

PGIMER BSc Nursing Biology

Sample Paper – 5

Duration: 23 Minutes

Maximum Marks: 25

Instructions

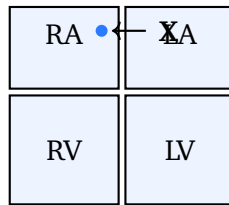
- This paper contains **25** Multiple Choice Questions (Single Correct Answer), modelled on the Biology portion of the **PGIMER BSc Nursing** entrance exam.
- Each correct answer carries **+1 mark**. **0.25 mark** is deducted for every incorrect answer. Unattempted questions carry **0 marks**.
- Only **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 inner wall of the human small intestine bears numerous tiny finger-like projections that greatly increase the surface area available for the absorption of digested food. These projections are called:

- (A) Rugae
- (B) Gastric pits
- (C) Villi
- (D) Sphincters

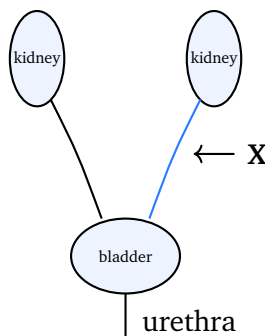
Q2. The diagram shows the human heart. The small mass of specialised tissue labelled **X**, located in the wall of the right atrium, sets off each heartbeat and is therefore called the natural pacemaker. Structure **X** is the:





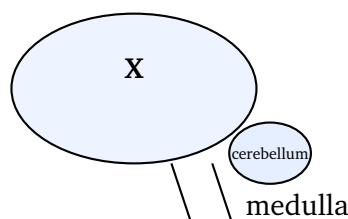
- (A) AV node
- (B) SA node
- (C) Purkinje fibres
- (D) Bundle of His

Q3. The diagram shows the human urinary system. The tube labelled X, which carries urine from the kidney down to the urinary bladder for storage, is the:



- (A) Urethra
- (B) Renal artery
- (C) Collecting duct
- (D) Ureter

Q4. The diagram shows the human brain. The largest part, labelled X, is the seat of thinking, memory, reasoning and voluntary action. Part X is the:



- (A) Cerebrum
- (B) Cerebellum
- (C) Medulla oblongata
- (D) Hypothalamus

Q5. The volume of air that a person breathes in or breathes out during a single normal, quiet breath is called the:

- (A) Vital capacity
- (B) Tidal volume
- (C) Residual volume
- (D) Total lung capacity

Q6. A deficiency of antidiuretic hormone (ADH) reduces water reabsorption by the kidney tubules, so the body loses large amounts of dilute urine. This disorder is known as:

- (A) Diabetes mellitus
- (B) Goitre
- (C) Diabetes insipidus
- (D) Cretinism

Q7. In *Mirabilis jalapa*, a cross between a red-flowered (RR) and a white-flowered (rr) plant gives all pink (Rr) flowers in the F₁ generation. When these F₁ plants are self-pollinated, the F₂ phenotypic ratio of red : pink : white is:

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



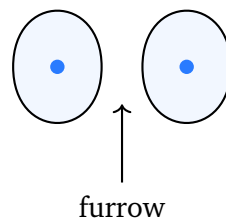
- Q8.** Red–green colour blindness in humans is far more common in males than in females. This is because the defective gene responsible for it is:
- (A) Present on the Y chromosome
 - (B) Recessive and located on the X chromosome
 - (C) Dominant and located on the X chromosome
 - (D) Located on an autosome
- Q9.** During translation (protein synthesis), the sequence of three consecutive bases on the mRNA that specifies a single amino acid is called a:
- (A) Codon
 - (B) Anticodon
 - (C) Gene
 - (D) Nucleosome
- Q10.** The theory that organisms pass on to their offspring the characters they gain during their own lifetime, illustrated by the long neck of the giraffe developed through constant stretching, was proposed by:
- (A) Charles Darwin
 - (B) Gregor Mendel
 - (C) Jean-Baptiste Lamarck
 - (D) Hugo de Vries
- Q11.** The membrane-bound organelles that contain powerful digestive enzymes and are called the “suicidal bags” of the cell because they can digest the cell’s own worn-out parts are the:
- (A) Ribosomes
 - (B) Peroxisomes
 - (C) Golgi bodies
 - (D) Lysosomes



