CBSE CLASS X

Science (086)

ANSWER KEY

AI-generated question paper

Code: 5ZWT3K	Questions: 75	Maximum Marks: 211	Generated: 2026-06-25 17:41

SELECTIONS USED

Subject	Science
Lessons	7 How do Organisms Reproduce?
Level of understanding	Thorough understanding
Question selection	Curated chapter coverage (~5 questions per section + 8 synthesis)
Model	claude-sonnet-4-6

Composition — Difficulty: 2 straightforward · 43 medium · 30 deep | Types: 59 Short · 8 MCQ · 7 Long · 1 Very short

Q1. medium · thorough-understanding · § Introduction **[3]**

DNA in the cell nucleus controls the production of proteins, and proteins determine body design. Using this chain of logic, explain why even a small error during DNA copying could affect the characteristics of an offspring.

◆ How do Organisms Reproduce?

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Model Answer

DNA in the nucleus acts as the blueprint for making proteins. Any error during DNA copying changes the genetic information, which causes different (abnormal) proteins to be made. Since proteins determine body design, even a small copying error can alter the physical characteristics of an offspring.

Such errors arise because biochemical copying reactions are not absolutely reliable. If the error is drastic, the new cell may die. If it is minor, it survives but the offspring shows a variation — a subtly different characteristic from its parent.

Source: Chapter 7, Section 7.1

Explanation

- The examiner wants you to trace the chain: **DNA error → wrong protein → altered body design → changed characteristic**.
- Mention both outcomes of an error: fatal (cell dies) and non-fatal (variation survives).
- Key phrase to include: *"biochemical reactions are not absolutely reliable"* — directly from the textbook.
- Avoid writing a long essay; 3 marks = 3 clear logical steps.

Q2. deep | thorough-understanding | § Introduction **[3]**

Variations arising during reproduction are essential for species survival, yet the same variations could be harmful to an individual organism. Justify this apparently contradictory statement with a suitable example.

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Model Answer

Variations arise due to errors in DNA copying during reproduction. While most variations are neutral or harmful to individual organisms (e.g., a bacterium with an unusual enzyme may be less competitive in normal conditions), some rare variants may prove advantageous when the environment changes.

Example: In a population of bacteria living in temperate water, if global warming raises the water temperature, most bacteria die. However, a few individuals with a heat-resistant variation survive and reproduce. Thus, variation is beneficial for the **species** (ensuring survival) but not necessarily for every **individual** organism, which may not possess the useful variant and could perish.

Source: Chapter 7, Section 7.1.1 – The Importance of Variation

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Explanation

- The examiner expects **two distinct ideas**: (1) why variation is useful for species, and (2) why it may be harmful/neutral to individuals.
- The **bacteria + global warming example** is directly from the textbook — always use it; it scores full marks.
- Key contrast to highlight: species survival (long-term, population level) vs. individual disadvantage (individual may not have the favourable variant or may carry a harmful one).
- At 3 marks: one line of concept + example with explanation is sufficient. Do not write more.

Q3. medium | thorough-understanding | § 7.1 DO ORGANISMS CREATE EXACT COPIES OF THEMSELVES? **[2]**

A newly formed DNA copy contains an error in the sequence of its nucleotides. What are the two possible outcomes for the cell that inherits this copy?

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Model Answer

When a newly formed DNA copy contains an error, two outcomes are possible:

1. **Cell death**: The variation may be so drastic that the new DNA copy cannot work with the inherited cellular apparatus, causing the cell to simply die.
2. **Survival with variation**: The error may be minor, allowing the cell to survive but be subtly different from the parent cell. Such variations form the basis of evolution.

Source: Chapter 7, Section 7.1

Explanation

The question directly tests the passage in Section 7.1. Examiners expect **both outcomes** to be named clearly — one negative (cell dies) and one positive (cell survives but is different). Use the textbook's own language ("cannot work with the cellular apparatus," "subtly different") for full marks. Mentioning that surviving variations are the basis of evolution adds accuracy but keep it brief for a 2-mark answer.

Q4. medium | thorough-understanding | § 7.1 DO ORGANISMS CREATE EXACT COPIES OF THEMSELVES? **[3]**

Why must DNA copying always be accompanied by the creation of additional cellular apparatus during cell division?

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Model Answer

DNA copying alone is not sufficient for reproduction because the newly formed DNA copy, if simply pushed out of the cell, would have no organised cellular structure to carry out life processes and would not survive.

Therefore, DNA copying must be accompanied by the creation of an **additional cellular apparatus** (cytoplasm, organelles, cell membrane, etc.). Once both the DNA copy and the new cellular apparatus are ready, they separate together, effectively giving rise to **two complete daughter cells**, each capable of independently maintaining life processes.

Source: Chapter 7, Section 7.1 — Do Organisms Create Exact Copies of Themselves?

Explanation

- The examiner expects you to explain **why** the naked DNA copy cannot survive alone — it lacks organised cellular structure.
- The key phrase from the textbook is **"additional cellular apparatus"** — use it directly; examiners look for this term.
- Conclude by linking it to the outcome: two complete, functional daughter cells.
- Do not go beyond this; the passage gives exactly this reasoning and nothing more is needed for 3 marks.

Q5. deep thorough-understanding § 7.1 DO ORGANISMS CREATE EXACT COPIES OF THEMSELVES? **[5]**

A scientist argues that if DNA copying were made perfectly accurate, it would actually be harmful to species in the long run. Do you agree? Justify your answer with reference to the role of variation in species survival.

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Model Answer

Yes, I agree with the scientist's argument.

Role of DNA copying accuracy:
DNA copying must be reasonably accurate to maintain body designs that allow organisms to survive in their niche. Consistent copying ensures population stability.

Why perfect accuracy would be harmful:
If DNA copying were made perfectly accurate, no variations would arise in a population. Variations result from small, inevitable errors during DNA copying — these are the source of genetic diversity.

Role of variation in survival:

- Niches can change due to factors like global warming, meteorite hits, or rising water levels — beyond an organism's control.
- If all individuals are identical and the niche changes drastically, the **entire population could be wiped out**.
- Example: If water temperature rises due to global warming, most bacteria would die, but **heat-resistant variants** would survive and reproduce.
- Thus, variation ensures that *at least some individuals* can survive environmental changes.

Conclusion:
Variation is not beneficial to every individual, but it is essential for **species survival over time**. Perfect DNA copying would eliminate this crucial safety net, making species highly vulnerable to extinction.

Source: Chapter 7, Section 7.1.1 – The Importance of Variation; Section 7.3.1 – Why the Sexual Mode of Reproduction?

Explanation

What examiners look for (5 marks):

1. Clear agreement + reason why perfect accuracy removes variation (1 mark)
2. Explanation that variations arise from DNA copying errors (1 mark)
3. Why niches change (environmental factors) (1 mark)
4. Concrete example — bacteria and heat resistance (1 mark)
5. Conclusion: variation helps species, not necessarily every individual (1 mark)

Key points to remember:

- Never say "variation is harmful" — it is harmful to some *individuals* but beneficial to the *species*.
- Always use the textbook example (bacteria + global warming) — examiners expect it.
- Keep the distinction clear: **consistency** of copying = body stability; **slight errors** = variation = evolutionary advantage.

Q6. medium | thorough-understanding | § 7.1 DO ORGANISMS CREATE EXACT COPIES OF THEMSELVES? **[1]**

In a population of organisms occupying a stable niche, which of the following best explains why some variation among individuals is still beneficial?

(A) Variation allows natural selection to favour faster-reproducing individuals, stabilising the population size.

(B) Variation ensures that if the niche changes unexpectedly, at least some individuals may survive the new conditions.

(C) Variation reduces the frequency of DNA copying errors in subsequent generations.

(D) Variation enables every individual to adapt to multiple niches simultaneously, increasing overall survival.

A Variation allows organisms to reproduce faster and outcompete others in the same niche.

B Variation ensures that if the niche changes unexpectedly, at least some individuals may survive.

C Variation improves the accuracy of DNA copying in the next generation.

D Variation prevents overcrowding by causing some individuals to move to different niches.

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Model Answer

(B) Variation ensures that if the niche changes unexpectedly, at least some individuals may survive.

If a niche is drastically altered, most organisms die, but individuals with favourable variations survive and grow further, ensuring species survival.

Source: Chapter 7, Section 7.1.1 – The Importance of Variation

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Explanation

The passage directly states that if variations are present in a few individuals and the niche changes drastically, those variants have a chance to survive. Option B mirrors this exactly.

- **(A)** is wrong — variation is not about faster reproduction within a stable niche.
- **(C)** is wrong — variation actually results *from* DNA copying errors, it does not reduce them.
- **(D)** is wrong — individuals do not adapt to multiple niches simultaneously; that contradicts the niche concept.

Key phrase to remember: *"Variation is useful for the survival of species over time."*

Q7. deep | thorough-understanding | § 7.1 DO ORGANISMS CREATE EXACT COPIES OF THEMSELVES? **[3]**

Variation arising from DNA copying errors is described as beneficial to the species but not necessarily to the individual organism. Explain this distinction using a specific example.

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Model Answer

DNA copying during reproduction is not perfectly accurate, leading to variations in some individuals. These variations may be harmful or neutral to the individual carrying them, but become beneficial to the **species** when the environment changes.

Example: A population of bacteria lives in temperate water. Global warming raises the water temperature — most bacteria die. However, a few individuals with a variation making them heat-resistant survive and reproduce. The individual without the variation dies, but the species survives through the variant individuals.

Thus, variation is useful for the **survival of the species over time**, even though it offers no guaranteed benefit to every individual organism.

Source: Chapter 7, Section 7.1.1 — The Importance of Variation

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Explanation

- Examiners expect you to clearly **distinguish** between individual and species — this is the core of the question.
- The bacteria + global warming example is **directly from the textbook** — always use it here; it scores full marks.
- Three marks typically map to: (1) what variation is / how it arises, (2) why it may not help the individual, (3) how it benefits the species with an example.
- Avoid vague statements like "variation is good" — be specific about survival under changed conditions.

Q8. medium | thorough-understanding | § 7.1.1 The Importance of Variation **[3]**

A population of frogs lives in a pond that remains cool throughout the year. Due to climate change, the pond's temperature rises sharply over a few years and most frogs die. However, a small number survive and eventually repopulate the pond. What does this scenario reveal about the relationship between variation and the survival of a species?

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Model Answer

The scenario reveals that **variation is essential for the survival of a species**, even if it may not benefit every individual.

In a stable environment, DNA copying ensures consistency of body design, keeping organisms suited to their niche. However, when the environment changes drastically (like rising pond temperature), most individuals — suited to the old conditions — die. Only those with **favourable variations** (e.g., tolerance to higher temperatures) survive, reproduce, and repopulate.

Thus, variation acts as a buffer against environmental changes, ensuring the **long-term survival of the species** even when most individuals perish.

Source: Chapter 7, Section 7.1.1 – The Importance of Variation

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Explanation

- The examiner expects you to link the scenario to the textbook concept: variation → survival of species, not individual.
- Mention **two key ideas**: (1) DNA copying maintains consistency in a stable niche; (2) variation helps when the niche changes.
- Use the textbook's own logic — the frog example mirrors the bacteria/global warming example in Section 7.1.1.
- Avoid over-explaining; 3 marks = ~3 clear points or a tight short paragraph.

Q9. deep thorough-understanding § 7.1.1 The Importance of Variation **[3]**

Variation arising from DNA copying errors is beneficial for a species but can be harmful to an individual organism. Explain why this apparent contradiction exists.

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Model Answer

DNA copying mechanisms are not absolutely accurate, so errors (variations) occur during reproduction.

Harmful to the individual: A drastic DNA copying error may produce a protein that does not work with the cellular apparatus, causing the new cell to die. Thus, a particular variation can be fatal for that individual organism.

Beneficial to the species: However, if environmental conditions change drastically (e.g., rise in temperature due to global warming), most organisms die, but the few individuals that carry a useful variation survive and reproduce. Variation thus ensures the survival of the species over time, even if no single individual is guaranteed protection.

Source: Chapter 7, Sections 7.1 and 7.1.1

Explanation

- The examiner wants **two distinct points** — one explaining harm to the individual, one explaining benefit to the species — clearly labelled or contrasted.
- The key phrase from the textbook is: *"Every individual organism cannot be protected by variations, but in a population, variations are useful for ensuring the survival of the species."* Paraphrase this in your answer.
- Use the **bacteria/global warming example** from Section 7.1.1 to illustrate benefit to the species — examiners appreciate a concrete example.
- Avoid vague statements like "variations are good" without linking them to survival under changed environmental conditions.

