

PGIMER BSc Nursing Biology

Sample Paper – 11

Duration: 23 Minutes

Maximum Marks: 25

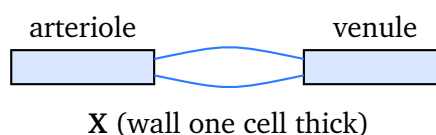
Instructions

- 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 digestion of starch that begins in the mouth is completed in the duodenum by an enzyme present in the pancreatic juice. This enzyme is:

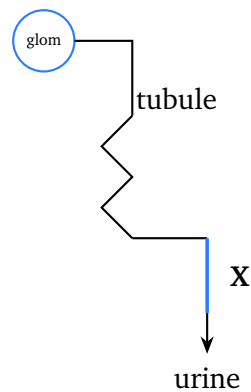
- (A) Pepsin
- (B) Trypsin
- (C) Pancreatic amylase
- (D) Bile salt

Q2. The figure shows a blood vessel X that connects an arteriole to a venule. Its wall is only one cell thick, which allows the exchange of gases, nutrients and wastes with the surrounding tissue. Vessel X is a:



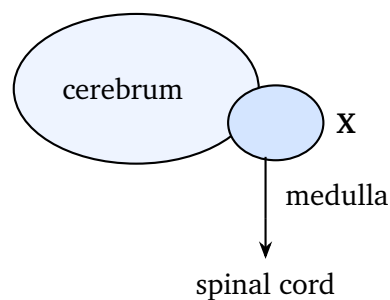
- (A) Capillary
- (B) Large artery
- (C) Large vein
- (D) Lymph vessel

Q3. The figure shows a nephron. The part labelled X, into which the tubule empties and where the final urine from many nephrons is gathered before leaving the kidney, is the:



- (A) Glomerulus
- (B) Bowman's capsule
- (C) Proximal tubule
- (D) Collecting duct

Q4. The figure shows a side view of the human brain. The part labelled X, which maintains posture and balance and coordinates precise muscular movements, is the:



- (A) Cerebrum



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

Q5. During heavy exercise, when the oxygen supply to the muscles is not enough, glucose is broken down anaerobically. The substance that then builds up in the muscle and causes fatigue and cramps is:

- (A) Ethanol and carbon dioxide
- (B) Acetic acid
- (C) Lactic acid
- (D) Citric acid

Q6. When the blood glucose level falls, the alpha cells of the islets of Langerhans secrete a hormone that raises it again by breaking down liver glycogen into glucose. This hormone, which is antagonistic to insulin, is:

- (A) Glucagon
- (B) Insulin
- (C) Thyroxine
- (D) Calcitonin

Q7. When a pure tall pea plant (TT) is crossed with a pure dwarf pea plant (tt), every plant of the F_1 generation is tall. This happens because, with respect to the dwarf allele, the tall allele (T) is:

- (A) Recessive
- (B) Dominant
- (C) Co-dominant
- (D) Lethal

Q8. A human male carries an extra X chromosome, giving a sex-chromosome make-up of XXY and a total of 47 chromosomes. He has poorly developed testes and some feminine features. This condition is:



- (A) Turner syndrome
- (B) Down syndrome
- (C) Sickle-cell anaemia
- (D) Klinefelter syndrome

Q9. RNA differs from DNA in having the sugar ribose and in one of its nitrogenous bases. In RNA, the base thymine of DNA is replaced by:

- (A) Adenine
- (B) Guanine
- (C) Uracil
- (D) Cytosine

Q10. Oparin and Haldane independently proposed that the first living things arose from non-living matter through the slow build-up of complex organic molecules in the primitive ocean. This idea is known as the:

- (A) Theory of chemical origin of life
- (B) Theory of special creation
- (C) Theory of spontaneous generation
- (D) Theory of panspermia

Q11. The plastids that contain coloured pigments other than green and give bright colours to flower petals and ripe fruits such as tomato and chilli are the:

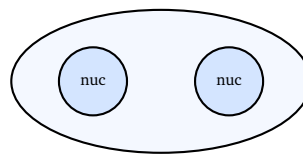
- (A) Chloroplasts
- (B) Chromoplasts
- (C) Leucoplasts
- (D) Amyloplasts