Q12. Enzymes speed up the biochemical reactions of a living cell without themselves being used up in the reaction. Chemically, almost all enzymes are:

- (A) Proteins
- (B) Carbohydrates
- (C) Lipids
- (D) Nucleic acids

Q13. The figure shows the final event of cell division in an animal cell, in which the cytoplasm divides through a furrow that pinches the cell into two daughter cells. This process is called:



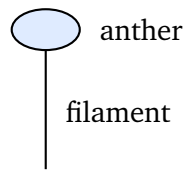
- (A) Karyokinesis
- (B) Cytokinesis
- (C) Synapsis
- (D) Chiasma formation

Q14. The number of chromosomes present in a normal human somatic (body) cell is:

- (A) 23
- (B) 48
- (C) 46
- (D) 44

Q15. The figure shows the male reproductive part of a flower, a slender stalk bearing a swollen top that produces pollen. This structure, the stamen, is made up of:





- (A) Anther and filament
- (B) Stigma and style
- (C) Ovary and ovule
- (D) Sepal and petal

Q16. After being matured and stored in the epididymis, the sperms are carried away from the testis towards the urethra by a long muscular tube called the:

- (A) Fallopian tube
- (B) Seminiferous tubule
- (C) Ureter
- (D) Vas deferens

Q17. The attachment and embedding of the developing blastocyst into the thick, spongy inner lining (endometrium) of the uterus is called:

- (A) Fertilisation
- (B) Ovulation
- (C) Implantation
- (D) Cleavage

Q18. In a green leaf, photosynthesis takes place mainly in the mesophyll cells, because these cells are packed with the green organelle that contains chlorophyll, namely the:

- (A) Mitochondrion
- (B) Chloroplast
- (C) Vacuole



(D) Nucleus

Q19. On humid mornings, small drops of liquid water are seen at the tips and margins of the leaves of certain plants, given out through special pores called hydathodes. This loss of water in the liquid form is called:

(A) Guttation

(B) Transpiration

(C) Translocation

(D) Imbibition

Q20. R. H. Whittaker classified all living organisms into five kingdoms. Which one of the following was **NOT** a main criterion used by him for this classification?

(A) Cell structure (prokaryotic or eukaryotic)

(B) Body organisation (unicellular or multicellular)

(C) Mode of nutrition (autotrophic or heterotrophic)

(D) Colour of the organism

Q21. Sponges are placed in the phylum Porifera because their body wall is perforated by numerous tiny pores called ostia, through which:

(A) They release their eggs into the surroundings

(B) They give out carbon dioxide only

(C) Water enters the body for filter feeding

(D) They attach themselves to the substratum

Q22. The figure shows a food chain. The organism at position X, which is not eaten by any other member of the chain and occupies the highest trophic level (the top carnivore), is the:

Grass \leftarrow Grasshopper \rightarrow Frog \rightarrow Snake \rightarrow X



- (A) Eagle
- (B) Frog
- (C) Grasshopper
- (D) Grass

Q23. The flow of energy through the successive trophic levels of a food chain in an ecosystem is:

- (A) Cyclic, returning finally to the producers
- (B) Two-way between neighbouring trophic levels
- (C) Constant and equal at every trophic level
- (D) Unidirectional, passing from producers to consumers

Q24. Acquired Immuno Deficiency Syndrome (AIDS) is caused by the Human Immunodeficiency Virus (HIV), which weakens the body's defence by destroying a particular type of white blood cell, the:

- (A) Red blood cells
- (B) Helper-T lymphocytes
- (C) Blood platelets
- (D) Mast cells

Q25. The human insulin used today by many diabetic patients is manufactured on a large scale by inserting the human insulin gene into bacteria. Insulin produced in this way is described as:

- (A) Natural pancreatic insulin
- (B) Animal-extracted insulin
- (C) Recombinant (genetically engineered) insulin
- (D) Purely synthetic chemical insulin



Detailed Solutions

Q1.

Solution

Concept — Absorption in the small intestine: Most of the absorption of digested food takes place in the small intestine, which is specially adapted to give a very large absorptive surface.

Step 1 — Identify the adaptation: The inner lining of the small intestine is thrown into countless tiny finger-like projections called villi.

Step 2 — Explain how they help: The villi enormously increase the surface area, and each villus has a rich supply of blood capillaries and a lacteal, so digested food (glucose, amino acids, fatty acids) is absorbed quickly and efficiently.