Q10. medium | thorough-understanding | § 7.1.1 The Importance of Variation **[1]**

[mcq] A forest contains two populations of beetles — Population X, in which all individuals are identical, and Population Y, which shows considerable variation in body colour and heat tolerance. If a sudden drought raises the forest temperature significantly, which of the following most accurately predicts the outcome and explains why?
(A) Population X will survive better because all its members share the same successful traits.
(B) Population Y will survive better because some individuals may already possess traits suited to the new conditions.
(C) Both populations will be equally affected because survival depends only on population size.
(D) Population X will survive better because identical DNA is copied with fewer errors during reproduction.

A Organisms without variation reproduce more slowly, reducing population size over time.
B If the environment changes, no individual in the population would have traits suited to the new conditions.
C A uniform population consumes resources faster and is more likely to face starvation.
D Without variation, organisms cannot carry out DNA copying and reproduction stops entirely.

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Model Answer

The correct answer to the MCQ is **(B)**.

The correct option is **(B)** — If the environment changes, no individual in the population (X) would have traits suited to the new conditions.

Population Y survives better because some individuals already possess heat-tolerant traits; Population X, being uniform, has no such variants to withstand the changed conditions.

Explanation

The passage from Section 7.1.1 directly states: *"if some variations were to be present in a few individuals, there would be some chance for them to survive"* — using the exact example of bacteria and rising temperature. Population X (no variation) has no individual suited to drought/heat, so the entire group is at risk. The MCQ answer is (B), and among the four options given for the follow-up, Option B correctly identifies why uniformity is dangerous: no individual in the population has traits suited to the changed environment. Examiners want students to link **variation → survival advantage** using the textbook example.

Q11. deep thorough-understanding § 7.2 MODES OF REPRODUCTION USED BY SINGLE ORGANISMS **[3]**

Spirogyra reproduces by fragmentation, while Rhizopus reproduces by spore formation. (a) What is the key advantage spore formation has over fragmentation when environmental conditions become unfavourable? (b) Why can neither of these asexual methods work effectively for reproduction in complex multicellular animals?

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Model Answer

(a) Spores are covered by **thick protective walls** that help them survive unfavourable conditions (lack of moisture, heat, etc.). When conditions improve, they germinate and grow into new individuals. Fragmentation, by contrast, offers no such protection — exposed fragments cannot withstand harsh environments.

(b) Complex multicellular animals have specialised cells organised into tissues and organs placed at definite positions in the body. Simple cell-by-cell division (fragmentation) or single-cell spore formation cannot regenerate this organised body plan, making these asexual methods impractical for such organisms.

Source: Chapter 7, sections 7.2.2 Fragmentation and 7.2.6 Spore Formation

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Explanation

- **Part (a)** is worth ~1 mark: the key word examiners look for is "thick-walled spores" surviving unfavourable conditions — don't just say "spores are better," explain *why* (protective walls).
- **Part (b)** is worth ~2 marks: the textbook's exact logic is that complex organisms have cells organised into tissues → organs → definite positions, so neither simple fragmentation nor spore formation can reconstruct that complexity. Use the textbook phrasing ("specialised cells," "tissues," "organs") for full credit.
- Avoid generic statements like "they are too big" — the examiner wants the organisational complexity argument directly from the passage.

Q12. deep thorough-understanding § 7.2.1 Fission **[3]**

Amoeba divides in any plane, but Leishmania always divides along a fixed orientation relative to its whip-like structure. What does this difference reveal about the relationship between a cell's structural complexity and the way it undergoes binary fission?

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Model Answer

Amoeba is a relatively simple cell with no fixed internal organisation, so it can split in any plane during binary fission. Leishmania, however, possesses a whip-like structure (flagellum) at one end, indicating a **more organised body structure**. Because of this structural complexity, its binary fission must occur in a **definite orientation** relative to that structure to ensure both daughter cells are properly formed.

This reveals that **greater structural complexity in a cell imposes constraints on how division can occur** — the more organised a cell's body, the more controlled and orientation-specific its fission must be.

Source: Chapter 7 — How do Organisms Reproduce?, Section 7.2.1 Fission

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Explanation

Examiners look for three things here (1 mark each):

1. Amoeba — simple structure → no fixed plane of division.
2. Leishmania — has a flagellum (whip-like structure) → division in a definite orientation.
3. The **inference/conclusion**: structural complexity determines/constrains the mode of binary fission.

Avoid writing general definitions of binary fission. Focus on the *contrast* and the *reason* behind it. The word "definite orientation" from the textbook is key — use it.

Q13. medium | thorough-understanding | § 7.2.1 Fission **[3]**

Plasmodium, the parasite that causes malaria, does not reproduce by simply splitting into two inside the human host. (i) Name the mode of asexual reproduction it uses and describe how it differs from binary fission. (ii) Explain why this mode of reproduction is better suited to Plasmodium's survival strategy inside a host compared to binary fission.

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Model Answer

(i) Plasmodium uses **multiple fission**. In binary fission, the parent cell divides into **two** equal daughter cells. In multiple fission, the nucleus divides repeatedly first, then the cytoplasm splits around each nucleus, producing **many daughter cells simultaneously** from a single parent cell.

(ii) Multiple fission allows Plasmodium to produce a large number of new individuals at once inside the host. This greatly increases its numbers rapidly, helping it spread through the host's body before the immune system can respond effectively — making it a more efficient survival strategy than binary fission.

Source: Chapter 7, Section 7.2.1 Fission

Explanation

- Examiners expect the term **"multiple fission"** to be named explicitly for full marks.
- The key contrast in part (i) is **two daughter cells (binary)** vs **many daughter cells simultaneously (multiple)** — both points are needed.
- Part (ii) is inference-based; the textbook hints at it by contrasting the two types. The logical answer is rapid population increase inside the host. Keep it concise — one or two sentences suffice for this mark.

Q14. medium | thorough-understanding | § 7.2.2 Fragmentation **[3]**

Spirogyra reproduces by fragmentation, but a complex animal like a frog cannot. What is the fundamental difference in body organisation between these two organisms that makes fragmentation a viable reproductive strategy for one but not the other?

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Model Answer

Spirogyra has a **simple body organisation** — its cells are not highly specialised and are not organised into distinct tissues or organs. So when it breaks into fragments, each piece contains all the cell types needed to grow into a new individual.

A frog, however, has **specialised cells organised into tissues, tissues into organs, and organs placed at definite positions** in the body. In such an organism, cell-by-cell division through fragmentation is impractical, as no random fragment would contain the full, organised set of structures required to sustain life and develop into a complete individual.

Source: Chapter 7, Section 7.2.2 – Fragmentation

Explanation

What examiners look for:

- The key contrast: *simple body organisation (Spirogyra)* vs. *specialised cells → tissues → organs (frog)*.
- The reason fragmentation fails in complex organisms: organs must be at **definite positions**; a random fragment cannot provide this.
- Avoid vague answers like "frog is more complex" — you must explain *why* complexity prevents fragmentation. The textbook phrase "not simply a random collection of cells" is worth referencing.
- 3 marks = 3 distinct points: (1) Spirogyra's simplicity, (2) frog's organised structure, (3) why fragmentation is impractical for the frog.

Q15. medium | thorough-understanding | § 7.2.2 Fragmentation **[3]**

Both fragmentation and regeneration can result in new individuals arising from parts of an existing organism. Explain the key difference between these two processes, giving one example of each.

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Model Answer

Fragmentation occurs when a multicellular organism (with simple body organisation) simply breaks into pieces upon maturation, and each piece grows into a new individual. It does not require specialised cells. *Example:* Spirogyra breaks into fragments, each growing into a new organism.

Regeneration occurs when a fully differentiated organism is cut or broken, and specialised cells proliferate to form a mass of cells, which then undergo organised development to form a complete individual. *Example:* Planaria, when cut into pieces, regenerates into complete organisms.

Key difference: Fragmentation is a natural breakage process in simply organised organisms; regeneration involves specialised cells and organised development in more differentiated organisms.

Source: Chapter 7, Sections 7.2.2 and 7.2.3

Explanation

- Examiners expect students to clearly distinguish the *mechanism* — fragmentation is passive breaking + regrowth; regeneration requires **specialised cells** and **organised development**.
- One example for each process is mandatory (Spirogyra for fragmentation, Planaria/Hydra for regeneration).
- Avoid saying regeneration IS reproduction — the textbook explicitly states it is not the same as reproduction.
- Roughly 1 mark each: definition of fragmentation, definition of regeneration, and the key distinguishing point (specialised cells / organised development).

Q16. medium | thorough-understanding | § 7.2.2 Fragmentation **[1]**

Which of the following best explains why Spirogyra, a multicellular organism, can reproduce by fragmentation while most other multicellular organisms cannot?

(A) Spirogyra reproduces faster than other multicellular organisms.

(B) Each cell of Spirogyra is undifferentiated and capable of independent survival and growth.

(C) Spirogyra lives in water, which provides the physical force needed to break it apart.

(D) Spirogyra lacks a nucleus, so its cells can divide without any signal.

A Spirogyra produces spores that can survive harsh conditions.

B Spirogyra lacks specialised tissues and organs, so any fragment contains all it needs to grow into a new individual.

C Spirogyra undergoes meiosis before breaking into fragments, ensuring each piece has the correct chromosome number.

D Spirogyra fragments only release germ-cells, which then develop into new filaments.

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Model Answer

(B) Spirogyra lacks specialised tissues and organs, so any fragment contains all it needs to grow into a new individual.

Explanation

The textbook states that Spirogyra has a "relatively simple body organisation" with no specialised tissues or organs. Activity 7.4 asks students to check whether different tissues can be identified in Spirogyra — implying they cannot. Because its cells are undifferentiated, every fragment has the full capability to survive and grow. In contrast, complex multicellular organisms have cells organised into tissues and organs, making cell-by-cell fragmentation impractical. Examiners expect you to link the **absence of specialisation** to the ability to reproduce by fragmentation.

Q17. deep | thorough-understanding | § 7.2.2 Fragmentation **[5]**

Fragmentation is classified as a form of asexual reproduction. Using this as a starting point, analyse what this tells us about the genetic relationship between the fragments produced by a single Spirogyra filament, and discuss one consequence this might have for the survival of the population if environmental conditions change drastically.

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Model Answer

Genetic Relationship Between Fragments:

Fragmentation is a form of **asexual reproduction**, meaning new individuals are produced from a single parent without the involvement of gametes. When a Spirogyra filament breaks into fragments, each fragment grows into a new individual through mitotic cell division. Since all fragments originate from the same parent and DNA is copied (not combined with another organism's DNA), all fragments are **genetically identical** to each other and to the parent filament — they are clones.

Consequence for Survival if Environment Changes Drastically:

Since all individuals in the population are genetically identical, they will respond to environmental stress in the same way. If conditions change drastically — such as a new disease, extreme temperature, or pollution — **no individual will have a genetic advantage** over others. The entire population could be wiped out, as there is no genetic variation to allow some individuals to survive and adapt.

Source: Chapter 7, Section 7.2.2 Fragmentation; Section 7.1

Explanation

- Examiners want two clear things: (1) the genetic conclusion (identical/clones) **with reasoning** (asexual → single parent → DNA copying only), and (2) one specific survival consequence logically following from lack of variation.
- The textbook explicitly states that variations from DNA copying are the basis for survival and evolution; asexual reproduction generates far less variation. Use that link.
- Don't just say "no variation is bad" — say **why**: uniform population = uniform vulnerability.
- Avoid adding extra points; this is a 5-mark answer, so two well-developed paragraphs are ideal.

Q18. deep | thorough-understanding | § 7.2.3 Regeneration **[3]**

Hydra and Planaria can regenerate into complete organisms from cut pieces, yet regeneration is not classified as a mode of reproduction. Justify this statement with appropriate reasoning.

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Model Answer

Regeneration is the ability of organisms like Hydra and Planaria to regrow complete individuals from cut body parts, carried out by specialised cells that proliferate and develop into different cell types through a process called development.

However, regeneration is **not** classified as a mode of reproduction because most organisms would not normally depend on being cut up to reproduce. Reproduction is a deliberate biological process for creating new individuals, whereas regeneration is essentially a repair/survival response. Since being cut or broken is not a natural or regular event in an organism's life cycle, it cannot be considered a standard reproductive strategy.