Q12. Proteins are large polymers whose repeating monomer units are joined together by peptide bonds. The monomers that make up a protein are:



- (A) Fatty acids
- (B) Monosaccharides
- (C) Nucleotides
- (D) Amino acids

Q13. The figure shows a dividing cell in which the nucleus has already split into two, but the cytoplasm has not yet divided. This division of the nucleus, which comes before cytokinesis, is called:



two nuclei, cytoplasm still undivided

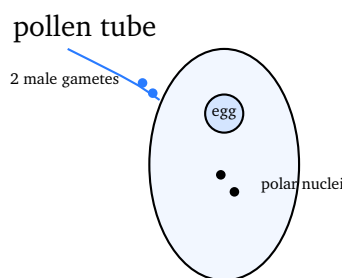
- (A) Karyokinesis
- (B) Cytokinesis
- (C) Binary fission
- (D) Budding

Q14. The interphase of the cell cycle is followed by the mitotic phase. The correct order of the phases in one complete cell cycle is:

- (A) $S \rightarrow G_1 \rightarrow G_2 \rightarrow M$
- (B) $G_1 \rightarrow G_2 \rightarrow S \rightarrow M$
- (C) $G_1 \rightarrow S \rightarrow G_2 \rightarrow M$
- (D) $M \rightarrow G_2 \rightarrow S \rightarrow G_1$

Q15. The figure shows a pollen tube discharging two male gametes into the embryo sac. One gamete fuses with the egg cell and the other fuses with the two polar nuclei to form the endosperm. Because two fusions take place, the process is called:





- (A) Single fertilisation
- (B) Double fertilisation
- (C) External fertilisation
- (D) Self-pollination

Q16. The cap-like structure at the tip of the head of a sperm, which contains enzymes that help the sperm to dissolve the covering of the egg and penetrate it, is the:

- (A) Middle piece
- (B) Tail
- (C) Nucleus
- (D) Acrosome

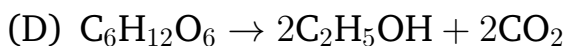
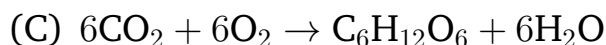
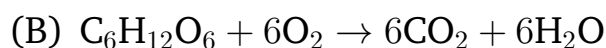
Q17. The human menstrual cycle lasts about 28 days and starts with the menstrual (bleeding) phase. The phase that follows menstruation and comes before ovulation, during which the uterine lining is rebuilt, is the:

- (A) Menstrual phase
- (B) Luteal phase
- (C) Proliferative (follicular) phase
- (D) Secretory phase

Q18. Which of the following correctly represents the overall balanced equation of photosynthesis?

- (A) $6\text{CO}_2 + 6\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$





Q19. The plant hormone that promotes cell division, helps in the formation of new leaves and shoots, and delays the ageing (senescence) of leaves is:

(A) Auxin

(B) Cytokinin

(C) Absciscic acid

(D) Ethylene

Q20. The older two-kingdom system that divided all organisms into Plantae and Animalia was replaced by the five-kingdom system mainly because it:

(A) Had far too many kingdoms to be useful

(B) Correctly separated prokaryotes from eukaryotes

(C) Could not separate prokaryotes from eukaryotes and grouped very different organisms together

(D) Ignored the plant kingdom altogether

Q21. Warm-blooded vertebrates whose bodies are covered with feathers, whose forelimbs are modified into wings, and which have a toothless beak, belong to the class:

(A) Mammalia

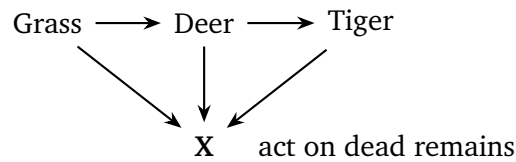
(B) Reptilia

(C) Amphibia

(D) Aves

Q22. In the figure, the organisms labelled X feed on the dead remains of the grass, the deer and the tiger, breaking them down and returning nutrients to the soil. These organisms are the:





- (A) Decomposers
- (B) Producers
- (C) Primary consumers
- (D) Top carnivores

Q23. Among the ecological pyramids, the one that is always upright in every ecosystem, because usable energy is lost at each higher trophic level, is the pyramid of:

- (A) Numbers
- (B) Energy
- (C) Biomass
- (D) Volume

Q24. A foreign substance that enters the body and triggers an immune response is called an antigen. The Y-shaped protein (immunoglobulin) that the body produces in response to it, and which binds to it, is the:

- (A) Antigen
- (B) Histamine
- (C) Antibody
- (D) Interferon

Q25. An organism into whose genome a useful gene from a different species has been deliberately introduced so that it shows a new trait is called a:

- (A) Clone
- (B) Hybrid
- (C) Mutant



(D) Transgenic (genetically modified) organism



Detailed Solutions**Q1.****Solution**

Concept — Completion of starch digestion: Starch digestion is not finished in the mouth; it is completed in the small intestine with the help of the pancreatic juice that pours into the duodenum.

Step 1 — Recall where the food reaches: The partly digested food (chyme) passes from the stomach into the first part of the small intestine, the duodenum.

Step 2 — Identify the pancreatic enzyme for starch: The pancreas releases pancreatic juice into the duodenum. It contains pancreatic amylase, which acts on the remaining starch and breaks it down into the disaccharide maltose.

Why other options are wrong:

- Option A (Pepsin): a protein-digesting enzyme that acts only in the acidic stomach.
- Option B (Trypsin): also from the pancreas, but it digests proteins, not starch.
- Option D (Bile salt): bile salts only emulsify fats; they are not enzymes and do not digest starch.

Final Answer: Starch digestion is completed in the duodenum by pancreatic amylase ⇒

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

Q2.**Solution**

Concept — Blood vessels and exchange: Different blood vessels have walls of different thickness suited to their function. Exchange of materials with tissues needs the thinnest possible wall.

Step 1 — Read the figure: Vessel X lies between an arteriole and a venule, and its wall is drawn as a single cell layer.

Step 2 — Identify the vessel: Only capillaries have walls that are just one cell (endothelium) thick. This thin wall lets oxygen, nutrients and wastes diffuse easily between the blood and the tissue cells, so X is a capillary.

Why other options are wrong:



- Option B (Large artery): has a thick muscular and elastic wall to withstand high pressure; no exchange occurs across it.
- Option C (Large vein): has a fairly thick wall with valves; it collects blood but does not carry out exchange.
- Option D (Lymph vessel): carries lymph, not the blood that flows from an arteriole to a venule.

Final Answer: The one-cell-thick exchange vessel between an arteriole and a venule is a capillary $\Rightarrow$

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

Q3.

Solution

Concept — Parts of a nephron: A nephron has a filtering unit and a long tubule that finally opens into a duct which gathers urine from many nephrons.

Step 1 — Follow the path of the filtrate: Blood is filtered at the glomerulus; the filtrate then travels along the tubule where useful substances are reabsorbed.

Step 2 — Identify part X: The tubule finally empties into the collecting duct. Several nephrons drain into one collecting duct, where the final concentration of urine takes place before it leaves the kidney. So X is the collecting duct.

Why other options are wrong:

- Option A (Glomerulus): is the ball of capillaries where filtration begins, shown at the top of the figure.
- Option B (Bowman's capsule): the cup that surrounds the glomerulus, not the duct at the end.
- Option C (Proximal tubule): the coiled part just after the capsule where most reabsorption occurs, not the collecting duct.

Final Answer: The duct that gathers final urine from many nephrons is the collecting duct $\Rightarrow$

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



Q4.

Solution

Concept — Regions of the human brain: The brain has three main parts: the fore-brain (cerebrum), the mid-brain, and the hind-brain (cerebellum, pons and medulla), each with its own job.

Step 1 — Read the figure: Part X is the small, folded structure at the back and lower side of the brain, below the large cerebrum.