Why other options are wrong:

- Option A (Rugae): are the folds of the stomach wall that allow it to expand, not absorptive projections.
- Option B (Gastric pits): are small openings of the gastric glands in the stomach.
- Option D (Sphincters): are ring-like muscles that control the passage of food, not surfaces for absorption.

Final Answer: The absorptive projections of the small intestine are the villi ⇒

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

Q2.

Solution

Concept — Origin of the heartbeat: The human heart beats on its own (myogenic beat), and the beat is started by a special patch of tissue that acts as a pacemaker.

Step 1 — Locate the pacemaker: In the wall of the right atrium, near the opening of the superior vena cava, lies a small mass of specialised tissue called the sinoatrial (SA) node.

Step 2 — Explain its role: The SA node generates waves of electrical impulses on its own and sets the rhythm of the heartbeat, so it is called the pacemaker. Structure X in the diagram, sitting in the right atrium wall, is the SA node.

Why other options are wrong:



- Option A (AV node): lies between the atria and ventricles and only relays the impulse; it does not initiate the beat.
- Option C (Purkinje fibres): spread the impulse through the ventricle walls.
- Option D (Bundle of His): conducts the impulse from the AV node to the ventricles.

Final Answer: The pacemaker in the right atrium wall is the SA node ⇒

[Go Back to Q2](#)

Q3.

Solution

Concept — Parts of the urinary system: The human urinary system consists of two kidneys, two ureters, one urinary bladder and one urethra, each with a definite job.

Step 1 — Trace the path of urine: Urine is formed in the kidneys, then leaves each kidney and must be carried down to the bladder for storage.

Step 2 — Identify the connecting tube: The tube that runs from each kidney to the urinary bladder, carrying urine downward by peristalsis, is the ureter. The labelled tube X between the kidney and the bladder is therefore the ureter.

Why other options are wrong:

- Option A (Urethra): carries urine from the bladder to the outside of the body, not from kidney to bladder.
- Option B (Renal artery): brings blood into the kidney, it does not carry urine.
- Option C (Collecting duct): lies inside the kidney and gathers urine from the nephrons before it reaches the ureter.

Final Answer: The tube carrying urine from the kidney to the bladder is the ureter ⇒

[Go Back to Q3](#)



Q4.

Solution

Concept — Parts of the human brain: The brain has three main regions: the fore-brain (mainly the cerebrum), the mid-brain, and the hind-brain (cerebellum, pons and medulla).

Step 1 — Identify the largest part: The cerebrum is by far the largest part of the human brain and forms most of its bulk.

Step 2 — State its functions: The cerebrum is the centre for thinking, memory, reasoning, intelligence, will power and voluntary actions. The large uppermost part labelled X is therefore the cerebrum.

Why other options are wrong:

- Option B (Cerebellum): a smaller part behind and below the cerebrum that maintains balance and coordinates muscular activity.
- Option C (Medulla oblongata): the stalk-like base that controls involuntary actions such as heartbeat and breathing.
- Option D (Hypothalamus): a small region of the fore-brain that controls body temperature, hunger and thirst.

Final Answer: The largest part of the brain, the seat of thinking, is the cerebrum
⇒

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

Q5.

Solution

Concept — Lung volumes: The air moved in and out of the lungs is measured in terms of several respiratory volumes and capacities.

Step 1 — Define the volume in question: The amount of air that moves in or out of the lungs in a single normal, relaxed breath is called the tidal volume.

Step 2 — Note its value: In a healthy adult the tidal volume is about 500 mL of air per quiet breath.

Why other options are wrong:

- Option A (Vital capacity): the maximum air breathed out after the deepest possible inhalation, much larger than a normal breath.
- Option C (Residual volume): the air that always remains in the lungs even



after the strongest exhalation.

- Option D (Total lung capacity): the total volume the lungs can hold, the sum of all lung volumes.

Final Answer: Air moved in one quiet breath is the tidal volume \Rightarrow **B**

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

Q6.

Solution

Concept — Antidiuretic hormone (ADH): ADH, also called vasopressin, is released from the posterior pituitary and controls how much water the kidney reabsorbs.

Step 1 — Note the effect of ADH shortage: When ADH is deficient, the kidney tubules cannot reabsorb enough water, so a large volume of very dilute urine is passed out.