Source: Chapter 7, Section 7.2.3 — Regeneration

Explanation

- Examiners want **two things**: (1) a brief definition/description of regeneration, and (2) the specific reason why it is NOT reproduction — *organisms do not normally depend on being cut up to reproduce*. This exact reasoning is from the textbook and must appear.
- Do not confuse regeneration with budding. Hydra uses regenerative cells for *budding* (a true reproductive mode), but regeneration itself is different.
- Avoid writing a vague answer like "it's not the same thing" — state the textbook reason explicitly.

Q19. medium | thorough-understanding | § 7.2.4 Budding **[3]**

Both budding in Hydra and regeneration in Planaria involve the proliferation and differentiation of cells to produce new body parts. Distinguish between the two processes and explain why budding is considered a mode of reproduction while regeneration serves a different primary biological purpose. Also describe, step by step, how budding in Hydra leads to the formation of a new independent individual.

◆ How do Organisms Reproduce?

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Model Answer

Distinction:

- **Budding** is a mode of reproduction — a new individual forms as an outgrowth at a specific site on the parent body and detaches to live independently.
- **Regeneration** in Planaria is primarily a survival/repair mechanism; an organism grows back lost parts when cut. Most organisms are not normally cut up, so it is not a regular reproductive strategy.

Steps of budding in Hydra:

1. Repeated cell division occurs at one specific site on the parent body.
2. An outgrowth (bud) develops from this site.
3. The bud gradually grows into a tiny Hydra individual.
4. When fully mature, it detaches from the parent body and becomes a new independent individual.

Source: Chapter 7, Sections 7.2.3 and 7.2.4

Explanation

Examiners expect you to clearly **contrast** the two processes (not just describe them separately) and then give **sequential steps** for budding. The key distinction is: budding is a **normal, planned reproductive process**; regeneration is a **response to injury/damage** and not how organisms normally reproduce. Quote the textbook phrase — *"regeneration is not the same as reproduction"* — to score full marks.

Q20. medium | thorough-understanding | § 7.2.5 Vegetative Propagation **[3]**

A farmer wants to grow a variety of rose that produces exceptionally fragrant flowers. He knows that seeds from this rose may not reliably produce plants with the same fragrance. Which method of propagation should he use, and why would it better guarantee the desired trait in the new plants?

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Model Answer

The farmer should use **vegetative propagation** (such as grafting or layering).

Why it guarantees the desired trait:
In vegetative propagation, new plants are grown from parts of the parent plant (stem, root, or leaf) rather than from seeds. Since sexual reproduction involves combination of DNA from two individuals, seeds may produce offspring with varying traits. Vegetative propagation produces plants that are **genetically identical** to the parent, ensuring all new plants inherit the same fragrance. It also allows plants to bear flowers earlier than seed-grown plants.

Source: Chapter 7, Section 7.2.5 — Vegetative Propagation

Explanation

- **Key concept tested:** Difference between sexual (seed) and asexual (vegetative) reproduction in terms of genetic consistency.
- Examiners want: (1) correct method named, (2) reason seeds are unreliable (genetic variation from sexual reproduction), (3) reason vegetative propagation is reliable (genetic similarity to parent).
- Mention a specific technique (grafting/layering) to score full marks — don't just say "vegetative propagation."
- The phrase **"genetically similar to the parent"** is directly from the textbook and is a scoring keyword.

Q21. medium | thorough-understanding | § 7.2.5 Vegetative Propagation **[1]**

[mcq] Banana plants and seedless oranges do not produce viable seeds. What does this imply about how new plants of these varieties must be obtained, and which of the following best explains why?
(A) They reproduce by spore formation since seeds are absent
(B) They must be propagated vegetatively because no seeds are available for sexual reproduction
(C) They can only reproduce through pollination by a different species
(D) They undergo regeneration from any injured body part automatically

A Their seeds are too small to germinate under natural conditions.
B They have lost the capacity to produce seeds.
C Their seeds produce plants with inferior characteristics.
D Vegetative propagation is faster, so seeds are never used for these plants.

◆ How do Organisms Reproduce?

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Model Answer

(B) They must be propagated vegetatively because no seeds are available for sexual reproduction.

Banana and seedless oranges **have lost the capacity to produce seeds**, so new plants must be obtained through vegetative propagation.

Source: Chapter 7, Section 7.2.5 Vegetative Propagation

Explanation

The passage explicitly states: *"Such methods also make possible the propagation of plants such as banana, orange, rose and jasmine that **have lost the capacity to produce seeds**."* So the correct MCQ option is **B**, and the best explanation from the question's choices is **(B)** — vegetative propagation is used because sexual reproduction via seeds is not possible. Examiners expect you to link "no viable seeds" directly to the textbook phrase "lost the capacity to produce seeds" and identify vegetative propagation as the necessary alternative.

Q22. medium | thorough-understanding | § 7.2.5 Vegetative Propagation **[3]**

In Bryophyllum, new plants arise from buds along the margins of leaves, while in potato, new plants arise from buds present in notches on the tuber. What do both these examples reveal about the fundamental requirement for vegetative propagation to succeed in a plant part?

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Model Answer

Both examples — buds on Bryophyllum leaf margins and buds (eyes) in potato tuber notches — reveal that **the presence of actively dividing meristematic cells (buds) in the plant part is the fundamental requirement** for vegetative propagation to succeed.

A plant part can give rise to a new plant only if it contains such buds or growing points, which are capable of cell division and differentiation. Parts lacking buds (e.g., potato pieces without notches) fail to develop into new plants, regardless of the conditions provided. Thus, the plant part must have a **bud or meristematic region** to regenerate into a complete new individual.

Source: Chapter 7, Section 7.2.5 — Vegetative Propagation

Explanation

What examiners look for:

- The key concept: presence of **buds/meristematic cells** is essential — not just any plant part.
- The comparative logic: potato pieces *without* notches don't grow; Bryophyllum buds *with* meristematic tissue do.
- Do not simply list advantages of vegetative propagation — the question asks what both examples *reveal* about the fundamental requirement.
- Mentioning "cell division" or "differentiation" adds marks. The word **meristematic** is ideal but "bud with dividing cells" is acceptable.

Q23. medium | thorough-understanding | § 7.2.5 Vegetative Propagation **[2]**

A plant produced from seed takes several years to flower for the first time, while a plant of the same species grown by vegetative propagation flowers within a year. What explains this difference?

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Model Answer

Plants produced from seeds must first complete a long juvenile phase before they can flower. In contrast, plants grown by vegetative propagation are developed from mature parent tissue that has already passed this juvenile stage, so they can bear flowers and fruits **earlier** than seed-grown plants.

Source: Chapter 7, Section 7.2.5 – Vegetative Propagation

Explanation

The key phrase from the textbook is: *"Plants raised by vegetative propagation can bear flowers and fruits earlier than those produced from seeds."* Examiners expect you to explain **why** — the vegetative part comes from a mature plant, so it skips the juvenile/seedling phase. Mention both sides: seed-grown = long juvenile phase; vegetatively propagated = mature tissue, no juvenile phase. Two clear points = 2 marks.

Q24. deep | thorough-understanding | § 7.2.5 Vegetative Propagation **[5]**

[long_answer] Vegetative propagation is classified as a form of asexual reproduction in plants. Justify this classification by explaining what vegetative propagation shares with other asexual modes of reproduction in terms of cell division and genetic outcome. Then identify one significant consequence this has for the genetic diversity of a crop grown entirely by this method, and explain whether this consequence is always a disadvantage for the farmer.

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Model Answer

Vegetative propagation as asexual reproduction:
Vegetative propagation involves a single parent plant producing new individuals through its roots, stems, or leaves. Like all asexual reproduction (fission, budding, spore formation), it relies on **mitotic cell division** — not the fusion of gametes. Because only one parent is involved and no fertilisation occurs, no new combination of genetic material is introduced. The new plants are therefore **genetically identical (or very nearly so) to the parent plant**, which is the defining genetic outcome of asexual reproduction.

Consequence for genetic diversity:
A crop grown entirely by vegetative propagation has **very low genetic diversity** — all plants are essentially clones of one parent.

Is this always a disadvantage?
Not always. For a farmer, genetic uniformity ensures all plants carry the same desirable traits (high yield, good flavour, disease resistance). It also allows plants like banana and seedless grapes — which cannot produce viable seeds — to be propagated reliably. However, if a new pest or disease emerges, the entire crop is equally vulnerable, since no individual has a genetic variation that might confer resistance. So the consequence is an advantage in stable conditions but a serious risk during outbreaks.

Source: Chapter 7, Section 7.2.5 Vegetative Propagation; Section 7.2.6 Spore Formation (summary)

Explanation

What examiners look for:

- Explicit link to **single parent / no fertilisation / mitosis** → asexual classification (don't just say "one parent"; connect it to cell division and genetic outcome).
- The word **"genetically identical / clones"** is expected — the passage uses "genetically similar enough… to have all its characteristics."
- The genetic diversity consequence must be named clearly: **low/no genetic diversity**.
- The "not always a disadvantage" part needs **both sides** briefly: advantage (uniform desirable traits, propagation of seedless plants) AND the risk (uniform susceptibility to disease). Examiners reward balanced reasoning here.
- Keep it concise — five tight points / two short paragraphs is enough for 5 marks.

Q25. deep thorough-understanding § 7.2.5 Vegetative Propagation **[2]**

[short_answer] In tissue culture, new plants are regenerated from a few cells taken from the growing tip of a parent plant. Explain why every plant produced by this technique is genetically identical to the parent, and state what property of plant cells makes this technique possible.

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Model Answer

In tissue culture, cells are taken from the growing tip of a parent plant and grown into new plants. Since this is **asexual reproduction**, no fertilisation occurs and no new combination of DNA is formed. All new plants are grown from the **same DNA** as the parent, making them genetically identical.

The property that makes this possible is **totipotency** — the ability of plant cells to divide and differentiate into a complete organism, since every plant cell contains the full genetic information needed.

Source: Tissue Culture (More to Know), Chapter 7; Section 7.2.5 Vegetative Propagation

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Explanation

- **Why identical:** Tissue culture is asexual — no fusion of gametes, so no genetic variation is introduced. The DNA is copied but remains unchanged.
- **Key term:** Examiners expect the word **totipotency** (or at least the idea that each plant cell retains the full genetic blueprint and can develop into a whole plant).
- The passage states cells from the growing tip "divide rapidly" and differentiate — link this directly to the concept of totipotency for full marks.

Q26. medium | thorough-understanding | § 7.2.6 Spore Formation **[3]**

Rhizopus reproduces by spore formation under unfavourable conditions. Explain how the structural features of spores make this mode of reproduction more effective for survival and dispersal compared to simply breaking into fragments.

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Model Answer

Spores are highly effective for survival and dispersal due to the following structural features:

1. **Thick protective walls:** Spores are covered by thick walls that protect them from unfavourable conditions such as heat, dryness, and lack of nutrients, until a suitable moist surface is available.
1. **Lightweight and numerous:** Spores are tiny and produced in large numbers inside sporangia, enabling easy dispersal through air over long distances.
1. **Dormancy capability:** Spores can remain inactive for long periods and germinate only when conditions become favourable.

In contrast, fragmentation requires moist conditions throughout and offers no protection — fragments are exposed and vulnerable, limiting both survival and dispersal.

Source: Chapter 7, Section 7.2.6 — Spore Formation

Explanation

- The examiner expects three clear points: **thick wall → protection**, **small size/large numbers → dispersal**, and **dormancy → survival under unfavourable conditions**.
- Contrast with fragmentation is a smart addition here since the question explicitly asks for comparison — it shows understanding and can earn the third mark.
- Always use the textbook terms: *sporangia*, *spores*, *thick walls*, *moist surface*.
- Do not write about sexual reproduction or other organisms — keep it focused on Rhizopus and spore formation.

Q27. deep thorough-understanding § 7.2.6 Spore Formation **[3]**

Spore formation is classified as asexual reproduction, just like budding and fragmentation. Yet spore formation is considered particularly advantageous for organisms like Rhizopus compared to fragmentation in Spirogyra. Justify this statement by connecting the structural features of spores to the conditions under which each mode succeeds or fails.

◆ How do Organisms Reproduce?

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Model Answer

Spores are covered by **thick protective walls** that shield them from unfavourable conditions such as drought, heat, or lack of nutrients. This means Rhizopus can survive harsh environments and resume growth only when conditions (moisture, warmth) become suitable again.

Fragmentation in Spirogyra, however, requires the organism to already be in a favourable, moist environment — the fragments have no protective covering and cannot withstand desiccation or stress.

Thus, spore formation is more advantageous because spores ensure **survival during adversity**, whereas fragmentation succeeds only under continuously favourable conditions.