Step 2 — Match the function: This structure is the cerebellum. It keeps the body balanced, maintains posture, and coordinates fine and precise muscular movements such as writing or riding a bicycle.

Why other options are wrong:

- Option A (Cerebrum): the large upper part responsible for thinking, memory and voluntary actions, not balance.
- Option C (Medulla oblongata): controls involuntary actions like heartbeat and breathing; it is the stalk-like part below, not X.
- Option D (Hypothalamus): a small fore-brain region controlling hunger, thirst and body temperature.

Final Answer: The brain part controlling balance and muscular coordination is the cerebellum $\Rightarrow$ **B**

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

Q5.

Solution

Concept — Anaerobic respiration in muscle: When cells respire without enough oxygen, glucose is only partly broken down, and the product depends on the type of cell.

Step 1 — Recall the condition: During heavy exercise the muscles use oxygen faster than it can be supplied, so they respire anaerobically.

Step 2 — Identify the product in muscle: In human muscle cells, anaerobic breakdown of glucose produces lactic acid (not ethanol, which forms in yeast). The build-up of lactic acid causes the feeling of fatigue and muscle cramps.

Why other options are wrong:

- Option A (Ethanol and carbon dioxide): these are the products of anaerobic



respiration in yeast, not in human muscle.

- Option B (Acetic acid): is not a product of anaerobic respiration in muscle.
- Option D (Citric acid): forms in the Krebs cycle, which is part of aerobic respiration.

Final Answer: Anaerobic respiration in muscle produces lactic acid $\Rightarrow$

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

Q6.

Solution

Concept — Hormonal control of blood glucose: Two hormones of the islets of Langerhans work in opposite directions to keep blood glucose steady.

Step 1 — Identify the low-glucose response: When blood glucose falls, the alpha cells of the islets of Langerhans secrete a hormone.

Step 2 — Name the hormone and its action: This hormone is glucagon. It acts on the liver to break down stored glycogen into glucose, which raises blood glucose. Because it opposes the action of insulin, it is called the antagonist of insulin.

Why other options are wrong:

- Option B (Insulin): lowers blood glucose; it does the opposite of what is asked.
- Option C (Thyroxine): from the thyroid, controls the general metabolic rate, not the fine control of blood sugar.
- Option D (Calcitonin): also from the thyroid, lowers blood calcium, unrelated to glucose.

Final Answer: The hormone that raises blood glucose against insulin is glucagon $\Rightarrow$

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



Q7.

Solution

Concept — Dominant and recessive alleles: When two contrasting pure-breeding parents are crossed, only one of the two traits appears in the F_1 generation.

Step 1 — Set up the cross: Pure tall (TT) crossed with pure dwarf (tt) gives F_1 plants that are all Tt.

Step 2 — Explain the result: Every F_1 plant is tall, which means the tall allele (T) masks the dwarf allele (t) when both are present. An allele that expresses itself even in the heterozygous condition is the dominant allele; the one that stays hidden (t) is recessive.

Why other options are wrong:

- Option A (Recessive): a recessive allele would be hidden in Tt, but here the tall trait is shown, so T is not recessive.
- Option C (Co-dominant): in co-dominance both alleles would show together; here only the tall trait appears.
- Option D (Lethal): a lethal allele would kill the plant; the F_1 plants are healthy and tall.

Final Answer: The tall allele appears in all F_1 plants because it is dominant $\Rightarrow$ **B**

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

Q8.

Solution

Concept — Chromosomal disorders of sex chromosomes: An abnormal number of sex chromosomes leads to specific syndromes in humans.

Step 1 — Read the chromosome make-up: The person is a male with the sex chromosomes XXY, giving a total of 47 chromosomes (an extra X).

Step 2 — Name the condition: A male with an extra X chromosome ($44 + XXY$) shows Klinefelter syndrome. Such individuals have underdeveloped testes, are usually sterile, and develop some feminine features such as breast development.

Why other options are wrong:

- Option A (Turner syndrome): occurs in females with only one X ($44 + XO$), not in XXY males.



- Option B (Down syndrome): caused by an extra chromosome 21, an autosome, not a sex chromosome.
- Option C (Sickle-cell anaemia): a gene (point) mutation in haemoglobin, not a change in chromosome number.

