CBSE CLASS X

Science (086)

ANSWER KEY

AI-generated question paper

Code: P3HA2R	Questions: 31	Maximum Marks: 71	Generated: 2026-06-25 17:27

SELECTIONS USED

Subject	Science
Lessons	5 Life Processes
Level of understanding	Exam-ready
Question selection	CBSE board paper, whole lesson (~80 marks across Sections A-E)
Model	claude-sonnet-4-6

Composition — Difficulty: 7 straightforward · 17 medium · 7 deep | Types: 8 MCQ · 7 Short · 5 Assertion–reason · 5 Very short · 3 Long · 3 Case-based | Sections: A 13Q/13m · B 5Q/10m · C 7Q/21m · D 3Q/15m · E 3Q/12m

Q1. straightforward exam-ready **[1]**

Which of the following is the correct site for the breakdown of pyruvate in aerobic respiration?
(A) Cytoplasm
(B) Nucleus
(C) Mitochondria
(D) Chloroplast

A Cytoplasm
B Nucleus
C Mitochondria
D Chloroplast

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Model Answer

(C) Mitochondria

The breakdown of pyruvate using oxygen (aerobic respiration) takes place in the **mitochondria**, producing carbon dioxide, water, and energy.

Explanation

The textbook (Chapter 5, Respiration) clearly states: "Break-down of pyruvate using oxygen takes place in the mitochondria." Note that the *first* step (glucose → pyruvate) happens in the cytoplasm, but the aerobic breakdown of pyruvate specifically occurs in the mitochondria. This distinction is commonly tested in MCQs.

Source: Chapter 5 – Life Processes, Section 5.3 Respiration

Q2. straightforward exam-ready **[1]**

In the human digestive system, which sphincter muscle regulates the release of food from the stomach into the small intestine?

(A) Anal sphincter

(B) Pyloric sphincter

(C) Cardiac sphincter

(D) Ileocaecal sphincter

A Anal sphincter
B Pyloric sphincter
C Cardiac sphincter
D Ileocaecal sphincter

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Model Answer

(B) Pyloric sphincter

The exit of food from the stomach is regulated by the **pyloric sphincter** muscle, which releases food in small amounts into the small intestine.

Source: Life Processes, Section 5.2.4 (Nutrition in Human Beings)

Explanation

The passage explicitly states: *"The exit of food from the stomach is regulated by a sphincter muscle which releases it in small amounts into the small intestine."* This refers to the **pyloric sphincter**. Note the distinction: the **anal sphincter** regulates waste exit from the body, not food from the stomach. Examiners expect you to recall the correct name of the sphincter and its specific location/function.

Q3. straightforward exam-ready **[1]**

Oxygen-rich blood returning from the lungs first enters which chamber of the human heart?
(A) Right atrium
(B) Right ventricle
(C) Left ventricle
(D) Left atrium

A Right atrium
B Right ventricle
C Left ventricle
D Left atrium

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Model Answer

(D) Left atrium

Oxygen-rich blood returning from the lungs first enters the **left atrium** — the thin-walled upper chamber on the left side of the heart.

Source: Life Processes, Section 5.4.1

Explanation

The passage clearly states: *"Oxygen-rich blood from the lungs comes to the thin-walled upper chamber of the heart on the left, the left atrium."* Students often confuse left and right sides. Remember: **lungs → left atrium → left ventricle → body**; and **body → right atrium → right ventricle → lungs**. The word "first enters" is the key — the left atrium receives it before the left ventricle pumps it out.

Q4. medium exam-ready **[1]**

Which of the following correctly describes the role of bile in digestion?
(A) It chemically digests proteins using enzymes.
(B) It breaks large fat globules into smaller droplets and makes the medium alkaline.
(C) It converts starch into simple sugars.
(D) It absorbs digested food directly into the blood.

A It chemically digests proteins using enzymes.
B It breaks large fat globules into smaller droplets and makes the medium alkaline.
C It converts starch into simple sugars.
D It absorbs digested food directly into the blood.

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Model Answer

(B) Bile breaks large fat globules into smaller droplets (emulsification) and makes the medium alkaline so that pancreatic enzymes can act on the food.

Source: Life Processes, Section 5.2.4

Explanation

The passage clearly states that bile makes the acidic food coming from the stomach **alkaline** and that bile salts break large fat globules into smaller globules (emulsification). Bile contains **no enzymes**, so it does not chemically digest fats — it only physically emulsifies them. Options A, C, and D describe functions of other digestive secretions (pepsin/trypsin, salivary amylase, and villi respectively). Examiners expect students to distinguish between bile's physical (emulsification) and chemical (alkalinisation) roles without confusing it with enzyme action.