Step 2 — Name the disorder: This condition, marked by excessive dilute urine and constant thirst, is called diabetes insipidus.

Why other options are wrong:

- Option A (Diabetes mellitus): is caused by a shortage of insulin, giving high blood sugar and sugar in the urine, not an ADH problem.
- Option B (Goitre): is the swelling of the thyroid gland due to iodine deficiency.
- Option D (Cretinism): results from a lack of thyroxine in children.

Final Answer: A lack of ADH causes diabetes insipidus \Rightarrow **C**

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

Q7.

Solution

Concept — Incomplete dominance: In incomplete dominance neither allele is fully dominant, so the heterozygote shows a blended, intermediate character.

Step 1 — Read the F₁ result: Red (RR) \times white (rr) gives all pink (Rr) plants, because Rr shows a blend of red and white, not pure red.

Step 2 — Work out the F₂: Selfing the pink F₁ (Rr \times Rr) gives genotypes RR, Rr,



Rr and rr in the ratio 1 : 2 : 1.

Step 3 — Convert to phenotypes: Because RR is red, Rr is pink and rr is white, the phenotypes appear as 1 red : 2 pink : 1 white, that is 1 : 2 : 1. Here the phenotypic ratio equals the genotypic ratio.

Why other options are wrong:

- Option A (3 : 1): is the monohybrid ratio under complete dominance, where the heterozygote looks like the dominant parent.
- Option B (9 : 3 : 3 : 1): is the dihybrid ratio for two gene pairs.
- Option C (1 : 1): is a test-cross ratio.

Final Answer: Incomplete dominance in *Mirabilis* gives an F₂ ratio of 1 : 2 : 1 ⇒

D

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

Q8.

Solution

Concept — Sex-linked inheritance: Genes carried on the X chromosome show a special pattern of inheritance because males and females differ in their X chromosomes.

Step 1 — Locate the gene: The gene for red–green colour blindness is a recessive gene carried on the X chromosome. Males are XY and females are XX.

Step 2 — Explain the higher frequency in males: A male has only one X chromosome, so a single defective recessive allele on it makes him colour blind. A female would need the recessive allele on both her X chromosomes to be colour blind, which is much rarer. Hence the disorder is commoner in males.

Why other options are wrong:

- Option A (On the Y chromosome): the gene is on the X, not the Y chromosome.
- Option C (Dominant, on the X): the allele is recessive, not dominant; if it were dominant it would appear in many more females too.
- Option D (On an autosome): colour blindness is sex-linked, so the gene is not on an autosome.

Final Answer: Colour blindness is due to a recessive gene on the X chromosome ⇒ **B**



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

Q9.

Solution

Concept — The genetic code in translation: During translation, the message carried by mRNA is read three bases at a time to build a chain of amino acids.

Step 1 — Define the reading unit: A group of three consecutive bases on the mRNA that stands for one amino acid is called a codon.

Step 2 — Link it to protein synthesis: Each codon is recognised by the matching anticodon of a tRNA that brings the correct amino acid, so the order of codons decides the order of amino acids in the protein.

Why other options are wrong:

- Option B (Anticodon): is the triplet of bases on the tRNA, not on the mRNA.
- Option C (Gene): is a whole segment of DNA that carries the information for a full polypeptide, not a single triplet.
- Option D (Nucleosome): is a bead of DNA wound around histone proteins, a packaging unit, not a coding triplet.

Final Answer: The mRNA triplet coding for one amino acid is a codon ⇒

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

Q10.

Solution

Concept — Theories of evolution: Different scientists explained how species change over time in different ways.

Step 1 — Recall Lamarck's idea: Jean-Baptiste Lamarck proposed the inheritance of acquired characters: characters gained by an organism during its life through use and disuse are passed to the offspring.

Step 2 — Apply the giraffe example: Lamarck argued that giraffes stretched their necks to reach high leaves, and this acquired long neck was inherited by their young, so necks grew longer over generations.

Why other options are wrong:

- Option A (Charles Darwin): gave the theory of natural selection (survival of



the fittest), not the inheritance of acquired characters.

- Option B (Gregor Mendel): worked out the laws of inheritance, not a theory of evolution.
- Option D (Hugo de Vries): proposed the mutation theory of evolution, based on sudden heritable changes.

Final Answer: The inheritance of acquired characters was proposed by Lamarck

⇒ C

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

Q11.