Final Answer: A male with the XXY constitution has Klinefelter syndrome $\Rightarrow$ D

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

Q9.

Solution

Concept — Differences between DNA and RNA: DNA and RNA are both nucleic acids, but they differ in their sugar and in one of their nitrogenous bases.

Step 1 — Recall the bases: DNA contains the bases adenine, guanine, cytosine and thymine. RNA contains adenine, guanine, cytosine, but not thymine.

Step 2 — Identify the replacing base: In RNA, the place of thymine is taken by the base uracil. Uracil pairs with adenine just as thymine does. (RNA also has ribose sugar instead of deoxyribose.)

Why other options are wrong:

- Option A (Adenine): is present in both DNA and RNA and pairs with thymine/uracil; it does not replace thymine.
- Option B (Guanine): is common to both nucleic acids and pairs with cytosine.
- Option D (Cytosine): is found in both DNA and RNA; it is not the base that replaces thymine.

Final Answer: In RNA, thymine is replaced by uracil $\Rightarrow$ C

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



Q10.

Solution

Concept — Origin of life: Several ideas have tried to explain how life first appeared on Earth. The modern, widely accepted one is a chemical explanation.

Step 1 — Recall the Oparin–Haldane idea: Oparin and Haldane suggested that simple molecules in the primitive ocean gradually combined, using energy from lightning and ultraviolet rays, to form more and more complex organic molecules, and finally the first living things.

Step 2 — Name the theory: Because life is said to have arisen step by step through chemical changes in non-living matter, this is called the theory of the chemical origin of life (chemical evolution).

Why other options are wrong:

- Option B (Special creation): the belief that all life was created at once by a divine power, not a chemical process.
- Option C (Spontaneous generation): the old, disproved idea that living things appear suddenly from non-living matter (for example maggots from mud); it was rejected by Louis Pasteur.
- Option D (Panspermia): the idea that life reached Earth as spores from outer space, not that it formed here chemically.

Final Answer: The Oparin–Haldane idea is the theory of chemical origin of life ⇒

A

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

Q11.

Solution

Concept — Types of plastids: Plant cells contain three kinds of plastids that differ in colour and function: chloroplasts, chromoplasts and leucoplasts.

Step 1 — Match colour to function: Coloured plastids other than green are called chromoplasts. They contain pigments such as carotene and xanthophyll (red, orange, yellow).

Step 2 — Apply it: The bright colours of flower petals and of ripe fruits like tomato and chilli are due to chromoplasts, which attract insects and animals for pollination and seed dispersal.

Why other options are wrong:



- Option A (Chloroplasts): green plastids containing chlorophyll; they carry out photosynthesis, they are not the coloured ones of petals.
- Option C (Leucoplasts): colourless plastids that store food such as starch, oils and proteins.
- Option D (Amyloplasts): a type of leucoplast that stores starch specifically; they are colourless.

Final Answer: The coloured plastids of petals and ripe fruits are chromoplasts ⇒

B

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

Q12.

Solution

Concept — Proteins as biopolymers: The large biomolecules of the cell are polymers, each built from a specific kind of small repeating unit (monomer).

Step 1 — Recall the monomer of protein: Proteins are polymers whose building blocks are amino acids. There are about 20 different amino acids.

Step 2 — Recall the linkage: Amino acids are joined one after another by peptide bonds to form a long polypeptide chain, which folds into the protein. So the monomer of a protein is the amino acid.

Why other options are wrong:

- Option A (Fatty acids): together with glycerol they build fats (lipids), not proteins.
- Option B (Monosaccharides): simple sugars that join to form carbohydrates such as starch and cellulose.
- Option C (Nucleotides): the monomers of nucleic acids (DNA and RNA), not of proteins.

Final Answer: Proteins are polymers of amino acids joined by peptide bonds ⇒

D

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



Q13.

Solution

Concept — Nuclear and cytoplasmic division: Cell division has two separate events: the division of the nucleus and the division of the cytoplasm.