Q5. straightforward exam-ready **[1]**

Which of the following organisms performs anaerobic respiration and produces ethanol and carbon dioxide?
(A) Human muscle cells during exercise
(B) Yeast during fermentation
(C) Fish in oxygenated water
(D) Leaves during the day

A Human muscle cells during exercise
B Yeast during fermentation
C Fish in oxygenated water
D Leaves during the day

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Model Answer

(B) Yeast during fermentation

Yeast converts pyruvate into **ethanol and carbon dioxide** in the absence of oxygen. This is called anaerobic respiration (fermentation).

Explanation

The passage from Section 5.3 explicitly states: *"the pyruvate may be converted into ethanol and carbon dioxide. This process takes place in yeast during fermentation... it is called anaerobic respiration."* Human muscle cells produce **lactic acid** (not ethanol) under anaerobic conditions — a common trap in this question. Fish in oxygenated water and leaves during the day perform aerobic respiration. Examiners often use this question to test whether students can distinguish between the two anaerobic pathways (yeast → ethanol + CO_2 vs. muscle → lactic acid).

Q6. medium exam-ready **[1]**

In a fish, blood passes through the heart only once during each complete circulatory cycle. This type of circulation is called:
(A) Double circulation
(B) Open circulation
(C) Single circulation
(D) Pulmonary circulation

A Double circulation
B Open circulation
C Single circulation
D Pulmonary circulation

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Model Answer

(C) Single circulation

In fish, blood passes through the heart only once in each circulatory cycle, so it is called **single circulation**.

Explanation

The textbook (Chapter 5) states: *"blood goes only once through the heart in the fish during one cycle of passage through the body."* This is single circulation. Double circulation (option A) applies to birds and mammals, where blood passes through the heart twice per cycle. Options B and D are unrelated concepts.

Q7. medium exam-ready **[1]**

Lymph is similar to blood plasma but differs from it in one important way. Which of the following correctly states this difference?
(A) Lymph contains more red blood cells than plasma.
(B) Lymph is colourless and contains less protein than plasma.
(C) Lymph has a higher concentration of nitrogenous wastes than plasma.
(D) Lymph does not flow in the direction of veins.

A Lymph contains more red blood cells than plasma.
B Lymph is colourless and contains less protein than plasma.
C Lymph has a higher concentration of nitrogenous wastes than plasma.
D Lymph does not flow in the direction of veins.

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Model Answer

(B) Lymph is colourless and contains less protein than plasma.

Source: Life Processes, Section 5.4.1 (Lymph)

Explanation

The textbook states directly: "It (lymph) is similar to the plasma of blood but colourless and contains less protein." Lymph has no RBCs (ruling out A), and options C and D are not supported by the text. Memorise this one-line distinction as it is frequently tested.

Q8. straightforward exam-ready **[1]**

Which of the following end products of digestion are produced from fats by the action of lipase?
(A) Amino acids and glycerol
(B) Glucose and fructose
(C) Fatty acids and glycerol
(D) Glycogen and fatty acids

A Amino acids and glycerol
B Glucose and fructose
C Fatty acids and glycerol
D Glycogen and fatty acids

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Model Answer

(C) Fatty acids and glycerol

Lipase breaks down fats (lipids) into **fatty acids and glycerol** as the end products of digestion.

Explanation

Lipase is the enzyme that acts on fats. Amino acids come from proteins (via proteases), and glucose/fructose come from carbohydrates. Glycogen is a storage form of glucose, not a digestion product. Option C is the only chemically correct pair for fat digestion.

Q9. medium exam-ready **[1]**

Assertion (A): Aquatic animals breathe at a much faster rate compared to most terrestrial animals.
Reason (R): The concentration of dissolved oxygen in water is much lower than the concentration of oxygen in air.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

A Both A and R are true and R is the correct explanation of A.
B Both A and R are true but R is not the correct explanation of A.
C A is true but R is false.
D A is false but R is true.

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Model Answer

(A) Both A and R are true and R is the correct explanation of A.

The amount of dissolved oxygen in water is fairly low compared to oxygen in air, so aquatic organisms must breathe much faster to obtain sufficient oxygen.

Source: Life Processes, Section 5.3 Respiration

Explanation

The textbook directly states: *"Since the amount of dissolved oxygen is fairly low compared to the amount of oxygen in the air, the rate of breathing in aquatic organisms is much faster than that seen in terrestrial organisms."* This confirms both A and R are true, and R directly causes A — making option (A) the correct choice. Examiners expect you to link the reason to the assertion explicitly.

Q10. medium exam-ready **[1]**

Assertion (A): In mammals and birds, the left and right sides of the heart are completely separated.
Reason (R): This separation prevents oxygenated and deoxygenated blood from mixing, ensuring efficient oxygen supply for high energy needs.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

A Both A and R are true and R is the correct explanation of A.
B Both A and R are true but R is not the correct explanation of A.
C A is true but R is false.
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Model Answer

(A) Both A and R are true and R is the correct explanation of A.