Solution

Concept — Lysosomes: Cell organelles share out the work of the cell, and one of them handles digestion and disposal of waste.

Step 1 — Identify the organelle: Lysosomes are tiny membrane-bound sacs that contain powerful digestive (hydrolytic) enzymes.

Step 2 — Explain the nickname: When a cell is damaged, worn out or starved, its lysosomes can burst and digest the cell's own contents, so they are called the "suicidal bags" of the cell.

Why other options are wrong:

- Option A (Ribosomes): are the sites of protein synthesis and hold no digestive enzymes.
- Option B (Peroxisomes): break down hydrogen peroxide and fatty acids, but are not called suicidal bags.
- Option C (Golgi bodies): package and dispatch cell products; in fact they help form lysosomes but are not themselves the suicidal bags.

Final Answer: The suicidal bags of the cell are the lysosomes ⇒ D

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



Q12.

Solution

Concept — Nature of enzymes: Enzymes are biological catalysts that greatly speed up the chemical reactions of the cell.

Step 1 — Recall their chemical nature: Almost all enzymes are proteins, made of long chains of amino acids folded into a precise three-dimensional shape.

Step 2 — Link shape to function: This specific shape gives each enzyme an active site that fits only its particular substrate, which is why enzymes are highly specific and are not used up in the reaction.

Why other options are wrong:

- Option B (Carbohydrates): serve mainly as energy sources and structural material, not as the main catalysts.
- Option C (Lipids): act as stored energy and form membranes, not as enzymes.
- Option D (Nucleic acids): store and carry genetic information; a few RNA molecules can act catalytically, but almost all enzymes are proteins.

Final Answer: Enzymes are chemically proteins \Rightarrow

[Go Back to Q12](#)

Q13.

Solution

Concept — Division of the cytoplasm: Cell division has two overlapping events, division of the nucleus and division of the cytoplasm.

Step 1 — Read the figure: After the nucleus has divided, the cytoplasm of the animal cell is being split by a furrow that pinches inward from the surface, separating the cell into two.

Step 2 — Name the process: The division of the cytoplasm to form two daughter cells is called cytokinesis. In animal cells it occurs by a cleavage furrow, while in plant cells it occurs by forming a cell plate.

Why other options are wrong:

- Option A (Karyokinesis): is the division of the nucleus, which happens before cytokinesis.
- Option C (Synapsis): is the pairing of homologous chromosomes during



meiosis, not cytoplasmic division.

- Option D (Chiasma formation): is the point of crossing over between chromosomes in meiosis.

Final Answer: The pinching division of the cytoplasm is cytokinesis ⇒ **B**

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

Q14.

Solution

Concept — Human chromosome number: Every species has a fixed number of chromosomes in its body cells, kept constant from generation to generation.

Step 1 — State the diploid number: A normal human somatic (body) cell is diploid and contains 46 chromosomes.

Step 2 — Express it as pairs: These 46 chromosomes occur as 23 pairs, of which 22 pairs are autosomes and one pair is the sex chromosomes (XX in females, XY in males).

Why other options are wrong:

- Option A (23): is the haploid number, found in the gametes (sperm or egg), not in body cells.
- Option B (48): is the diploid number in the chimpanzee, not in humans.
- Option D (44): counts only the autosomes and leaves out the two sex chromosomes.

Final Answer: A human body cell has 46 chromosomes ⇒ **C**

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

Q15.

Solution

Concept — The stamen: The stamen is the male reproductive unit of a flower, and together the stamens form the whorl called the androecium.

Step 1 — Identify the parts in the figure: The figure shows a slender stalk carrying a swollen, pollen-bearing top.

Step 2 — Name the two parts: The swollen top that produces pollen is the anther, and the stalk that holds it up is the filament. So a stamen is made up of an anther



and a filament.

Why other options are wrong:

- Option B (Stigma and style): are parts of the female pistil (gynoecium), not the stamen.
- Option C (Ovary and ovule): also belong to the female part of the flower.
- Option D (Sepal and petal): are the non-reproductive protective and attractive whorls of the flower.

Final Answer: A stamen consists of an anther and a filament \Rightarrow

[Go Back to Q15](#)

Q16.

Solution

Concept — Path of sperm in the male: Sperms formed in the testis travel through a series of tubes before being released.