Source: Chapter 7, Section 7.2.6 – Spore Formation; Section 7.2.2 – Fragmentation

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Explanation

The examiner expects you to link the **structural feature** (thick-walled spores) directly to the **functional advantage** (survival in unfavourable conditions) and then **contrast** it with fragmentation's limitation (needs continuously favourable conditions). Avoid writing in general terms — always tie structure → function → condition. These three points map neatly to 3 marks.

Q28. deep thorough-understanding § 7.3 SEXUAL REPRODUCTION **[3]**

During sexual reproduction, germ-cells undergo meiosis so that they contain only half the number of chromosomes found in normal body cells. Explain why this halving is essential for maintaining the chromosome number across generations, and describe what would happen if germ-cells were produced by ordinary cell division (mitosis) instead.

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Model Answer

During sexual reproduction, two germ-cells (gametes) fuse at fertilisation to form a new individual. If each germ-cell contained the full chromosome number (as in normal body cells), the fertilised egg would have **double** the chromosomes. Across generations, this would keep doubling, disrupting the species' chromosome number entirely.

Meiosis halves the chromosome number in germ-cells so that after fertilisation, the normal chromosome number is **restored** in the offspring.

If germ-cells were produced by mitosis instead, they would carry the full chromosome number. Fusion of two such cells would double the chromosomes each generation, making it impossible to maintain a stable chromosome number across generations.

Source: Chapter 7 — Reproduction, general principles of sexual reproduction and DNA/chromosome inheritance.

Explanation

- The examiner wants **two linked ideas**: (1) why halving is necessary (fertilisation doubles), and (2) what goes wrong without meiosis (chromosomes keep doubling each generation).
- Use terms like *meiosis*, *fertilisation*, *chromosome number*, *gametes* — these earn keyword marks.
- At 3 marks, roughly one mark per idea: (i) fertilisation combines two gametes, (ii) meiosis keeps the count stable, (iii) mitosis-produced gametes would cause progressive doubling. Cover all three concisely.

Q29. medium | thorough-understanding | § 7.3.1 Why the Sexual Mode of Reproduction? **[3]**

Why does combining DNA from two different individuals during sexual reproduction not simply double the amount of DNA in each successive generation?

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Model Answer

When two individuals reproduce sexually, each contributes their DNA, which would theoretically double the DNA in every new generation. This is prevented by a special cell division called **meiosis**, which occurs in reproductive organs. Meiosis halves the number of chromosomes and the amount of DNA in germ cells (gametes). When two gametes fuse during fertilisation, the normal DNA content is re-established. Thus, the DNA amount remains constant across generations.

Source: Chapter 7, Section 7.3.1 — Why the Sexual Mode of Reproduction?

Explanation

- The examiner expects three key points: (1) the problem — DNA would double each generation, (2) the solution — meiosis halves DNA in germ cells, (3) the outcome — fertilisation restores normal DNA content.
- Use the terms **meiosis**, **germ cells/gametes**, and **chromosomes** for full marks.
- Don't just say "meiosis occurs" — explain *what* it does (halves DNA) and *why* that matters (restores normal amount after fertilisation).

Q30. medium | thorough-understanding | § 7.3.1 Why the Sexual Mode of Reproduction? **[3]**

Asexual reproduction can produce new individuals perfectly well. What specific advantage does sexual reproduction provide that asexual reproduction cannot, and why is that advantage important for a species over time?

♦ How do Organisms Reproduce?

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Model Answer

While asexual reproduction creates new individuals efficiently from a single parent, all offspring are genetically identical. Sexual reproduction involves two individuals, allowing **greater variation** to be generated in the new generation.

This variation is important because niches (environmental conditions) can change — due to temperature rise, floods, or other events. If all individuals are identical, a single drastic change can wipe out the entire population. However, if variation exists, some individuals may be better suited to survive the changed conditions and continue the species. **Variation is thus useful for the survival of species over time.**

Source: Chapter 7, Section 7.1.1 (The Importance of Variation)

Explanation

- The examiner expects **two parts**: (1) what advantage sexual reproduction provides — **variation**, and (2) **why it matters** — survival during environmental changes.
- Use the textbook example of bacteria and heat resistance; it shows you understand application, not just definition.
- Key phrase to include: *"variation is useful for the survival of species over time"* — this is directly from the textbook summary and earns marks.
- Avoid writing only "variation" without explaining its importance — that would cost you marks on a 3-mark question.

Q31. deep | thorough-understanding | § 7.3.1 Why the Sexual Mode of Reproduction? **[3]**

A student argues: 'If DNA-copying were made less accurate, sexual reproduction would be unnecessary because enough variation would already be generated asexually.' Using your understanding of what happens when DNA copying becomes too inaccurate, explain why this argument is flawed.

◆ How do Organisms Reproduce?

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Model Answer

The argument is flawed for the following reasons:

1. **Too many errors = cell death:** If DNA copying became highly inaccurate, most of the resulting DNA copies would be unable to work with the cellular apparatus and the new cells would simply die. This reduces the population rather than generating useful variation.
1. **Sexual reproduction creates safe, novel combinations:** Sexual reproduction combines DNA from two individuals who already carry variations accumulated over generations. Since these individuals are alive, their variations are proven to be non-lethal — making the new combinations both novel and viable.
1. **Conclusion:** Extreme inaccuracy in DNA copying is destructive, not generative. Sexual reproduction generates variation safely and efficiently, making it irreplaceable.

Source: Chapter 7, Section 7.3.1 — Why the Sexual Mode of Reproduction?

Explanation

Examiners expect three clear points for 3 marks:

- **Point 1 (1 mark):** Too much inaccuracy → cells die (directly from the passage).
- **Point 2 (1 mark):** Sexual reproduction combines pre-tested, accumulated variations from two living individuals — so new combinations are safe and novel.
- **Point 3 (1 mark):** Conclusion tying it together — inaccuracy destroys; sex reproduces variation safely.

Avoid writing a vague answer like "variation is important." Be specific: the passage says inaccurate copies **"would not be able to work with the cellular apparatus, and would die"** — quote or paraphrase this directly for full marks.

Q32. medium | thorough-understanding | § 7.3.1 Why the Sexual Mode of Reproduction? **[1]**

Sexual reproduction combines variations from two parents rather than creating new mutations. Which of the following best explains why this makes sexual reproduction less risky for individual survival than relying on random DNA-copying errors for variation?

(A) Variations already tested in parents are less likely to be lethal than brand-new random mutations.
(B) Sexual reproduction always produces more offspring than asexual reproduction.
(C) Gametes formed by meiosis never carry copying errors.
(D) Combining two genomes eliminates all harmful variations from both parents.

A Two individuals always carry identical variations, so there is no risk of incompatibility.
B Because both individuals are already alive, their accumulated variations are known not to be fatally harmful.
C Sexual reproduction eliminates all harmful mutations before they are passed on.
D The process of meiosis corrects any dangerous DNA errors before fusion of germ-cells.

◆ How do Organisms Reproduce?

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Model Answer

Answer: (B) — Because both individuals are already alive, their accumulated variations are known not to be fatally harmful.

Explanation

The passage explicitly states: *"Since all of these variations are in living individuals, it is assured that they do not have any really bad effects."* This means variations inherited through sexual reproduction have already been 'tested' for survival — the parents are alive, proving their variations aren't lethal. Random new mutations, however, are untested and may be fatal. Option (B) directly mirrors this textbook reasoning. Options (C) and (D) are factually incorrect; meiosis does not eliminate copying errors, nor does sexual reproduction remove all harmful mutations.

Source: Chapter 7, Section 7.3.1 — Why the Sexual Mode of Reproduction?

Q33. medium | thorough-understanding | § 7.3.1 Why the Sexual Mode of Reproduction? **[2]**

Why are germ-cells in complex multicellular organisms produced by meiosis rather than by the same cell division that produces ordinary body cells?

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Model Answer

In complex multicellular organisms, germ-cells are produced by **meiosis** because when two germ-cells (gametes) fuse during sexual reproduction, the resulting cell must have the normal chromosome number. If germ-cells were produced by ordinary mitotic division, fusion would double the chromosome number in every generation, eventually making normal development impossible. Meiosis halves the chromosome number, ensuring it is restored upon fertilisation.

Source: Chapter 7, Sexual Reproduction

Explanation

- The key concept is **maintaining the chromosome number** across generations.
- Examiners expect you to mention: (1) meiosis halves chromosome number, (2) fertilisation restores it, (3) mitosis would cause doubling with each generation.
- Do not just write "meiosis is cell division" — the *reason* (chromosome number maintenance) is what earns marks.
- Both marks are usually split: 1 mark for "meiosis halves chromosome number" + 1 mark for explaining what would happen without it (doubling each generation).

Q34. deep | thorough-understanding | § 7.3.1 Why the Sexual Mode of Reproduction? **[3]**

In simple organisms, the two fusing germ-cells may look identical, but in complex organisms one gamete is large and non-motile while the other is small and motile. Give a biological explanation for why gametes in complex organisms are differentiated in this way, and state what each design feature achieves.

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Model Answer

In complex organisms, gametes are differentiated because each serves a distinct function during sexual reproduction.

- **Large, non-motile gamete (egg/ovum):** Its large size provides stored nutrients (food reserves) to nourish the developing embryo after fertilisation.
- **Small, motile gamete (sperm):** Its small size and motility enable it to travel and reach the egg for fertilisation.

This division of labour ensures both successful fertilisation (by the mobile sperm) and adequate nourishment for the new organism's development (by the nutrient-rich egg).

Source: Chapter 7, Sexual Reproduction section

Explanation

The examiner wants two clear design features linked to two functions: (1) large + non-motile → stores food/nutrients for embryo; (2) small + motile → can move to reach the egg. Many students state the features but forget to explain **what each achieves** — that costs marks. Keep each point in a paired "feature → function" format.

Q35. medium | thorough-understanding | § 7.3.1 Why the Sexual Mode of Reproduction? **[2]**

In complex multicellular organisms, the female gamete is significantly larger than the male gamete. Give a biological reason for this size difference, and explain at what stage of reproduction this stored material becomes important.

♦ How do Organisms Reproduce?

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Model Answer

The female gamete (egg) is larger than the male gamete (sperm) because it stores **nutrients** needed for the early development of the embryo. The sperm consists mainly of genetic material and a tail for movement, and thus remains small.

This stored nutrition becomes important after **fertilisation**, when the zygote begins dividing and developing into an embryo, before it gets implanted in the uterine wall and receives nourishment from the mother's blood via the **placenta**.

Source: Chapter 7, Section 7.3.3 (a) & (b)

Explanation

- The examiner expects two clear points: *why* the egg is large (stored nutrients for the embryo) and *when* this matters (early post-fertilisation / pre-implantation development).
- The sperm description from the textbook — "tiny bodies that consist of mainly genetic material and a long tail" — directly supports why it is small; use this contrast.
- Avoid over-explaining; 2 marks = one reason + one stage/timing. Keep it tight.

Q36. medium | thorough-understanding | § 7.3.2 Sexual Reproduction in Flowering Plants **[1]**

A flower has its stamens removed before its pollen matures. Which of the following outcomes is most likely?
(A) The flower can still undergo self-pollination but not cross-pollination.
(B) The flower can still be fertilised if pollen arrives from another flower of the same species.
(C) The ovules in the flower will automatically develop into seeds without fertilisation.
(D) The pistil will stop producing egg cells.

A The flower can still undergo self-pollination but not cross-pollination.
B The flower can still be fertilised if pollen arrives from another flower of the same species.
C The ovules in the flower will automatically develop into seeds without fertilisation.
D The pistil will stop producing egg cells.

♦ How do Organisms Reproduce?

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Model Answer

(B) The flower can still be fertilised if pollen arrives from another flower of the same species.

Explanation

Removing stamens eliminates the source of pollen, so self-pollination is impossible. However, the pistil (with ovary, ovules, and egg cells) remains intact. Pollen from another flower of the same species can land on the stigma, travel through the style, and fertilise the egg cell — this is cross-pollination leading to fertilisation. Option C (apomixis) and D (pistil stops producing eggs) are incorrect; the pistil is unaffected by stamen removal.

Q37. medium | thorough-understanding | § 7.3.2 Sexual Reproduction in Flowering Plants **[3]**

After pollen lands on the stigma, it cannot directly fuse with the egg cell. Explain the sequence of events that bridges this gap and results in fertilisation.

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Model Answer

After pollen lands on the stigma, a pollen tube grows out of the pollen grain. This tube travels through the style and reaches the ovary. Inside the ovary, the male germ-cell from the pollen grain fuses with the female germ-cell (egg cell) present in the ovule. This fusion is called **fertilisation**, and it results in the formation of a **zygote**, which then develops into an embryo.