The left and right sides of the heart in mammals and birds are completely separated. This prevents mixing of oxygenated and deoxygenated blood, ensuring efficient oxygen supply for their high energy needs (maintaining constant body temperature).

Source: Life Processes, Section 5.4.1

Explanation

The textbook explicitly states: "The separation of the right side and the left side of the heart is useful to keep oxygenated and de-oxygenated blood from mixing. Such separation allows a highly efficient supply of oxygen to the body. This is useful in animals that have high energy needs, such as birds and mammals." — so R directly and correctly explains A. Choose option (A).

Q11. medium exam-ready **[1]**

Assertion (A): Arteries have thicker and more elastic walls compared to veins.
Reason (R): Blood flows through arteries under much higher pressure than through veins.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

A Both A and R are true and R is the correct explanation of A.
B Both A and R are true but R is not the correct explanation of A.
C A is true but R is false.
D A is false but R is true.

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Model Answer

(A) Both A and R are true and R is the correct explanation of A.

Arteries carry blood away from the heart under high pressure, so they need thick, elastic walls to withstand it. Veins carry blood at low pressure and have thinner walls.

Explanation

The textbook directly states: *"Since the blood emerges from the heart under high pressure, the arteries have thick, elastic walls"* and *"Veins... do not need thick walls because the blood is no longer under pressure."* The Reason correctly and directly explains the Assertion, making option (A) the right choice.

Q12. deep exam-ready **[1]**

Assertion (A): Translocation of food in phloem can occur both upward and downward in a plant.
Reason (R): Phloem transport is driven by ATP energy and osmotic pressure differences, allowing movement according to the plant's needs.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

A Both A and R are true and R is the correct explanation of A.
B Both A and R are true but R is not the correct explanation of A.
C A is true but R is false.
D A is false but R is true.

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Model Answer

(A) Both A and R are true and R is the correct explanation of A.

Phloem translocates food (sucrose) both upward and downward depending on the plant's needs. This bidirectional transport is driven by ATP energy (active loading) and osmotic pressure differences, which together explain why movement can occur in either direction.

Explanation

The key concept here is the **pressure flow hypothesis**: sugar is actively loaded into phloem using ATP, raising osmotic pressure at the source, and unloaded at the sink, driving flow. Because the "source" and "sink" can be anywhere in the plant (e.g., leaves → roots *or* leaves → growing shoot tips), movement is bidirectional — and R correctly explains why A is true. Examiners expect you to link ATP-driven active transport and osmotic pressure to bidirectional flow.

Q13. deep exam-ready **[1]**

Assertion (A): Desert plants take in carbon dioxide at night rather than during the day.
Reason (R): Opening stomata during the day in a desert would cause excessive water loss, so CO_2 is fixed at night and stored as an intermediate for use during daytime photosynthesis.
(A) Both A and R are true and R is the correct explanation of A.
(B) Both A and R are true but R is not the correct explanation of A.
(C) A is true but R is false.
(D) A is false but R is true.

A Both A and R are true and R is the correct explanation of A.
B Both A and R are true but R is not the correct explanation of A.
C A is true but R is false.
D A is false but R is true.

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Model Answer

(A) Both A and R are true and R is the correct explanation of A.

Desert plants take in CO_2 at night to avoid water loss through open stomata in the hot daytime, storing it as an intermediate that is used for photosynthesis during the day when sunlight is available.

Source: Life Processes, Chapter 5, Section 5.2.1 – Autotrophic Nutrition

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Explanation

The textbook explicitly states: *"desert plants take up carbon dioxide at night and prepare an intermediate which is acted upon by the energy absorbed by the chlorophyll during the day."* It also explains that plants close stomata to prevent water loss when CO_2 is not needed. Both statements are factually correct, and R directly explains the adaptive reason behind A, making option (A) the right choice.

Q14. straightforward exam-ready **[2]**

State any two roles of hydrochloric acid secreted by the gastric glands in the stomach.

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Model Answer

Two roles of hydrochloric acid (HCl) secreted by gastric glands:

1. **Creates acidic medium:** HCl makes the stomach contents acidic, which is necessary for the enzyme **pepsin** to function and digest proteins.
2. **Kills harmful bacteria:** The acidic environment destroys microorganisms that may enter the stomach along with food, preventing infection.

Source: Chapter 5, Section 5.2.4 – Nutrition in Human Beings

Explanation

The textbook explicitly states that HCl "creates an acidic medium which facilitates the action of the enzyme pepsin." The second role (killing germs) is implied by the textbook's question "What other function do you think is served by the acid?" — examiners expect this standard answer. Always name **pepsin** when mentioning the first role, as it earns the mark. Both points together cover 2 marks.

Q15. straightforward exam-ready **[2]**

Name two nitrogenous waste products excreted by the human kidneys. Why is it essential to remove them from the body?

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Model Answer

The two nitrogenous waste products excreted by human kidneys are **urea** and **uric acid**.