Step 1 — Recall the sequence: Sperms pass from the seminiferous tubules to the epididymis (where they mature and are stored), and then into a long muscular duct.

Step 2 — Name the conducting tube: The long muscular tube that carries the sperm away from the testis (from the epididymis) up towards the urethra is the vas deferens.

Why other options are wrong:

- Option A (Fallopian tube): is a part of the female reproductive system, where fertilisation occurs.
- Option B (Seminiferous tubule): is the site inside the testis where sperms are made, not the tube that carries them out.
- Option C (Ureter): belongs to the urinary system and carries urine, not sperm.

Final Answer: Sperms are carried from the testis by the vas deferens \Rightarrow

[Go Back to Q16](#)



Q17.

Solution

Concept — Early events of pregnancy: After fertilisation, the zygote divides repeatedly to form a hollow ball of cells called the blastocyst, which then settles in the uterus.

Step 1 — Follow the blastocyst: The blastocyst moves down the fallopian tube and reaches the uterus, whose inner lining (endometrium) has become thick and spongy.

Step 2 — Name the process: The attachment and embedding of the blastocyst into this uterine wall is called implantation, and it marks the start of pregnancy.

Why other options are wrong:

- Option A (Fertilisation): is the fusion of sperm and egg, which happens earlier, in the fallopian tube.
- Option B (Ovulation): is the release of the egg from the ovary.
- Option D (Cleavage): is the series of rapid cell divisions of the zygote before implantation.

Final Answer: Embedding of the blastocyst in the uterine wall is implantation ⇒

C

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

Q18.

Solution

Concept — Site of photosynthesis: Photosynthesis is carried out by green cells that contain a special light-trapping organelle.

Step 1 — Identify the green cells: The mesophyll cells of the leaf are rich in green organelles and are the main photosynthetic cells.

Step 2 — Name the organelle: These green organelles are the chloroplasts, which contain the pigment chlorophyll that absorbs sunlight and drives photosynthesis.

Why other options are wrong:

- Option A (Mitochondrion): carries out respiration and releases energy; it does not perform photosynthesis.
- Option C (Vacuole): stores cell sap and maintains turgidity, with no role in



trapping light.

- Option D (Nucleus): controls the activities of the cell and contains DNA, but does not carry out photosynthesis.

Final Answer: Photosynthesis occurs in the chlorophyll-containing chloroplast ⇒

B

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

Q19.

Solution

Concept — Loss of water from plants: Plants lose water in more than one way; when it is lost as liquid drops rather than vapour, the process has a special name.

Step 1 — Read the description: Drops of liquid water appear at the tips and margins of leaves, given out through special pores called hydathodes, usually on humid mornings.

Step 2 — Name the process: The loss of water in the liquid form through hydathodes is called guttation. It happens when root pressure is high and transpiration is very low.

Why other options are wrong:

- Option B (Transpiration): is the loss of water as vapour, mainly through the stomata, not as liquid drops.
- Option C (Translocation): is the transport of prepared food through the phloem, not water loss.
- Option D (Imbibition): is the absorption of water by dry solid substances such as seeds, the opposite of water loss.

Final Answer: Loss of liquid water through hydathodes is guttation ⇒ **A**

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



Q20.

Solution

Concept — Basis of the five-kingdom system: R. H. Whittaker grouped organisms into five kingdoms using a set of clear, biologically important criteria.

Step 1 — List the real criteria: He used cell structure (prokaryotic or eukaryotic), body organisation (unicellular or multicellular), mode of nutrition (autotrophic or heterotrophic), along with reproduction and phylogenetic (evolutionary) relationships.

Step 2 — Spot the odd one out: The colour of an organism is a superficial feature that varies widely and does not reflect its basic structure or ancestry, so it was NOT one of Whittaker's criteria.

Why other options are wrong:

- Option A (Cell structure): is a genuine criterion; it separates Monera (prokaryotes) from the rest.
- Option B (Body organisation): is a genuine criterion; it distinguishes unicellular Protista from multicellular kingdoms.
- Option C (Mode of nutrition): is a genuine criterion; it separates autotrophic Plantae from heterotrophic Fungi and Animalia.

Final Answer: Colour of the organism was not a criterion used by Whittaker ⇒

D

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

Q21.

Solution

Concept — Phylum Porifera: Sponges are simple, pore-bearing, aquatic animals grouped in the phylum Porifera (meaning “pore-bearers”).