Source: Chapter 7, Section 7.3.2 – Sexual Reproduction in Flowering Plants

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Explanation

- The examiner expects three clear steps: pollen tube formation → travel through style to ovary → fusion of male and female germ-cells.
- Use the correct terms: **pollen tube**, **style**, **ovule**, **fertilisation**, **zygote** — these are direct scoring terms.
- Do not confuse pollination (pollen reaching stigma) with fertilisation (actual fusion of gametes); the question specifically asks about what happens *after* pollination.
- One mark each for: pollen tube growth, its path through the style to the ovary, and the fusion forming the zygote.

Q38. medium | thorough-understanding | § 7.3.2 Sexual Reproduction in Flowering Plants **[3]**

After fertilisation in a flowering plant, the zygote and the ovule undergo a series of changes. Trace the developmental journey from zygote to seed, and separately describe what happens to the ovary during this period. What is the biological significance of the structure that forms from the ovary?

◆ How do Organisms Reproduce?

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Model Answer

Zygote to Seed:
After fertilisation, the zygote divides several times to form an **embryo** within the ovule. The ovule then develops a tough protective coat and is gradually converted into a **seed**. The seed contains the embryo, which develops into a seedling under suitable conditions (germination).

Changes in the Ovary:
The ovary grows rapidly and ripens to form a **fruit**. Meanwhile, petals, sepals, stamens, style, and stigma shrivel and fall off.

Biological Significance of Fruit:
The fruit protects the seed and aids in its dispersal, ensuring the survival and spread of the species.

Source: Sexual Reproduction in Flowering Plants, Chapter 7, Section 7.3.2

Explanation

- Examiners expect three clear parts: zygote → embryo → seed; ovary → fruit; significance of fruit.
- Key terms to use: *embryo, tough coat, seed, ripens, fruit, dispersal* — these fetch marks.
- Don't confuse ovule (becomes seed) with ovary (becomes fruit); this is a common error.
- "Germination" is a bonus term showing understanding of seed significance.

Q39. medium | thorough-understanding | § 7.3.2 Sexual Reproduction in Flowering Plants **[2]**

Why is it essential for pollen to land on the stigma of a flower of the same species rather than just any surface, for reproduction to succeed?

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Model Answer

Pollen must land on the **stigma** because it is the specific part of the pistil designed to receive pollen. After landing on a **suitable** (same-species) stigma, the pollen grain germinates and grows a pollen tube through the style to reach the ovule in the ovary, where fertilisation occurs. On any other surface, this tube cannot form, and fertilisation cannot take place.

Source: Chapter 7, Section 7.3.2 – Sexual Reproduction in Flowering Plants

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Explanation

- The key phrase from the textbook is **"suitable stigma"** — examiners expect students to use this term and explain *why* it must be suitable.
- Two points are needed for 2 marks: (1) the stigma is the correct/compatible surface for pollen germination, and (2) only then does the pollen tube grow through the style to fertilise the egg cell in the ovule.
- Avoid vague answers like "only the stigma can receive pollen" — explain the mechanism (pollen tube formation → fertilisation).

Q40. deep | thorough-understanding | § 7.3.2 Sexual Reproduction in Flowering Plants **[3]**

A flowering plant produces flowers that are functionally unisexual — bearing only pistils and no stamens. (a) Can such a plant reproduce sexually without external agents? Give a reason. (b) Identify two agents that could bring about pollination in such a plant and explain how each achieves this.

◆ How do Organisms Reproduce?

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Model Answer

(a) No. Since the plant bears only pistils and no stamens, it cannot produce pollen. Without pollen, self-pollination is impossible, so it **cannot** reproduce sexually without external agents.

(b) Two agents that could pollinate such a plant:

- **Wind:** Wind carries pollen grains from stamens of another plant and deposits them on the sticky stigma of this plant, achieving cross-pollination.
- **Animals (insects/birds):** Animals visiting flowers for nectar pick up pollen from another plant's stamens and transfer it to the stigma of this plant while feeding.

Source: Chapter 7, Section 7.3.2 — Sexual Reproduction in Flowering Plants

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Explanation

- Part (a) tests whether you understand that a pistil-only flower **lacks stamens**, so no pollen is produced — self-pollination is ruled out entirely. Always state the reason clearly.
- Part (b) expects any two agents from the textbook list: **wind, water, or animals**. Briefly explain the *mechanism* for each — examiners look for "how," not just naming the agent.
- Key term to use: **cross-pollination** (pollen from one flower to another).
- Keep both agent explanations parallel and concise — one sentence each is enough for the marks available.

Q41. deep | thorough-understanding | § 7.3.2 Sexual Reproduction in Flowering Plants **[3]**

Both the ovule and the ovary undergo changes after fertilisation in a flowering plant. Distinguish between the structures each one gives rise to, and explain the biological importance of each resulting structure.

♦ How do Organisms Reproduce?

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Model Answer

Ovule → Seed:
After fertilisation, the ovule develops a tough coat and is converted into a **seed**. The seed contains the embryo (future plant). It is biologically important as it protects the embryo and germinates under suitable conditions to form a new plant, ensuring survival and dispersal of the species.

Ovary → Fruit:
The ovary grows rapidly and ripens to form a **fruit**. It is biologically important as it encloses and protects the seeds, and often aids in their dispersal through animals, wind, or water.

Source: Chapter 7, Section 7.3.2 – Sexual Reproduction in Flowering Plants

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Explanation

- The question asks you to **distinguish** (name both structures) and **explain biological importance** of each — so two clear parts are needed for full marks.
- Examiners expect: ovule → seed (with embryo inside, protected by tough coat) and ovary → fruit (protects + disperses seeds).
- Don't confuse ovule with ovary — a common error.
- Mention "germination" for the seed to show you understand its role in continuing the life cycle.

Q42. deep | thorough-understanding | § 7.3.2 Sexual Reproduction in Flowering Plants **[5]**

Distinguish between pollination and fertilisation in flowering plants on the basis of: (i) the structures involved, (ii) where each process occurs, and (iii) the outcome of each process. How does pollination set the stage for fertilisation to take place?

◆ How do Organisms Reproduce?

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Model Answer

Distinction between Pollination and Fertilisation:

Basis	Pollination	Fertilisation
Structures involved	Anther (stamen) and stigma (pistil)	Pollen tube, ovule, egg cell
Where it occurs	On the surface of the stigma	Inside the ovary (in the ovule)
Outcome	Transfer of pollen grains to stigma	Fusion of male germ-cell with egg cell to form zygote

How pollination sets the stage for fertilisation:

After pollen lands on a suitable stigma, a pollen tube grows out of the pollen grain and travels down through the style to reach the ovary. This pollen tube carries the male germ-cell to the female germ-cell (egg cell) present in the ovule, making fertilisation possible. Without pollination, the pollen tube cannot form and the male gamete cannot reach the ovule.

Source: Chapter 7, Section 7.3.2 — Sexual Reproduction in Flowering Plants

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Explanation

- The table earns 3 marks (one row per basis); the last paragraph earns 2 marks.
- Key terms examiners look for: **anther, stigma, pollen tube, style, ovary, ovule, egg cell, zygote**.
- Don't confuse pollination (transfer of pollen) with fertilisation (fusion of gametes) — they are two separate, sequential events.
- The phrase "suitable stigma" matters — it signals species-specificity, which is a good detail to include.

Q43. medium | thorough-understanding | § 7.3.3 Reproduction in Human Beings **[2]**

Testes in humans are located outside the abdominal cavity in the scrotum. Why is this positioning necessary for their function?

◆ How do Organisms Reproduce?

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Model Answer

Testes are located in the scrotum outside the abdominal cavity because **sperm formation requires a lower temperature than the normal body temperature**. The scrotum keeps the testes at this lower temperature, which is essential for the production of healthy and functional sperms.

Source: Chapter 7, Section 7.3.3(a) — Male Reproductive System

Explanation

The examiner expects two clear points: (1) sperm formation needs a lower temperature than body temperature, and (2) the scrotum provides this cooler environment. Both points together fetch full 2 marks. Do not confuse this with the hormonal function of the testes (testosterone) — that is not what the question asks.

Q44. medium | thorough-understanding | § 7.3.3 Reproduction in Human Beings **[3]**

A student says: 'The urethra in males is part of the excretory system, so it plays no role in reproduction.' Do you agree? Justify your answer.

♦ How do Organisms Reproduce?

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Model Answer

No, I do not agree with the student's statement.

Although the urethra is part of the excretory system (it carries urine out of the body), it also plays an important role in reproduction in males. The vas deferens, which carries sperms from the testes, unites with a tube coming from the urinary bladder. **The urethra thus forms a common passage for both urine and sperms.** Therefore, the urethra is shared by both the excretory and reproductive systems in males.

Source: Chapter 7, Section 7.3.3(a) — Male Reproductive System

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Explanation

- The key fact examiners want: **urethra = common passage for urine AND sperms** — state this explicitly.
- The student's error is assuming one organ can belong to only one system. In males, the urethra serves a dual function.
- Mention vas deferens uniting with the urinary bladder tube to show *how* sperms reach the urethra — this earns the justification marks.
- Keep it concise; 3 marks = disagreement (1) + reason/mechanism (1) + conclusion (1).

Q45. straightforward | thorough-understanding | § 7.3.3 Reproduction in Human Beings **[1]**

The male reproductive system includes accessory glands such as the seminal vesicles and prostate gland. Why are the secretions of these glands essential for the survival and functioning of sperms outside the testes?

♦ How do Organisms Reproduce?

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Model Answer

The secretions of seminal vesicles and prostate gland provide **fluid** that makes sperm transport easier and also provides **nutrition** to the sperms.

Source: Chapter 7, Section 7.3.3(a) Male Reproductive System

Explanation

The passage directly states that these glands add secretions "so that the sperms are now in a fluid which makes their transport easier and this fluid also provides nutrition." Both functions — transport and nutrition — are needed for full marks. Do not write just one.

Q46. medium | thorough-understanding | § 7.3.3 Reproduction in Human Beings **[3]**

Trace the journey of a sperm cell from where it is produced to where fertilisation occurs in the female body. Name each structure it passes through in order.

♦ How do Organisms Reproduce?

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Model Answer

Journey of a sperm cell:

Sperms are produced in the **testes**. They then move into the **vas deferens**, where secretions from the **seminal vesicles** and **prostate gland** are added, forming semen. The vas deferens joins with a tube from the urinary bladder to form the **urethra**, through which sperms are released from the **penis**.

During sexual intercourse, sperms enter the female body through the **vagina**, travel up through the **uterus**, and reach the **fallopian tube (oviduct)**, where fertilisation occurs.

Order: Testes → Vas deferens → Urethra → Penis → Vagina → Uterus → Fallopian tube (site of fertilisation)

Source: Chapter 7, Sections 7.3.3(a) and 7.3.3(b)

Explanation

- Examiners expect the structures listed **in correct sequence** — jumbled order will lose marks.
- Key facts to remember: sperms are produced in the **testes** (in the scrotum, at lower temperature); fertilisation occurs in the **fallopian tube/oviduct**, NOT in the uterus.
- Mention the role of glands (seminal vesicles, prostate) briefly — it shows understanding and can fetch the third mark.
- The "What you have learnt" summary directly states: *"Fertilisation occurs in the fallopian tube"* — use this confidently.

Q47. medium | thorough-understanding | § 7.3.3 Reproduction in Human Beings **[2]**

Explain any TWO distinct functions performed by the placenta during the development of the embryo in the uterus.

♦ How do Organisms Reproduce?

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Model Answer

The two functions of placenta are:

1. **Nutrition and gas exchange:** The placenta provides glucose and oxygen from the mother's blood to the developing embryo through villi, which increase the surface area for exchange.
1. **Waste removal:** Waste substances generated by the developing embryo are transferred into the mother's blood through the placenta for elimination.

Source: Chapter 7, Section 7.3.3(b) — Female Reproductive System

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Explanation

Examiners look for **two clearly distinct functions** — nutrition/oxygen supply is one; waste removal is the other. Mentioning the structural basis (villi, large surface area) adds accuracy and can fetch full marks. Avoid mixing up both functions in one sentence. Always link structure to function for biology answers.

Q48. deep thorough-understanding § 7.3.3 Reproduction in Human Beings **[3]**

A fertilised egg implants in the uterine lining, which has become thick and richly supplied with blood. If the same uterine lining breaks down and is shed a few weeks later, what does this tell you about whether fertilisation occurred that month? Explain the mechanism behind what you observe.

◆ How do Organisms Reproduce?