It is essential to remove them because these are harmful metabolic wastes. Their accumulation in the body acts as a poison, which can damage body tissues and even lead to death.

Source: Life Processes, Section 5.5.1

Explanation

The question has two parts — naming the wastes (1 mark) and giving the reason (1 mark). The passage explicitly mentions "urea or uric acid" as nitrogenous wastes filtered by kidneys, and the 'More to Know' box states that accumulation of such wastes can lead to death. Stick to these two points; no extra detail is needed for 2 marks.

Q16. medium exam-ready **[2]**

Muscle cramps in athletes often occur during intense exercise. Explain the biochemical reason for this.

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Model Answer

During intense exercise, the body's demand for energy is high, but oxygen supply becomes insufficient. The muscle cells then respire **anaerobically**, breaking down glucose to produce energy and **lactic acid**. Accumulation of lactic acid in the muscles causes **muscle cramps** in athletes.

Explanation

- The key concept here is **anaerobic respiration in muscle cells**: Glucose → Lactic acid + Energy.
- Examiners want two points: (1) insufficient oxygen during intense exercise leads to anaerobic respiration, and (2) lactic acid build-up causes cramps.
- This is from the chapter on Life Processes (Chapter 6, respiration). Avoid writing about aerobic respiration in detail — just contrast it briefly to show *why* anaerobic pathway is used.
- Remember: in yeast, anaerobic respiration produces ethanol + CO_2; in muscles, it produces **lactic acid** — this distinction is commonly tested.

Q17. medium exam-ready **[2]**

Explain why the walls of the left ventricle are thicker than those of the right ventricle.

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Model Answer

The left ventricle pumps oxygenated blood to the **entire body** through the aorta, requiring much greater pressure. The right ventricle pumps blood only to the **nearby lungs** (a shorter distance, lower pressure). Therefore, the left ventricle needs thicker, more muscular walls to generate the higher force needed.

Explanation

Examiners look for two key points: (1) the destination of blood from each ventricle — whole body vs. lungs, and (2) the link between distance/pressure and wall thickness. Mention "greater pressure" or "more force" explicitly to secure both marks. This question is from the chapter on Life Processes (Chapter 6, circulatory system).

Q18. medium exam-ready **[2]**

State two ways in which plants store or dispose of waste products that are different from the method used by animals.

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Model Answer

Plants store or dispose of waste products in the following ways, different from animals:

1. **Storing in cell vacuoles** — Plants store waste products (like resins, gums, tannins) in their cell vacuoles.
2. **Storing in leaves** — Plants accumulate wastes in old leaves and dispose of them when the leaves fall off (leaf fall).

(Other acceptable answers: storing waste as dead bark; releasing waste into the soil around roots.)

Explanation

This question is from Chapter 6 (Life Processes) content, even though the source passages here focus on Chapter 13. Examiners expect two distinct methods, each worth 1 mark. Key contrast to remember: **animals excrete wastes actively** (kidneys, skin, lungs), whereas **plants store wastes** in vacuoles, resins, bark, or shed them via leaf fall — they have no special excretory organs. Name the method and give a brief example for each point to secure both marks.

Q19. medium exam-ready **[3]**

Describe the role of villi in the small intestine. How does their structure make them well-suited to their function?

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Model Answer

Villi are numerous finger-like projections on the inner lining of the small intestine. They increase the surface area available for absorption of digested food.

Their structure suits their function in two key ways:

- The large number of villi greatly increases the surface area, allowing more digested food to be absorbed quickly.
- Villi are richly supplied with blood vessels, which transport the absorbed food (glucose, amino acids, fatty acids, glycerol) to every cell of the body for energy, growth, and repair.

Source: Chapter 5, Section 5.2.4 – Nutrition in Human Beings

Explanation

The examiner expects two clear points: **(1) villi increase surface area** and **(2) they contain blood vessels for transport**. Many students mention only the first point and lose a mark. Use the exact textbook phrase "finger-like projections" and "richly supplied with blood vessels." Since it is 3 marks, three distinct ideas (what villi are + surface area + blood supply/function) earn full credit.

Q20. medium exam-ready **[3]**

Trace the complete pathway of air from the nostrils to the alveoli in human beings, naming each structure the air passes through. State one structural feature of the alveoli that makes them efficient for gas exchange.

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Model Answer

Pathway of air from nostrils to alveoli:

Nostrils → Nasal passage (filtered by fine hairs and mucus) → Throat (pharynx/larynx) → Trachea (supported by cartilage rings) → Bronchi → Bronchioles → Alveoli

Structural feature of alveoli:

The alveoli have walls containing an extensive network of blood capillaries. This, combined with their balloon-like structure that provides a very large surface area (about 80 m²), makes them highly efficient for gas exchange.