Step 1 — Note the pores: Their body wall is pierced by many tiny pores called ostia, and there is a larger opening at the top called the osculum.

Step 2 — Explain the function of ostia: Water carrying food particles and oxygen enters the body through the ostia; the sponge filters out the food and the used water leaves through the osculum. This is called filter feeding.

Why other options are wrong:

- Option A (Release eggs): the ostia are used mainly for the water current of



feeding, not for shedding eggs.

- Option B (Give out carbon dioxide only): the ostia bring water in for feeding and gas exchange; they are inlets, not mere gas outlets.
- Option D (Attach to the substratum): sponges attach by their base, not through the ostia.

Final Answer: Water enters through the ostia for filter feeding ⇒

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

Q22.

Solution

Concept — Trophic levels and the top carnivore: In a food chain, energy passes from producers to a series of consumers, and the animal at the very end is the top carnivore.

Step 1 — Read the chain: The chain is Grass → Grasshopper → Frog → Snake → X. Each arrow points to the organism that eats the previous one.

Step 2 — Identify X: X feeds on the snake and is itself not eaten by anyone in the chain, so it is the top carnivore of this food chain. A bird of prey such as the eagle fits this position.

Why other options are wrong:

- Option B (Frog): is a secondary consumer in the middle of the chain, eaten by the snake.
- Option C (Grasshopper): is the primary consumer (herbivore) at the second trophic level.
- Option D (Grass): is the producer at the base of the chain, not a carnivore.

Final Answer: The top carnivore that eats the snake is the eagle ⇒

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



Q23.

Solution

Concept — Energy flow in an ecosystem: Energy enters an ecosystem as sunlight, is trapped by producers, and then moves through the consumers.

Step 1 — Trace the direction: Energy flows from the producers to the herbivores (primary consumers), then to the carnivores, always moving forward from one trophic level to the next.

Step 2 — State the rule: This flow is unidirectional (one-way): energy never flows back from consumers to producers, and a large part is lost as heat at each level. So energy flow is a single-direction, non-cyclic process.

Why other options are wrong:

- Option A (Cyclic): nutrients are recycled, but energy is not; energy does not return to the producers.
- Option B (Two-way): energy never flows backward between trophic levels.
- Option C (Constant at every level): energy decreases at each higher level because much of it is lost as heat.

Final Answer: Energy flow through a food chain is unidirectional ⇒ **D**

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

Q24.

Solution

Concept — AIDS and HIV: AIDS is a disease of the immune system caused by a virus that attacks the body's own defence cells.

Step 1 — Identify the cause: AIDS is caused by the Human Immunodeficiency Virus (HIV), a retrovirus that spreads mainly through infected blood, unsafe sex and from mother to child.

Step 2 — Identify the target cell: HIV enters and destroys the helper-T lymphocytes (a type of white blood cell that coordinates the immune response). As their number falls, the body loses its ability to fight infections.

Why other options are wrong:

- Option A (Red blood cells): carry oxygen and are not the target of HIV.
- Option C (Blood platelets): help in blood clotting and are not destroyed by HIV.



- Option D (Mast cells): are involved in allergic responses, not the main cells attacked by HIV.

Final Answer: HIV destroys the helper-T lymphocytes ⇒

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

Q25.

Solution

Concept — Insulin by genetic engineering: Modern insulin for diabetics is made by recombinant DNA technology, not by extracting it from animals.

Step 1 — Describe the method: The human gene for insulin is cut out and inserted into a bacterium (such as *E. coli*) using a vector. The bacterium then reads the human gene and manufactures human insulin.

Step 2 — Name the product: Insulin produced by combining DNA from two sources (human gene inside a bacterium) is called recombinant, or genetically engineered, insulin. It is safe and can be made in large amounts.

Why other options are wrong:

- Option A (Natural pancreatic insulin): refers to insulin made by a person's own pancreas, not the manufactured product.
- Option B (Animal-extracted insulin): the older method used pig or cattle pancreas; it sometimes caused allergies and is not the gene-transfer product described here.
- Option D (Purely synthetic chemical insulin): the insulin here is made by living bacteria carrying a gene, not by pure chemical synthesis.

Final Answer: Insulin made by transferring the human gene into bacteria is recombinant insulin ⇒

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



Answer Key

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