Step 1 — Read the figure: The nucleus has already split into two separate nuclei, but the cell is still a single cell because the cytoplasm has not yet divided.

Step 2 — Name the event: The division of the nucleus into two is called karyokinesis. It happens first and is followed by cytokinesis, the division of the cytoplasm, which finally makes two separate cells.

Why other options are wrong:

- Option B (Cytokinesis): is the division of the cytoplasm, which has not yet occurred in the figure.
- Option C (Binary fission): is the simple splitting of a whole bacterial cell into two; it is not the term for nuclear division in this cell.
- Option D (Budding): is a form of asexual reproduction where a small out-growth forms a new organism, not shown here.

Final Answer: The division of the nucleus before cytokinesis is karyokinesis $\Rightarrow$ **A**

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

Q14.

Solution

Concept — Phases of the cell cycle: The cell cycle is made of a long interphase followed by the mitotic (M) phase. Interphase itself has three sub-phases.

Step 1 — List interphase sub-phases in order: Interphase runs as G_1 (growth), then S (DNA synthesis and replication), then G_2 (growth and preparation for division).

Step 2 — Add the mitotic phase: After G_2 comes the M phase, in which the nucleus and then the cell divide. So the full order is $G_1 \rightarrow S \rightarrow G_2 \rightarrow M$.

Why other options are wrong:

- Option A ($S \rightarrow G_1 \rightarrow G_2 \rightarrow M$): wrongly puts DNA synthesis before the first growth phase.
- Option B ($G_1 \rightarrow G_2 \rightarrow S \rightarrow M$): places S phase after G_2 , but DNA must be copied before G_2 .



- Option D ($M \rightarrow G_2 \rightarrow S \rightarrow G_1$): is the order reversed, which is not how the cycle runs.

Final Answer: The correct order is $G_1 \rightarrow S \rightarrow G_2 \rightarrow M \Rightarrow$ C

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

Q15.

Solution

Concept — Fertilisation in flowering plants: Angiosperms show a special kind of fertilisation involving two male gametes and two fusion events.

Step 1 — Follow the male gametes: The pollen tube carries two male gametes into the embryo sac and releases them there.

Step 2 — Recall the two fusions: One male gamete fuses with the egg cell to form the zygote (syngamy). The second male gamete fuses with the two polar nuclei to form the triploid endosperm (triple fusion). Since two fusions occur, the process is called double fertilisation.

Why other options are wrong:

- Option A (Single fertilisation): describes only one fusion, but here two fusions take place.
- Option C (External fertilisation): occurs outside the body in water (as in frogs and fish); this is inside the ovule.
- Option D (Self-pollination): is the transfer of pollen to the same flower, a step before fertilisation, not fertilisation itself.

Final Answer: Two fusions in the embryo sac make it double fertilisation $\Rightarrow$ B

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

Q16.

Solution

Concept — Structure of a sperm: A sperm has a head, a middle piece and a tail, each adapted for its role in reaching and fertilising the egg.

Step 1 — Locate the cap on the head: The front of the sperm head is covered by a cap-like structure.

Step 2 — Name it and give its function: This cap is the acrosome. It contains en-



zymes that dissolve the outer covering of the egg, allowing the sperm to penetrate and fertilise it.

Why other options are wrong:

- Option A (Middle piece): is packed with mitochondria that supply energy for the tail's movement, not enzymes for penetration.
- Option B (Tail): the whip-like part that propels the sperm forward; it does not contain the penetrating enzymes.
- Option C (Nucleus): lies in the head and carries the genetic material, but it is not the enzyme-filled cap.

Final Answer: The enzyme-containing cap on the sperm head is the acrosome ⇒

D

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

Q17.

Solution

Concept — Phases of the menstrual cycle: The roughly 28-day cycle is divided into phases based on changes in the ovary and the uterine lining.

Step 1 — Recall the sequence: The cycle starts with the menstrual (bleeding) phase, then the proliferative (follicular) phase, then ovulation around day 14, and finally the secretory (luteal) phase.