Source: Chapter 5, Section 5.3 — Respiration

Explanation

- Examiners expect **each structure named in order** — missing any (e.g., bronchi or bronchioles) loses marks.
- The **one structural feature** asked is the rich network of blood capillaries in the thin alveolar walls; mentioning the large surface area is a bonus point.
- The passage explicitly states "rings of cartilage in the throat" keep the airway open — you can mention this for trachea.
- Do not write a lengthy paragraph; a labelled pathway + one clear sentence on the structural feature is sufficient for 3 marks.

Q21. medium exam-ready **[3]**

What is transpiration? Explain how it helps in the movement of water and minerals from the roots to the leaves in a plant.

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Model Answer

Transpiration is the process by which plants lose water in the form of water vapour through tiny pores called stomata, mainly present on leaves.

How it helps in water and mineral movement:

- As water evaporates from leaf cells through stomata, it creates a **suction pull** (transpiration pull).
- This pull draws water upward through the xylem vessels from stem to leaves.
- The same suction force pulls water — along with dissolved minerals — from the roots into the xylem.
- Thus, transpiration creates a continuous column of water moving from **roots → stem → leaves**.

This process is sometimes called the **"suction pump"** of plants.

Source: Life Processes, Chapter 5

Explanation

- **1 mark** for defining transpiration correctly (water loss as vapour through stomata).
- **2 marks** for explaining the mechanism: transpiration pull → upward movement through xylem → water + minerals absorbed from roots.
- Key terms to use: *stomata, transpiration pull, xylem, suction force* — examiners look for these.
- Keep the flow logical: stomata lose water → suction created → water + minerals pulled up from roots.
- The source passages confirm xylem is responsible for water/mineral transport; transpiration explanation comes from standard Chapter 5 content.

Q22. medium exam-ready **[3]**

Compare aerobic and anaerobic respiration under the following heads: (i) requirement of oxygen, (ii) end products, (iii) amount of energy released.

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Model Answer

Head	Aerobic Respiration	Anaerobic Respiration
(i) Requirement of oxygen	Requires oxygen	Does not require oxygen
(ii) End products	CO_2 and water	Ethanol + CO_2 (in yeast); lactic acid (in muscle cells)
(iii) Energy released	Much greater amount of energy released	Less energy released

In aerobic respiration, pyruvate is broken down in the mitochondria using oxygen. In anaerobic respiration, pyruvate is broken down in the cytoplasm without oxygen.

Source: Life Processes, Section 5.3 Respiration

Explanation

- The examiner expects a **tabular format** for "compare under heads" questions — it earns full marks neatly.
- Must mention **both types of anaerobic end products**: ethanol + CO_2 (yeast/fermentation) and lactic acid (muscle cells during sudden activity). Missing either may cost half a mark.
- The phrase "a lot greater" (from the textbook) regarding aerobic energy release is key — make it explicit.
- Location (mitochondria vs. cytoplasm) is a bonus point that strengthens the answer.

Q23. medium exam-ready **[3]**

Explain how the length of the small intestine in herbivores and carnivores differs and why this difference exists.

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Model Answer

Herbivores have a **longer small intestine** than carnivores.

Herbivores eat grass and plant material, which contains **cellulose**. Cellulose is difficult to digest and requires more time and a greater length of intestine for complete digestion. Carnivores eat meat, which is **easier to digest**, so a shorter small intestine is sufficient for complete digestion.

For example, tigers (carnivores) have a shorter small intestine, while grass-eating animals (herbivores) have a longer one.

Source: Chapter 5, Section 5.2.4 – Nutrition in Human Beings

Explanation

- The key fact is directly stated in the textbook: *"Herbivores eating grass need a longer small intestine to allow the cellulose to be digested. Meat is easier to digest, hence carnivores like tigers have a shorter small intestine."*
- For 3 marks, examiners expect: (1) the difference stated clearly, (2) reason for herbivores' longer intestine (cellulose is hard to digest), and (3) reason for carnivores' shorter intestine (meat is easier to digest). Give an example if possible.
- Avoid writing lengthy paragraphs — three crisp points are enough.

Q24. medium exam-ready **[3]**

(a) State the location of haemoglobin in human blood and mention one structural feature that makes it suitable for oxygen transport.
(b) Why is haemoglobin considered essential for the survival of large multicellular animals?

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Model Answer

(a) Haemoglobin is found inside the **red blood corpuscles (RBCs)** in blood. It has a high **affinity for oxygen**, which allows it to bind oxygen efficiently in the lungs and release it to body tissues.

(b) In large multicellular organisms, not all cells are in direct contact with the environment, so oxygen cannot reach every cell by simple diffusion. Haemoglobin greatly increases the oxygen-carrying capacity of blood, ensuring adequate oxygen supply to all cells for energy (ATP) production. Without it, the circulatory system alone could not deliver sufficient oxygen to sustain life.

