloning $\Rightarrow$ D

Answer: (D) Go Back to Q25

Answer Key

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