Step 2 — Identify the rebuilding phase: After menstruation, and before ovulation, the uterine lining (endometrium) is repaired and thickened under the influence of estrogen. This is the proliferative or follicular phase, which matches the description.

Why other options are wrong:

- Option A (Menstrual phase): is the bleeding phase in which the lining is shed, not rebuilt.
- Option B (Luteal phase): comes after ovulation, not before it.
- Option D (Secretory phase): another name for the post-ovulation luteal phase, which is also after ovulation.

Final Answer: The phase after menstruation that rebuilds the lining is the proliferative (follicular) phase ⇒ **C**

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



Q18.

Solution

Concept — Overall reaction of photosynthesis: Photosynthesis uses carbon dioxide and water, in the presence of light and chlorophyll, to make glucose and release oxygen.

Step 1 — Identify reactants and products: The raw materials are carbon dioxide and water; the products are glucose (a sugar) and oxygen.

Step 2 — Write the balanced equation: Balancing the atoms gives $6\text{CO}_2 + 6\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2$ (in the presence of light and chlorophyll).

Why other options are wrong:

- Option B ($\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \rightarrow 6\text{CO}_2 + 6\text{H}_2\text{O}$): this is the equation of respiration, the reverse process.
- Option C ($6\text{CO}_2 + 6\text{O}_2 \rightarrow \dots$): wrongly shows oxygen as a reactant; in photosynthesis oxygen is released, not used.
- Option D ($\text{C}_6\text{H}_{12}\text{O}_6 \rightarrow 2\text{C}_2\text{H}_5\text{OH} + 2\text{CO}_2$): this is alcoholic fermentation, not photosynthesis.

Final Answer: Photosynthesis is $6\text{CO}_2 + 6\text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \Rightarrow \boxed{\text{A}}$

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

Q19.

Solution

Concept — Plant growth hormones: Plants have several hormones, each with its own main effect on growth and development.

Step 1 — Match the hormone to cell division: The hormone that stimulates cell division (cytokinesis), helps form new leaves and shoots, and keeps leaves green for longer is cytokinin.

Step 2 — Note its anti-ageing effect: Cytokinin also delays the ageing (senescence) of leaves by slowing the breakdown of chlorophyll, which is why it fits the description.

Why other options are wrong:

- Option A (Auxin): promotes cell elongation and controls bending towards light (phototropism), not mainly cell division.
- Option C (Absciscic acid): a growth inhibitor that closes stomata and causes



dormancy and leaf fall; it speeds ageing rather than delaying it.

- Option D (Ethylene): a gaseous hormone that ripens fruits and promotes ageing and shedding of leaves.

Final Answer: The hormone promoting cell division and delaying leaf ageing is cytokinin $\Rightarrow$ **B**

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

Q20.

Solution

Concept — Why classification systems changed: As biologists learnt more about cell structure, the simple two-kingdom system was found to be inadequate.

Step 1 — Recall the weakness of two kingdoms: The two-kingdom system (Plantae and Animalia) did not separate prokaryotes (like bacteria) from eukaryotes, and it forced very different organisms, such as bacteria, fungi and green plants, into the same kingdom.

Step 2 — State the improvement: To fix this, Whittaker proposed five kingdoms based on cell structure, body organisation and mode of nutrition, giving prokaryotes and fungi their own separate kingdoms.

Why other options are wrong:

- Option A (Too many kingdoms): the problem was too few kingdoms, not too many.
- Option B (Correctly separated prokaryotes): it did the opposite, it failed to separate them.
- Option D (Ignored the plant kingdom): the two-kingdom system did include Plantae, so this is false.

Final Answer: The two-kingdom system failed to separate prokaryotes from eukaryotes and lumped different organisms together $\Rightarrow$ **C**

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



Q21.

Solution

Concept — Class Aves: Vertebrates are grouped into classes by features such as body covering, blood temperature and limb structure.

Step 1 — List the given features: The animal is warm-blooded, its body is covered with feathers, its forelimbs are modified into wings, and it has a toothless beak.

Step 2 — Match the class: These are the defining features of birds, which belong to the class Aves. Feathers and a beak are found only in birds.