Source: Chapter 5, Section 5.4.1 Transportation in Human Beings

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Explanation

- **(a)** The key points examiners expect: **location = inside RBCs** (not just "in blood"), and **one structural/functional feature** — high affinity for oxygen is the standard answer. "Haemoglobin is a red pigment" alone won't fetch the mark; you must link the feature to oxygen transport.
- **(b)** The logic chain to show: large body → cells not in contact with environment → diffusion insufficient → haemoglobin essential to carry enough O_2. This directly mirrors the Class IX/X textbook reasoning about why specialised transport is needed in multicellular organisms.
- Avoid writing "haemoglobin is in plasma" — that is factually wrong; it is inside RBCs.

Q25. deep exam-ready **[3]**

How does the process of translocation in phloem differ from the transport of water in xylem? Give two points of difference. What provides the energy for translocation?

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Model Answer

Differences between translocation in phloem and transport in xylem:

Phloem (Translocation)	Xylem (Water transport)
Occurs in both upward and downward directions	Occurs only in one direction — upward
Requires energy (ATP); cannot be explained by simple physical forces	Driven by physical forces — transpiration pull and root pressure; no energy expenditure

Energy for translocation:
The energy is provided by **ATP**. Sucrose is transferred into phloem tissue using energy from ATP, which increases the osmotic pressure, causing water to move in and creating pressure that drives the food material to regions of lower pressure.

Source: Chapter 5, Section 5.4.2 – Transportation in Plants

Explanation

- Examiners expect **two clear, contrasting points** — direction of transport and energy requirement are the standard pair from the textbook.
- The second part on energy source must mention **ATP** and briefly explain the osmotic pressure mechanism.
- A table is acceptable and saves time; bullet points work equally well.
- Avoid vague answers like "phloem needs energy" without stating the source (ATP) — that loses a mark.

Q26. medium exam-ready **[5]**

(a) Draw a labelled diagram of the human excretory system showing the kidneys, ureters, urinary bladder and urethra.
(b) Describe the process by which the kidneys filter blood and produce urine, including the role of selective reabsorption in the nephron tubule.

◆ Life Processes

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Model Answer

(a) Labelled Diagram of Human Excretory System:

```
Right Kidney — Left Kidney
|  |
Right Ureter — Left Ureter
|
Urinary Bladder
|
Urethra
```

(Label: Kidneys — one on each side of backbone; Ureters — carry urine to bladder; Urinary Bladder — stores urine; Urethra — releases urine out of body)

(b) Process of Urine Formation:

Blood entering the kidney is filtered in the **nephrons** — the basic filtration units. Each nephron has a cluster of thin-walled capillaries associated with a cup-shaped **Bowman's capsule**, which collects the filtrate.

The initial filtrate contains water, glucose, amino acids, salts, urea, and uric acid. As this filtrate passes through the **nephron tubule**, useful substances — glucose, amino acids, salts, and a large amount of water — are **selectively reabsorbed** back into the blood. The amount of water reabsorbed depends on the body's needs. What remains — concentrated with nitrogenous wastes — is urine. It passes through the ureter to the urinary bladder, and is released through the urethra.

Source: Life Processes, Section 5.5.1

Explanation

- **Part (a):** Draw a neat, labelled diagram. Even a simple schematic showing the four organs in correct anatomical relation earns full marks. Examiners check for all four labels.
- **Part (b):** Key terms examiners look for: *nephron*, *Bowman's capsule*, *capillary cluster/glomerulus*, *selective reabsorption*, *nitrogenous waste (urea/uric acid)*. Mentioning that ~180 L is filtered daily but only 1–2 L is excreted (due to reabsorption) is a good bonus point if space allows.
- Do **not** confuse filtration (in Bowman's capsule) with reabsorption (in the tubule) — both steps must be mentioned for full marks.

Q27. deep exam-ready **[5]**

With the help of a labelled diagram of the human heart, explain the mechanism of double circulation. Why is double circulation necessary for mammals and birds but not for fish?

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Model Answer

Labelled Diagram of the Human Heart:

(Draw a diagram showing: Right Atrium, Right Ventricle, Left Atrium, Left Ventricle, Pulmonary Artery, Pulmonary Vein, Aorta, Vena Cava, and Valves)

Mechanism of Double Circulation:

Deoxygenated blood from the body enters the **right atrium** → passes to the **right ventricle** → pumped to the **lungs** via pulmonary artery (pulmonary circulation). In the lungs, CO_2 is removed and blood is oxygenated. Oxygenated blood returns to the **left atrium** via pulmonary vein → passes to the **left ventricle** → pumped to the entire body via aorta (systemic circulation). Since blood passes through the heart **twice** in one complete cycle, it is called **double circulation**.

Why necessary for mammals and birds but not fish:

Mammals and birds are warm-blooded; they constantly use energy to maintain body temperature, requiring a highly efficient oxygen supply. Complete separation of oxygenated and deoxygenated blood prevents mixing, ensuring this efficiency. Fish have only two-chambered hearts; blood passes through the heart only once per cycle (single circulation), which is sufficient as they do not regulate body temperature internally.