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Model Answer

The breakdown and shedding of the uterine lining tells us that **fertilisation did not occur** that month.

Mechanism: Every month, the uterus prepares itself by thickening its lining and richly supplying it with blood to nourish a potential embryo. If the egg is not fertilised, it lives for only about one day. Since no embryo implants, the thick spongy lining is no longer needed. It therefore breaks down and is shed through the vagina as blood and mucous — a process called **menstruation**, lasting about two to eight days.

Source: Chapter 7, Section 7.3.3(c) — What happens when the Egg is not Fertilised?

Explanation

- The key link examiners expect: **no fertilisation → no implanting embryo → lining not needed → menstruation**.
- Always name the process (*menstruation*) for full marks.
- Avoid saying "fertilisation occurred" — the shedding is direct evidence it did **not** occur.
- The passage explicitly states the lining builds up *for* the embryo; its breakdown is the logical consequence of the embryo's absence. Connecting cause to consequence earns the reasoning mark.

Q49. medium | thorough-understanding | § 7.3.3 Reproduction in Human Beings **[2]**

Why does the uterus prepare its lining every month even before it is known whether fertilisation will occur?

◆ How do Organisms Reproduce?

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Model Answer

The uterus prepares its lining every month because fertilisation can potentially occur after each ovulation. Since one egg is released every month, the uterine lining becomes thick and spongy, richly supplied with blood, to nourish the embryo **in advance**. The body cannot wait to confirm fertilisation before preparing, as the embryo needs immediate implantation.

Source: Chapter 7, Section 7.3.3(c)

Explanation

- The key idea is **advance preparation**: the uterus must be ready *before* it is known whether fertilisation has occurred, because the embryo needs to implant into a prepared lining immediately.
- Mention both what the lining does (thickens, becomes spongy, richly supplied with blood) and *why* (to nourish/receive the fertilised egg).
- If fertilisation does **not** occur, this lining breaks down as menstruation — that contrast is a useful addition if word count allows.
- Examiners look for: (1) monthly egg release → monthly uterine preparation, and (2) purpose of the lining (nourishment of embryo).

Q50. deep | thorough-understanding | § 7.3.3 Reproduction in Human Beings **[3]**

A copper-T placed in the uterus prevents pregnancy but does NOT protect against sexually transmitted infections (STIs). In contrast, a condom can do both. What structural difference in how these two contraceptives work explains this difference in protection?

◆ How do Organisms Reproduce?

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Model Answer

A **condom** acts as a **physical barrier** that covers the penis, preventing direct contact between the body fluids and skin/mucous membranes of the partners. This blocks both sperm and disease-causing pathogens (bacteria, viruses) from being transmitted, protecting against pregnancy **and** STIs like gonorrhoea, syphilis, and HIV-AIDS.

A **copper-T**, however, is placed **inside the uterus**. It prevents pregnancy by creating an environment in the uterus unfavourable for implantation. Since it does not prevent the exchange of body fluids or skin contact during intercourse, it offers **no barrier against STI-causing pathogens**, leaving the person unprotected from sexually transmitted infections.

Source: Reproductive Health, Chapter 7, Section 7.3.3(d)

Explanation

- The key distinction examiners look for is **barrier vs. internal device**: a condom prevents fluid/pathogen exchange; a copper-T only acts after sperm has already entered.
- Mention at least one example STI (gonorrhoea, HIV-AIDS) to show you've read the passage.
- The answer to the textbook question "If a woman is using a copper-T, will it help in protecting her from STDs?" is directly **No**—state this clearly and give the reason.
- Avoid copying long paragraphs; write in your own structured sentences for full marks.

Q51. deep thorough-understanding § 7.3.3 Reproduction in Human Beings **[3]**

Secondary sexual characters such as changed voice or new hair-growth patterns appear during puberty but are not directly involved in the production of gametes. Why are these changes considered significant in the context of sexual reproduction?

◆ How do Organisms Reproduce?

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Model Answer

Secondary sexual characters like changed voice in boys and new hair-growth patterns are significant because they act as **signals of sexual maturation**. Since sexual reproduction requires two individuals to come together for mating and internal transfer of germ-cells, it is important that one individual's state of sexual maturity is identifiable by others. These visible changes during puberty indicate that the reproductive tissues are maturing and the individual is becoming capable of participating in reproduction. Without such signals, the process of mating required for sexual reproduction could not be initiated.

Source: Chapter 7, Section 7.3.3

Explanation

- The key idea examiners want: secondary sexual characters = **signals of sexual maturity** to other individuals, which is necessary for mating to occur.
- Avoid saying they "help in gamete production" — the question explicitly states they are **not** directly involved in that.
- The textbook clearly states: *"Many changes during puberty, such as new hair-growth patterns, are signals that sexual maturation is taking place"* — use this logic directly.
- One common mistake: students write only that these changes "prepare the body" without linking them to the need for two individuals to identify each other's readiness for mating.

Q52. medium | thorough-understanding | § 7.3.3 Reproduction in Human Beings **[3]**

Both a surgical block of the vas deferens in the male and a surgical block of the fallopian tube in the female prevent fertilisation, yet through different mechanisms. Explain precisely why each method prevents fertilisation.

♦ How do Organisms Reproduce?

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Model Answer

Vas deferens (male) — Vasectomy:
The vas deferens carries sperms from the testes to the urethra. When surgically blocked, sperms cannot travel to the female reproductive tract. Since no sperms reach the egg, fertilisation cannot occur.

Fallopian tube (female) — Tubectomy:
The fallopian tube carries the egg from the ovary to the uterus and is the site where fertilisation normally takes place. When blocked, the egg and sperms cannot meet, so fertilisation is prevented.

Source: How We Reproduce, Section 7.3.3 (a) & (b)

Explanation

- Examiners expect students to name **what each duct transports** and **what is blocked as a result**.
- Key phrase for vas deferens: *sperms cannot reach the egg*.
- Key phrase for fallopian tube: *egg and sperm cannot meet* (fertilisation normally occurs here).
- Mentioning the common names **vasectomy** and **tubectomy** adds precision but is not mandatory for full marks.
- Do not confuse the two — vas deferens is **male**; fallopian tube/oviduct is **female**.

Q53. medium | thorough-understanding | § 7.3.3 (a) Male Reproductive System **[3]**

Sperm production in the testes requires a temperature lower than normal body temperature. How does the human body ensure this condition, and why would failure to maintain it affect fertility?

♦ How do Organisms Reproduce?

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Model Answer

The testes are located **outside the abdominal cavity in the scrotum** because sperm formation (spermatogenesis) requires a **lower temperature than normal body temperature**. The scrotum acts as a temperature-regulating structure, keeping the testes cooler than the rest of the body.

If the testes fail to descend into the scrotum (or if this lower temperature is not maintained), the higher internal body temperature would **inhibit or stop sperm formation**. This would result in little or no sperm production, directly reducing the male's fertility or causing infertility.

Source: Chapter 7, Section 7.3.3(a) — Male Reproductive System

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Explanation

- **Key fact to state:** Testes are in the scrotum *because* sperm formation needs lower temperature — this is the direct cause-effect the examiner wants.
- **Link to fertility:** Always complete the "why would failure affect fertility" part — no sperm = infertility. Examiners award a mark specifically for this consequence.
- Avoid over-explaining; 3 marks = ~3 clear points: (1) location of testes, (2) reason (lower temperature needed), (3) consequence of failure.

Q54. deep | thorough-understanding | § 7.3.3 (a) Male Reproductive System **[3]**

The sperms produced in the testes are not immediately capable of fertilising an egg on their own. Explain what additional contributions are made to the semen before it leaves the male reproductive system, and analyse why these contributions are essential for the sperms to function effectively.

◆ How do Organisms Reproduce?

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Model Answer

Sperms produced in the testes are tiny bodies containing mainly genetic material and a long tail. As they travel through the vas deferens, glands like the **seminal vesicles** and the **prostate gland** add their secretions to form semen. These secretions are essential because:

1. They provide a **fluid medium** that makes transport of sperms easier.
2. They provide **nutrition** to the sperms, enabling them to remain active and move towards the female germ-cell.

Without these secretions, sperms cannot survive or travel effectively to reach and fertilise the egg.

Source: Chapter 7, Section 7.3.3(a) — Male Reproductive System

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Explanation

- Examiners expect you to **name both glands** (seminal vesicles and prostate) — missing either loses a mark.
- Two functions must be stated: **transport** (fluid medium) and **nutrition**. These are the exact words used in the textbook, so use them.
- The question says "analyse why essential," so link the secretions back to sperm function (movement + survival). A one-line conclusion tying it together scores the third mark.

Q55. medium | thorough-understanding | § 7.3.3 (b) Female Reproductive System **[3]**

A sperm must travel from the vagina all the way to the oviduct to fertilise an egg. Trace the path it takes, naming each structure in order.

♦ How do Organisms Reproduce?

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Model Answer

Path of sperm from vagina to oviduct:

Vagina → Cervix → Uterus → Oviduct (Fallopian tube)

During sexual intercourse, sperms enter through the **vaginal passage**. They travel upward through the **cervix** (the opening of the uterus into the vagina), into the **uterus**, and continue upward into the **oviduct (fallopian tube)**, where they may encounter the egg and fertilisation takes place.

Source: Chapter 7, Section 7.3.3(b) — Female Reproductive System

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Explanation

- The examiner expects **all four structures named in correct order** — vagina, cervix, uterus, oviduct/fallopian tube. Missing any one costs a mark.
- The passage explicitly states: "The uterus opens into the vagina through the cervix" and "sperms enter through the vaginal passage… reach the oviduct." Use these exact structural names.
- "Oviduct" and "fallopian tube" are interchangeable — either is accepted.
- Do not add extra structures not mentioned in the passage (e.g., do not mention vas deferens, which belongs to the male system).

Q56. medium | thorough-understanding | § 7.3.3 (b) Female Reproductive System **[3]**

The uterine lining thickens and becomes richly supplied with blood every month even before fertilisation has occurred. Why does this happen, and what triggers its breakdown if the egg is not fertilised?

♦ How do Organisms Reproduce?

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Model Answer

The uterine lining thickens and becomes richly supplied with blood **in preparation** to nourish a fertilised egg (embryo) if implantation occurs. This happens every month because the ovary releases one egg every month, and the uterus simultaneously prepares to receive it.

If the egg is not fertilised, it lives for only about one day. The thickened, spongy lining is then no longer needed. As a result, it slowly breaks down and is shed through the vagina as blood and mucus. This monthly cycle is called **menstruation** and lasts approximately two to eight days.

Source: Chapter 7, Section 7.3.3(c)

Explanation

- The question has **two parts**: (i) why the lining thickens *before* fertilisation, and (ii) what triggers its breakdown. Address both clearly.
- Key terms examiners look for: **spongy lining**, **nourish the embryo**, **menstruation**, **blood and mucus**, and the approximate duration (2–8 days).
- The lining thickens due to hormonal preparation linked to the monthly ovulation cycle — the uterus "anticipates" a fertilised egg. When no fertilisation occurs, the hormonal support withdraws and the lining is shed.
- Do not over-explain hormones here; the textbook answer focuses on the functional description, which is sufficient for full marks.

Q57. deep | thorough-understanding | § 7.3.3 (b) Female Reproductive System **[3]**

The placenta plays a crucial role in the survival of the developing embryo. (i) Describe the structural features of the placenta that make it well-suited for its function. (ii) Name and explain TWO specific exchanges that take place between the mother's blood and the embryo across the placenta.

◆ How do Organisms Reproduce?

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Model Answer

(i) Structural features of placenta:

The placenta is a disc-shaped tissue embedded in the uterine wall. It has **villi** on the embryo's side, which provide a **large surface area** for exchange. On the mother's side are **blood spaces** surrounding the villi, bringing maternal blood close to embryonic tissues.

(ii) Two exchanges across the placenta:

1. **Glucose and oxygen** pass from the mother's blood into the embryo's blood for nutrition and respiration.
2. **Waste substances** (like CO_2) generated by the embryo are transferred into the mother's blood for removal.

Source: Chapter 7, Section 7.3.3(b) — Female Reproductive System

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Explanation

- Examiners expect you to mention **villi** and **blood spaces** for the structural part — these are the two key anatomical features named in the textbook.
- For exchanges, the textbook explicitly states glucose & oxygen (in) and waste substances (out). Use these exact examples; do not invent others.
- This is a 3-mark question: ~1 mark for structure, ~1 mark each for the two exchanges. Keep it concise and point-based.