Why other options are wrong:

- Option A (Mammalia): warm-blooded but covered with hair, not feathers, and they feed young on milk.
- Option B (Reptilia): cold-blooded, with dry scaly skin, not feathers.
- Option C (Amphibia): cold-blooded, with moist skin, and they live both in water and on land.

Final Answer: Feathered, warm-blooded, winged, beaked vertebrates belong to class Aves ⇒

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

Q22.

Solution

Concept — Decomposers in an ecosystem: Besides producers and consumers, every ecosystem has organisms that break down dead material.

Step 1 — Read the figure: The organisms marked **X** receive arrows from the grass, the deer and the tiger, meaning they act on the dead remains of all of them.

Step 2 — Identify their role: Organisms that break down the dead bodies and wastes of plants and animals, and release simple nutrients back into the soil, are the decomposers (mainly bacteria and fungi). So **X** represents the decomposers.

Why other options are wrong:

- Option B (Producers): green plants that make their own food; here the grass is the producer, not X.
- Option C (Primary consumers): herbivores such as the deer that eat producers, not the dead remains.



- Option D (Top carnivores): the tiger here; it feeds on other animals, it does not decompose dead matter.

Final Answer: The organisms that break down dead remains and recycle nutrients are the decomposers $\Rightarrow$ **A**

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

Q23.

Solution

Concept — Ecological pyramids: Pyramids of numbers, biomass and energy show the relationship between successive trophic levels, but they do not all behave the same way.

Step 1 — Recall the special feature of the energy pyramid: Energy is lost as heat at every transfer, so the energy available always decreases from producers to top consumers.

Step 2 — Conclude: Because usable energy always falls at each higher level, the pyramid of energy is always upright and can never be inverted, unlike the pyramids of numbers and biomass which can sometimes be inverted.

Why other options are wrong:

- Option A (Numbers): can be inverted, for example a single large tree supporting many insects.
- Option C (Biomass): can be inverted, as in a pond where the small biomass of phytoplankton supports a larger biomass of zooplankton.
- Option D (Volume): is not one of the standard ecological pyramids.

Final Answer: The pyramid that is always upright is the pyramid of energy $\Rightarrow$ **B**

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



Q24.

Solution

Concept — Antigen and antibody: The immune response involves a foreign trigger and the body's protein defence made against it.

Step 1 — Define the trigger: An antigen is any foreign substance (such as part of a germ) that enters the body and provokes an immune response.

Step 2 — Identify the response protein: In response, the body produces antibodies. An antibody is a Y-shaped protein called an immunoglobulin, made by the B-lymphocytes; it binds specifically to the antigen and helps destroy it.

Why other options are wrong:

- Option A (Antigen): is the foreign trigger itself, not the protein made against it.
- Option B (Histamine): a chemical released during allergic and inflammatory reactions, not the specific defence protein.
- Option D (Interferon): a protein released by virus-infected cells to warn neighbouring cells; it is not the Y-shaped immunoglobulin.

Final Answer: The Y-shaped immunoglobulin made against an antigen is the antibody ⇒

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

Q25.

Solution

Concept — Transgenic organisms: Genetic engineering can move a gene from one species into another to give the receiver a new, useful trait.

Step 1 — Understand the process: A useful gene from one species is cut out and inserted into the genome of another organism using recombinant DNA technology.

Step 2 — Name the result: An organism that carries and expresses such a foreign (introduced) gene is called a transgenic organism, also known as a genetically modified organism (GMO). Examples include Bt cotton and golden rice.

Why other options are wrong:

- Option A (Clone): a genetically identical copy of a parent; no foreign gene is added.
- Option B (Hybrid): the offspring of a cross between two varieties or species



by breeding, not by inserting a gene.

- Option C (Mutant): an organism with a change in its own genes due to mutation, not one given a gene from another species.

Final Answer: An organism carrying an introduced foreign gene is a transgenic (GM) organism ⇒

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	C
6	A	7	B	8	D	9	C	10	A
11	B	12	D	13	A	14	C	15	B
16	D	17	C	18	A	19	B	20	C
21	D	22	A	23	B	24	C	25	D