Source: Chapter 5, Section 5.4.1 — Transportation in Human Beings

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Explanation

- **Diagram is compulsory** — examiners deduct marks if it is absent or unlabelled. Label at least: four chambers, pulmonary artery/vein, aorta, vena cava.
- The two loops to name: **pulmonary circulation** (heart → lungs → heart) and **systemic circulation** (heart → body → heart).
- The key reason for double circulation in mammals/birds: **warm-blooded = high energy need = efficient O_2 supply required**. Fish are cold-blooded and single circulation suffices.
- Avoid mixing up pulmonary artery (deoxygenated) and pulmonary vein (oxygenated) — a common error examiners watch for.

Q28. deep exam-ready **[5]**

(a) List the three main events that occur during photosynthesis.
(b) Explain the role of each of the following in photosynthesis: (i) chlorophyll, (ii) stomata, (iii) water.
(c) A plant kept in a dark room for 72 hours is then placed in bright sunlight. After a few hours, a leaf is tested for starch using iodine solution. Predict the result and explain.

◆ Life Processes

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Model Answer

(a) Three main events during photosynthesis:

1. Absorption of light energy by chlorophyll.
2. Conversion of light energy to chemical energy and splitting of water molecules into hydrogen and oxygen.
3. Reduction of carbon dioxide to carbohydrates.

(b) Role of each component:

- **(i) Chlorophyll:** Absorbs light energy and converts it into chemical energy needed for photosynthesis.
- **(ii) Stomata:** Tiny pores on leaf surface through which massive amounts of CO_2 enter the leaf. Guard cells regulate opening and closing of stomata.
- **(iii) Water:** Taken up from soil by roots; it is split during photosynthesis to release hydrogen (used to reduce CO_2) and oxygen (released as byproduct).

(c) Prediction and Explanation:
The leaf will turn **blue-black** with iodine solution, confirming the **presence of starch**.

After 72 hours in darkness, all starch in the leaf gets used up. Once placed in bright sunlight, chlorophyll absorbs light energy, CO_2 enters through stomata, and photosynthesis resumes. Carbohydrates (starch) are produced and stored in the leaf. Hence, iodine turns blue-black.

Source: Life Processes, Section 5.2.1

Explanation

- Part (a) is directly lifted from the textbook — memorise the exact three points in order.
- Part (b): Each sub-point is worth ~½ mark; keep answers to one line each.
- Part (c): Examiners expect two things — the correct result (blue-black) AND the reasoning (dark room depletes starch → sunlight restores photosynthesis → starch accumulates). Missing either loses marks. The 72-hour dark period is a standard destarching technique used in Activity 5.1.

Q29. deep exam-ready **[4]**

Read the following passage and answer the questions that follow.

Rohan is a 45-year-old man who was recently diagnosed with chronic kidney disease. His doctor explained that both his kidneys were functioning at only 20% of their normal capacity. As a result, harmful nitrogenous wastes were accumulating in his blood. The doctor recommended he undergo hemodialysis three times a week. During hemodialysis, Rohan's blood is passed through tubes with a semi-permeable lining immersed in a dialysing fluid that has the same osmotic pressure as normal blood but contains no nitrogenous wastes.

(i) Name the nitrogenous waste products that accumulate in Rohan's blood due to kidney failure. (1 mark)
(ii) By what process do the waste products move from Rohan's blood into the dialysing fluid during hemodialysis? (1 mark)
(iii) A healthy person produces about 180 L of initial filtrate in the kidneys each day but excretes only 1–2 L of urine. Explain the process responsible for this difference and where it occurs. (2 marks)

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Model Answer

(i) The nitrogenous waste products that accumulate in Rohan's blood are **urea** and **uric acid**.

(ii) The waste products move from Rohan's blood into the dialysing fluid by the process of **diffusion**. Since the dialysing fluid contains no nitrogenous wastes, a concentration gradient exists, causing wastes to diffuse out of the blood across the semi-permeable membrane.

(iii) The process responsible is **selective reabsorption**, and it occurs in the **kidney tubules (nephrons)**. As the initial filtrate passes through the tubules, useful substances like glucose, amino acids, salts, and a large amount of water are selectively reabsorbed back into the blood. The amount of water reabsorbed depends on the body's needs. Only the remaining waste-concentrated fluid (~1–2 L) is excreted as urine, out of the 180 L filtered daily.

Source: Chapter 5, Section 5.5.1 — Excretion in Human Beings; Artificial Kidney (Hemodialysis)

Explanation

- **(i)** Always name **both** urea and uric acid — writing only one may cost you the mark.
- **(ii)** The keyword examiners look for is **diffusion**. Justify it briefly by mentioning the concentration gradient.
- **(iii)** Two things must be stated for 2 marks: the **name of the process** (selective reabsorption) and the **location** (kidney tubules/nephrons). Mentioning the 180 L vs 1–2 L figures from the passage strengthens the answer. Avoid confusing reabsorption with filtration.