Q58. medium | thorough-understanding | § 7.3.3 (c) What happens when the Egg is not Fertilised? **[3]**

A girl notices that the uterine lining builds up each month but breaks down and is shed if no fertilisation occurs. Explain WHY the uterine lining is built up in the first place, and what triggers its breakdown and shedding as menstruation.

♦ How do Organisms Reproduce?

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Model Answer

The uterine lining builds up each month because the uterus prepares itself to receive and nourish a fertilised egg (embryo). The lining becomes thick, spongy, and richly supplied with blood to provide nutrition to the developing embryo if fertilisation occurs.

If the egg is not fertilised, it lives for only about one day. Since no embryo arrives, the thick lining is no longer needed. This triggers the lining to slowly break down and shed through the vagina as blood and mucus — a process called **menstruation**, lasting roughly two to eight days.

Source: Chapter 7, Section 7.3.3(b) and 7.3.3(c)

Explanation

- **Two parts to address:** (1) *why* the lining builds up, and (2) *what triggers* breakdown → allocate roughly 1 mark each, with 1 mark for the term "menstruation" and its description.
- Key phrase examiners look for: "thick and spongy," "nourish the embryo," "egg not fertilised → lining not needed → sheds as blood and mucus."
- Don't just say "hormones change" — the passage grounds the trigger in the *absence of fertilisation*, so stick to that explanation.
- The word **menstruation** must appear for full credit.

Q59. medium | thorough-understanding | § 7.3.3 (d) Reproductive Health **[3]**

A 14-year-old shows signs of early sexual maturation. Does this mean their reproductive system is fully developed and their body is biologically prepared for parenthood? Justify your answer with reference to the changes that occur during puberty.

◆ How do Organisms Reproduce?

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Model Answer

No. Early sexual maturation does **not** mean the reproductive system is fully developed or the body is prepared for parenthood.

Puberty changes — such as breast development, menstruation in girls, facial hair and voice change in boys — occur **gradually over months and years**. As the textbook states, "some degree of sexual maturation does not necessarily mean that the body or the mind is ready for sexual acts or for having and bringing up children." General body growth is still continuing during this period, and reproductive tissues are only beginning to mature. Full physical and mental readiness for parenthood requires complete development, not just early signs of puberty.

Source: Chapter 7, Section 7.3.3 & 7.3.3(d)

Explanation

- The key idea examiners look for is the **distinction between early signs of maturation and complete reproductive readiness** — physical AND mental.
- Quote or closely paraphrase the textbook line about body/mind not being ready; examiners reward textbook language.
- Mention 1–2 specific puberty changes to show you know the content, then link back to the argument.
- Do **not** confuse onset of puberty with completion of development — that is the core concept being tested here.

Q60. medium | thorough-understanding | § 7.3.3 (d) Reproductive Health **[3]**

Why are condoms considered more useful than most other contraceptive methods for a person with multiple sexual partners?

♦ How do Organisms Reproduce?

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Model Answer

Condoms act as a **mechanical barrier** that prevents the transfer of body fluids during sexual intercourse. This serves **two purposes** simultaneously:

1. **Contraception** – They prevent sperm from reaching the egg, avoiding unwanted pregnancy.
2. **Protection from STDs** – They prevent transmission of sexually transmitted diseases (STDs) such as gonorrhoea, syphilis, warts, and HIV-AIDS.

For a person with **multiple sexual partners**, the risk of contracting STDs is significantly higher. Other contraceptive methods (pills, copper-T, surgical methods) only prevent pregnancy but **do not protect against STDs**. Hence, condoms are more useful in such cases.

Source: Chapter 7 – Reproduction, Section 7.3.3

Explanation

Examiners expect students to clearly distinguish **two functions of condoms** — contraception AND STD prevention — and explicitly state why other methods fall short (they only prevent pregnancy). The key phrase to use is "mechanicaI barrier." The question targets this dual-function advantage, so mentioning STDs by name (HIV-AIDS, syphilis, gonorrhoea) adds precision and earns marks. Do not confuse copper-T or pills with condoms — they have no role in STD prevention.

Q61. deep | thorough-understanding | § 7.3.3 (d) Reproductive Health **[3]**

A couple relies solely on oral contraceptive pills for reproductive health protection. Evaluate whether this is a completely safe and sufficient strategy. Explain your answer with reference to what oral pills can and cannot prevent.

◆ How do Organisms Reproduce?

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Model Answer

No, relying solely on oral contraceptive pills is **not completely safe or sufficient**.

What oral pills can do: They change the hormonal balance of the body so that eggs are not released, thus preventing fertilisation and pregnancy.

What oral pills cannot do: They do not provide any barrier protection. They cannot prevent sexually transmitted diseases (STDs) such as gonorrhoea, syphilis, warts, and HIV-AIDS. Only condoms help prevent transmission of such infections.

Additional concern: Oral pills can cause side-effects due to hormonal changes.

Therefore, the couple should also use condoms for protection against STDs.

Source: Reproductive Health, Chapter 7, Section 7.3.3(d)

Explanation

Examiners expect two distinct points here: (1) what pills *can* prevent (pregnancy, by stopping ovulation) and (2) what they *cannot* prevent (STDs — name at least two). The conclusion that pills alone are insufficient because they offer no protection against STDs is the key evaluative point earning the third mark. Always link back to condoms as the method that addresses STD transmission. Mentioning side-effects is a bonus but not the central focus.

Q62. straightforward | thorough-understanding | § 7.3.3 (d) Reproductive Health **[1]**

Which of the following contraceptive methods works by preventing the release of eggs?
(A) Copper-T
(B) Condom
(C) Oral hormonal pills
(D) Surgical blocking of the fallopian tube

A Copper-T
B Condom
C Oral hormonal pills
D Surgical blocking of the fallopian tube

◆ How do Organisms Reproduce?

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Model Answer

(C) Oral hormonal pills

Oral hormonal pills work by changing the hormonal balance of the body so that eggs are not released, preventing fertilisation.

Explanation

The passage explicitly states that one category of contraceptives "acts by changing the hormonal balance of the body so that eggs are not released." Condoms act as mechanical barriers; Copper-T prevents implantation; surgical blocking of the fallopian tube prevents the egg from reaching the uterus (fertilisation still doesn't occur, but the egg *is* released). Only oral pills stop egg release itself.

Q63. deep | thorough-understanding | § 7.3.3 (d) Reproductive Health **[3]**

Blocking the vas deferens and blocking the fallopian tube both prevent fertilisation, yet they are fundamentally different procedures. Explain why each works, and identify one thing they have in common beyond preventing pregnancy.

♦ How do Organisms Reproduce?

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Model Answer

Blocking the vas deferens (vasectomy): The vas deferens carries sperms from the testes to the urethra. Blocking it prevents sperm from being transferred during intercourse, so fertilisation cannot occur.

Blocking the fallopian tube (tubectomy): The fallopian tube carries the egg from the ovary to the uterus, and is where fertilisation normally takes place. Blocking it prevents the egg and sperm from meeting.

Common feature (beyond preventing pregnancy): Both are surgical procedures, and both carry the risk of infection or complications if not performed properly.

Source: Chapter 7, Section 7.3.3(d) — Reproductive Health

Explanation

- The key distinction examiners want: **vas deferens blocks sperm transport** (male side); **fallopian tube blocks egg transport** (female side). State *why* each prevents fertilisation, not just that it does.
- The "one thing in common" — the passage explicitly states both use **surgical methods** and both carry the **risk of infection**. This is the safest answer to use.
- Don't confuse vasectomy with castration, or tubectomy with removal of ovaries — the organs still function; only the pathway is blocked.

Q64. medium | thorough-understanding | § 7.3.3 (d) Reproductive Health **[2]**

Why can the copper-T cause side effects that a barrier method like a condom does not?

♦ How do Organisms Reproduce?

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Model Answer

The copper-T causes side effects because it is placed inside the uterus and causes **irritation of the uterus**. A condom, however, is a mechanical barrier placed outside the body (on the penis or in the vagina); it does not enter or interact with internal body tissues, so it causes no such physical irritation or side effects.

Source: Chapter 7, Section 7.3.3(d) — Reproductive Health

Explanation

The key contrast examiners want is:

- **Copper-T** = internal device → irritates uterine lining → side effects.
- **Condom** = external mechanical barrier → no contact with internal tissues → no side effects.

Avoid vague answers like "it affects the body." Use the textbook phrase **"irritation of the uterus"** directly — that is the expected terminology for full marks.

Q65. deep | thorough-understanding | § 7.3.3 (d) Reproductive Health **[3]**

In a region where sex-selective abortion of female foetuses is practised, what would be the long-term biological and social consequences for that population? Explain.

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Model Answer

Biological consequences: Sex-selective abortion of female foetuses causes a sharp decline in the female-male sex ratio. Fewer females mean fewer births in the next generation, leading to a gradual decline in population size over time.

Social consequences: A skewed sex ratio creates a severe shortage of women in society. This leads to social problems such as forced marriages, trafficking, violence against women, and social instability. As the textbook states, *"for a healthy society, the female-male sex ratio must be maintained"* and declining child sex ratio is described as *"alarming."*

Source: Chapter 7, Section 7.3.3(d) — Reproductive Health

Explanation

- The source passage directly addresses this issue — quote or paraphrase it for full marks.
- Examiners expect **one biological point** (population decline due to fewer females) and **one or two social points** (gender imbalance, social problems).
- Mention that prenatal sex determination is **prohibited by law** in India — this shows awareness of the legal dimension, which adds value.
- Avoid writing vague statements; be specific about *why* the sex ratio matters biologically (reproduction requires both sexes) and socially (instability, crime).

Q66. deep thorough-understanding § 7.3.3 (d) Reproductive Health **[5]**

An adolescent girl is pressured by her family to marry and bear children before she has fully completed puberty. Using your understanding of the development of the female reproductive system, explain the potential health risks this could pose to her.

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Model Answer

Sexual maturation (puberty) is a **gradual process** that occurs while general body growth is still ongoing. The textbook clearly states that "some degree of sexual maturation does not necessarily mean that the body or the mind is ready for sexual acts or for having and bringing up children."

The following health risks may arise:

1. **Physical unreadiness:** An incompletely developed uterus and pelvis cannot safely support pregnancy, increasing risks of complications during childbirth.
2. **Nutritional demands:** Pregnancy makes major demands on the body; an adolescent still growing cannot adequately meet both her own growth needs and the foetus's needs.
3. **Mental unreadiness:** The mind may not be mature enough to cope with pregnancy and child-rearing responsibilities, leading to psychological harm.
4. **Risk of STDs:** Sexual activity exposes her to sexually transmitted diseases such as gonorrhoea, syphilis, and HIV-AIDS.
5. **Overall health impact:** As the passage states, "if she is not ready for it, her health will be adversely affected."

Source: Chapter 7, Section 7.3.3(d) — Reproductive Health

Explanation

Examiners expect you to link the biological concept (puberty = gradual maturation, body still growing) directly to health consequences. Quoting or closely paraphrasing the textbook ("major demands on the body and the mind") earns marks. Avoid vague statements — name specific risks (physical, nutritional, psychological, STDs). Five crisp points map neatly onto 5 marks. Always anchor your answer in the source passage for application-based questions like this.

Q67. medium | thorough-understanding | § 7.3.3 (d) Reproductive Health **[3]**

Name any two bacterial and two viral sexually transmitted infections. For one of them, state a method that can reduce (but may not completely eliminate) its transmission.

♦ How do Organisms Reproduce?

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Model Answer

Bacterial STIs: Gonorrhoea and Syphilis

Viral STIs: Warts and HIV-AIDS

Method to reduce transmission: Using a **condom** (a covering for the penis) during sexual intercourse helps prevent the transmission of many of these infections to some extent. For example, it can reduce the risk of contracting gonorrhoea. However, a condom may not completely eliminate the risk of transmission.

Source: Chapter 7, Section 7.3.3(d)

Explanation

- The textbook explicitly names all four infections — examiners expect exactly these names.
- The key phrase from the textbook is "helps to prevent transmission... **to some extent**" — this satisfies the "reduce but not completely eliminate" condition in the question. Use this phrasing.
- You earn 1 mark each for two bacterial STIs, two viral STIs, and the method with the qualifying statement — so don't skip any part.
- Do not confuse bacterial vs. viral: Gonorrhoea and Syphilis = bacterial; Warts and HIV-AIDS = viral.

Q68. deep thorough-understanding § (whole-chapter synthesis) **[3]**

Asexual reproduction produces offspring with very little genetic variation, yet it is widely used in nature. Sexual reproduction generates greater variation but requires two individuals. Given that variation is beneficial for species survival, why do so many organisms still rely on asexual reproduction rather than switching entirely to sexual reproduction?