Q30. medium exam-ready **[4]**

Read the following passage and answer the questions that follow.

During a science fair, Priya set up two identical healthy potted plants of the same species and size. She placed both in a dark room for three days. She then placed Plant A under a bell jar sealed airtight to a glass plate, with a watch-glass of potassium hydroxide inside the jar. Plant B was placed under a similar sealed bell jar but without any potassium hydroxide. Both plants were kept in bright sunlight for two hours. Priya then tested a leaf from each plant for the presence of starch.

(i) What was the purpose of keeping the plants in a dark room for three days before the experiment? (1 mark)
(ii) What result did Priya observe when she tested the leaf of Plant A with iodine solution? Give a reason. (1 mark)
(iii) What role does potassium hydroxide play in this experiment? (1 mark)
(iv) What conclusion can Priya draw from comparing the results of both plants? (1 mark)

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Model Answer

(i) The plants were kept in the dark room for three days to **destarch** them — i.e., to ensure all previously stored starch in the leaves was used up, so that any starch found later is produced only during the experiment.

(ii) The leaf of Plant A showed **no colour change** (remained brown/orange) with iodine solution, indicating **absence of starch**. This is because potassium hydroxide absorbs the CO_2 inside the jar, so Plant A had no CO_2 available for photosynthesis and could not produce starch.

(iii) Potassium hydroxide (KOH) absorbs carbon dioxide from the air inside the sealed bell jar, making CO_2 unavailable to Plant A for photosynthesis.

(iv) Priya can conclude that **carbon dioxide is necessary for photosynthesis**. Plant B (with CO_2) produced starch and turned blue-black with iodine, while Plant A (without CO_2) did not.

Explanation

- This is a classic "necessity of CO_2 for photosynthesis" experiment from Life Processes (Chapter 6, CBSE Class 10).
- The source passages provided are from Chemistry and Respiration; however, this experiment is standard NCERT biology content — answer is based on established board exam expectations.
- Key terms examiners look for: **destarching**, **KOH absorbs CO_2**, **iodine test**, **blue-black = starch present**, and the conclusion linking CO_2 to photosynthesis.
- Each sub-question is 1 mark — keep each answer to 1–2 lines.

Q31. deep exam-ready **[4]**

Read the following passage and answer the questions that follow.

Amit's grandfather was admitted to hospital with complaints of breathlessness and fatigue. The doctor found that the alveolar walls had thickened and some alveoli were damaged, reducing the surface area available for gas exchange. The doctor also noted that his haemoglobin levels were significantly low (anaemia). The doctor explained that both conditions together were seriously reducing oxygen delivery to body tissues.

(i) How does thickening and damage of alveolar walls reduce the efficiency of gas exchange in the lungs? (1 mark)
(ii) Name the pigment that normally carries oxygen in human blood and state where it is located in the blood. (1 mark)
(iii) Carbon dioxide is transported differently from oxygen in human blood. Explain how carbon dioxide is mainly transported. (1 mark)
(iv) Even if the alveoli were healthy, explain why a very low haemoglobin level would still cause oxygen deficiency in body tissues. (1 mark)

♦ Life Processes

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Model Answer

(i) Thickening of alveolar walls increases the distance over which gases must diffuse, slowing down diffusion. Damage reduces the total surface area available for gas exchange, so less oxygen can enter the blood per breath, causing breathlessness.

(ii) The pigment is **haemoglobin**. It is located in the **red blood corpuscles (RBCs)**.

(iii) Carbon dioxide is mainly transported in **dissolved form in the plasma** of blood. Unlike oxygen, it does not require a carrier pigment and is carried as dissolved CO_2 from body tissues to the lungs for removal.

(iv) Even with healthy alveoli, oxygen that diffuses into blood cannot be carried to tissues if haemoglobin is very low. Since oxygen is transported by RBCs (haemoglobin), insufficient haemoglobin means very little oxygen reaches body tissues, causing oxygen deficiency.

Source: Chapter 5, Section 5.4 Transportation in Human Beings

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Explanation

- **(i)** Examiners expect mention of **two effects**: increased diffusion distance (thickening) + reduced surface area (damage).
- **(ii)** Both parts are needed for 1 mark — name the pigment AND its location.
- **(iii)** The textbook states plasma transports CO_2 in dissolved form. Avoid saying CO_2 is carried by haemoglobin (that is oxygen's role).
- **(iv)** The key logic: alveoli = site of exchange; haemoglobin = transport vehicle. Healthy lungs can't help if the carrier molecule is absent. This is directly linked to Exercise Q10 in the chapter.

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