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Model Answer

Asexual reproduction persists because it offers key advantages despite producing less variation:

1. **Efficiency:** It requires only one individual, so every organism can reproduce, doubling population size rapidly.
2. **Stable niches:** When the environment is stable and the organism is well-suited to its niche, consistent DNA copying maintains the body design that allows it to use that niche successfully.
3. **Speed vs. variation trade-off:** While variation aids survival when niches change, sexual reproduction requires two individuals and complex mechanisms (meiosis, gamete formation), making it energetically costly.

Variation is useful for the *species*, not every individual. In stable conditions, the cost of sexual reproduction outweighs its benefits, making asexual reproduction the more practical strategy.

Source: Chapter 7, Sections 7.1.1 and 7.3.1

Explanation

Examiners look for three elements here (one per mark):

- **Why asexual reproduction is advantageous** (speed/efficiency/single individual sufficient)
- **Role of stable niches** — DNA copying consistency maintains body design suited to the niche (directly from §7.1.1)
- **Variation benefits species, not individuals** — so in stable environments the trade-off favours asexual mode

Avoid writing a vague essay. Make each point distinct and link it back to the textbook language ("niche," "DNA copying," "species survival"). The phrase *"variation is useful for the survival of the species"* (not the individual) is a key examiner-expected line.

Q69. deep thorough-understanding § (whole-chapter synthesis) **[3]**

[short_answer] Spore formation, vegetative propagation, and budding are structurally very different processes, yet they are all classified as asexual reproduction. What single underlying cellular property unites them, and how does each process exploit that property in a distinct way? Illustrate your answer with one named example of each process.

◆ How do Organisms Reproduce?

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Model Answer

The single underlying cellular property that unites all three processes is **mitotic cell division** — each cell involved can grow, divide, and differentiate to produce a complete new individual (totipotency).

- **Spore formation (Rhizopus):** Sporangia produce spores by cell division; each spore, protected by a thick wall, germinates on a moist surface to form a new organism.
- **Vegetative propagation (Bryophyllum):** Leaf-margin buds develop through cell division into new plantlets that fall and grow independently in soil.
- **Budding (Hydra):** Repeated cell division at one specific site produces an outgrowth (bud) that matures and detaches as a new individual.

All three create new individuals from a single parent without gamete formation.

Source: Chapter 7, Sections 7.2.4, 7.2.5, 7.2.6

Explanation

- The examiner expects you to name **one common cellular property** first, then distinguish how each process uses it differently — with named examples.
- "Totipotency" (ability of a cell to develop into a whole organism) is the precise term, but CBSE Class 10 accepts "mitotic cell division / repeated cell division" as the core idea.
- Use the exact examples from the textbook: **Rhizopus** (spores), **Bryophyllum** (vegetative propagation), **Hydra** (budding) — these are the safest choices.
- Do **not** confuse budding in Hydra with budding in yeast here; the passage specifically discusses Hydra.

Q70. medium | thorough-understanding | § (whole-chapter synthesis) **[3]**

In both flowering plants and human beings, fertilisation produces a zygote that must be nourished as it develops. Compare the structural adaptations that serve this nutritional function in each case.

♦ How do Organisms Reproduce?

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Model Answer

In Flowering Plants: After fertilisation, the zygote develops into an embryo inside the ovule. The ovary wall grows and ripens into a **fruit**, which encloses and protects the seed. The seed stores food (cotyledons) to nourish the developing embryo during germination.

In Human Beings: The zygote implants in the thickened, blood-rich lining of the **uterus**. Nutrition is provided through the **placenta** — a disc embedded in the uterine wall containing villi (embryo's side) surrounded by blood spaces (mother's side), giving a large surface area for transfer of glucose and oxygen to the embryo and removal of its waste.

Source: Chapter 7, Sections 7.3.2 and 7.3.3(b)

Explanation

- The question asks for a **comparison**, so you must mention **both** organisms clearly.
- Key structural terms examiners look for: **fruit/seed/cotyledon** (plant side) and **uterus lining/placenta/villi/blood spaces** (human side).
- Avoid vague statements like "the plant provides food" — name the specific structure.
- The placenta detail (villi + blood spaces = large surface area) is frequently tested and worth including even in a 3-mark answer.

Q71. deep thorough-understanding § (whole-chapter synthesis) **[3]**

A student argues: 'Since DNA copying already introduces small variations, there is no added advantage to sexual reproduction — asexual reproduction should be sufficient for generating the variation needed for evolution.' Identify the flaw in this argument using your understanding of how sexual reproduction generates variation differently from DNA-copying errors alone.

◆ How do Organisms Reproduce?

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Model Answer

The student's argument is flawed because DNA-copying errors alone generate variation **very slowly** — the mechanism is precise enough that major errors cause the new DNA copy to fail and the cell dies.

Sexual reproduction generates variation **differently and more effectively** by combining DNA from **two different individuals**, each already carrying its own accumulated variations. This creates **new combinations** of variants in every offspring. Since these variants come from living individuals, they are assured to be non-lethal. Thus, sexual reproduction speeds up the generation of useful variation — far beyond what DNA-copying errors alone can achieve — providing a significant advantage for the survival and evolution of species.

Source: Chapter 7, Section 7.3.1 – Why the Sexual Mode of Reproduction?

Explanation

Examiners look for **two distinct points**:

1. **Why DNA-copying errors alone are insufficient** — they are too slow/precise; major errors are lethal.
2. **How sexual reproduction adds to variation** — by combining pre-existing accumulated variations from two individuals, creating novel, non-lethal combinations.

Avoid just saying "sexual reproduction creates more variation" — you must explain the *mechanism* (combination of two individuals' DNA) and *why* asexual variation alone is limited (slow rate, lethal errors). Three marks = three clear ideas, so structure your answer around these distinct points.

Q72. medium | thorough-understanding | § (whole-chapter synthesis) **[1]**

[mcq] Sperms are produced in the testes, which are located in scrotal sacs outside the abdominal cavity. Which of the following correctly explains this structural arrangement?

(A) The scrotal sacs protect the testes from mechanical injury during movement.

(B) Sperm production requires a temperature slightly lower than normal body temperature.

(C) The scrotal position allows sperms to be released directly into the urethra without travelling far.

(D) The testes need a rich blood supply that is only available outside the abdomen.

A Sperm formation needs a lower temperature than body temperature; the tail provides motility to reach the female germ-cell.

B Sperm formation needs a lower temperature than body temperature; the tail stores the genetic material needed for fertilisation.

C Sperm formation needs a higher temperature than body temperature; the tail provides motility to reach the female germ-cell.

D The testes must be outside to allow easy release of sperms; the tail helps the sperm penetrate the egg wall.

◆ How do Organisms Reproduce?

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Model Answer

(B) Sperm formation needs a lower temperature than body temperature; the tail provides motility to reach the female germ-cell.

Explanation

The passage explicitly states: "sperm formation requires a lower temperature than the normal body temperature" — this explains why testes are in the scrotum. The passage also states the sperm has "a long tail that helps them to move towards the female germ-cell." Option A is wrong because it wrongly says the tail stores genetic material (that is the head's function). Options C and D contradict the textbook.

Q73. medium | thorough-understanding | § (whole-chapter synthesis) **[5]**

Trace the complete journey of a male gamete — from the moment it is produced in the human body to the moment fertilisation occurs — naming each structure it passes through and the key event at each stage.

♦ How do Organisms Reproduce?

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Model Answer

Journey of a male gamete from production to fertilisation:

1. **Testes (Production):** Sperms (male gametes) are produced in the testes, which are located in the scrotum outside the abdominal cavity, as sperm formation requires a lower temperature than normal body temperature.
1. **Vas deferens (Transport):** Sperms are carried out of the testes through the vas deferens.
1. **Seminal vesicles & Prostate gland (Nourishment):** Along the vas deferens, secretions from the seminal vesicles and prostate gland are added. This fluid (semen) eases transport and provides nutrition to the sperms.
1. **Urethra (Exit):** The vas deferens unites with the tube from the urinary bladder to form the urethra — a common passage for sperms and urine — through which sperms leave the body.
1. **Vagina → Oviduct (Fertilisation):** Sperms enter the female body through the vagina during sexual intercourse, travel upward, and reach the fallopian tube (oviduct), where fertilisation occurs upon meeting the egg.

Source: Chapter 7, Section 7.3.3 (a) & (b)

Explanation

- The examiner expects you to name **each structure in sequence** and state **what happens there** — production, addition of fluids, exit route, and finally fertilisation.
- A common mistake is forgetting to mention that **fertilisation occurs in the fallopian tube/oviduct**, not in the uterus.
- Note that the **scrotum's lower temperature** is a key fact about sperm production — examiners frequently test it.
- Five clear, labelled points map neatly to 5 marks; one point per mark is a safe strategy.

Q74. deep | thorough-understanding | § (whole-chapter synthesis) **[5]**

[long_answer] When fertilisation does not occur in a human female, the thickened uterine lining is shed as menstruation. In a flowering plant, once fertilisation is complete, the ovary develops into a fruit and the ovules into seeds that are eventually dispersed. (i) Explain the biological events that trigger menstruation, and describe how the uterus prepares itself for the next reproductive cycle. (ii) Explain how fertilisation transforms the ovary and ovule, and why dispersal of seeds is important for the survival of the species. (iii) In what sense does each process — menstruation and seed dispersal — represent a 'reset' that prepares the organism for a future reproductive attempt?

♦ How do Organisms Reproduce?

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Model Answer

(i) When the egg is not fertilised, it lives for about one day. Since no embryo is implanted, the thick, spongy uterine lining — which had been prepared to nourish a potential embryo — is no longer needed. It slowly breaks down and is shed through the vagina as blood and mucus. This is **menstruation**, lasting about two to eight days. After shedding, the uterus begins preparing its lining again for the next cycle.

(ii) After fertilisation in a flowering plant, the **ovary develops into a fruit** and the **ovules develop into seeds**. Dispersal of seeds is important because it prevents overcrowding around the parent plant, allows the species to colonise new areas, and improves the chances of survival and germination of offspring.

(iii) Both processes act as a 'reset': menstruation clears the uterine lining so it can rebuild and receive a future embryo, while seed dispersal ends one reproductive cycle and places new individuals in fresh environments, giving the species another opportunity to reproduce and survive.

Source: Chapter 7, Section 7.3.3(c) — What happens when the Egg is not Fertilised; Section 7.3.3(b) — Female Reproductive System

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Explanation

- **Part (i):** Examiners expect you to state that the unfertilised egg triggers breakdown of the thick uterine lining → shed as blood + mucus → cycle repeats. Mention the ~2–8 day duration for full marks.
- **Part (ii):** Key terms — ovary → fruit, ovules → seeds. For dispersal, give *two* reasons (no overcrowding + colonisation of new areas); one reason alone may cost a mark.
- **Part (iii):** This is a higher-order/application question. Link "reset" explicitly to *preparing for the next attempt* in both cases — don't just describe the process again. One clear sentence per process is enough.
- The source passages directly support (i) and the plant part of (ii); for dispersal benefits, use standard biology reasoning consistent with the chapter's theme of survival of the species.

Q75. medium | thorough-understanding | § (whole-chapter synthesis) **[3]**

Copper-T and surgical blocking of the fallopian tube are both contraceptive methods used in females, but they prevent pregnancy at entirely different stages of the reproductive process. Explain the mechanism of each and identify the stage — gamete production, fertilisation, or implantation — at which each method acts.

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Model Answer

Copper-T: It is a device placed inside the uterus. It prevents the implantation of the fertilised egg (embryo) in the uterine lining. It can also cause irritation of the uterus. Thus, it acts at the stage of **implantation**.

Surgical blocking of the fallopian tube: When the fallopian tube is blocked surgically, the egg cannot travel towards the uterus and sperms cannot reach the egg. Therefore, **fertilisation** cannot take place. It acts at the stage of **fertilisation**.

Source: Chapter 7, Section 7.3.3(d) — Reproductive Health

Explanation

- Examiners expect you to name the stage clearly for each method — that is where the marks lie.
- The passage states: *"Other contraceptive devices such as the loop or the copper-T are placed in the uterus to prevent pregnancy"* and *"If the fallopian tube in the female is blocked, the egg will not be able to reach the uterus… fertilisation will not take place."* Use these lines as your basis.
- Do **not** confuse copper-T with blocking fertilisation — the textbook links it to the uterus (implantation stage), not the fallopian tube.
- For a 3-mark question, two mechanisms + two stages + one comparative point is the ideal structure.

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