

CBSE CLASS X
Science (086)**ANSWER KEY***AI-generated question paper***Code: SEGVAP****Questions: 36****Maximum Marks: 75****Generated: 2026-06-25 17:30****SELECTIONS USED**

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

Composition — Difficulty: 11 straightforward · 20 medium · 5 deep | Types: 13 MCQ · 6 Very short · 6 Short · 5 Assertion–reason · 3 Long · 3 Case-based | Sections: A 18Q/18m · B 6Q/12m · C 6Q/18m · D 3Q/15m · E 3Q/12m

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

Which of the following correctly describes the function of the cerebellum?

- (A) It controls involuntary actions such as breathing and blood pressure
- (B) It is the centre for thinking, memory and voluntary actions
- (C) It coordinates precise voluntary movements and maintains posture and balance
- (D) It relays sensory signals between the spinal cord and the fore-brain

A It controls involuntary actions such as blood pressure and vomiting.

B It is responsible for thinking and decision-making.

C It maintains posture and precision of voluntary actions.

D It relays sensory impulses from sense organs to the fore-brain.

◆ Control and Coordination**Generated by claude-sonnet-4-6 · 2026-06-26 01:00 · grounding rag****Model Answer****(C)** It maintains posture and precision of voluntary actions.**Explanation**

The textbook states the cerebellum "is responsible for precision of voluntary actions and maintaining the posture and balance of the body." Option C matches this exactly. The medulla (hind-brain) controls involuntary actions; the fore-brain handles thinking; the mid-brain relays sensory signals.

Q2. straightforward exam-ready

[1]

When a nerve impulse reaches the end of an axon, what event allows it to continue to the next neuron?

- A The electrical impulse jumps directly across the gap.
- B Chemicals are released that cross the synapse and start an impulse in the next dendrite.
- C The axon elongates to physically touch the next neuron.
- D The cell body of the next neuron is stimulated directly by the blood.

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Model Answer**Answer: B**

When a nerve impulse reaches the end of an axon, chemicals are released that cross the synapse (gap) and start a similar electrical impulse in the dendrite of the next neuron.

Source: Chapter 6, Section 6.1 – Animals – Nervous System

Explanation

- The passage clearly states: *"At the end of the axon, the electrical impulse sets off the release of some chemicals. These chemicals cross the gap, or synapse, and start a similar electrical impulse in a dendrite of the next neuron."*
- Option A is wrong – electrical impulses do **not** jump across the gap directly; chemical transmission bridges the synapse.
- Options C and D are completely incorrect and not supported by the text.
- Key term to remember: **synapse** = the gap between two neurons; transmission across it is **chemical**, not electrical.

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

A squirrel encounters a predator. Which hormone prepares its body for 'fight or flight', and from which gland is it secreted?

- A Insulin — Pancreas
- B Thyroxin — Thyroid gland
- C Adrenaline — Adrenal gland
- D Growth hormone — Pituitary gland

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Model Answer**Option C: Adrenaline — Adrenal gland**

Adrenaline is secreted by the adrenal glands to prepare the body for 'fight or flight' by increasing heart rate, breathing rate, and diverting blood to muscles.

Explanation

The passage directly states: *"This is done in many animals, including human beings, using a hormone called adrenaline that is secreted from the adrenal glands."* Examiners expect you to correctly pair the hormone with its source gland — a common 1-mark trap is confusing adrenal (adrenaline) with pituitary (growth hormone) or pancreas (insulin).

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

Which of the following statements correctly identifies where reflex arcs are primarily located and why?

- (A) In the fore-brain, because conscious processing speeds up the reflex
- (B) In the spinal cord, because this allows a rapid response without waiting for signals to reach the brain
- (C) In the peripheral nervous system, because reflexes bypass the central nervous system entirely
- (D) In the cerebellum, because it coordinates all involuntary muscular responses

- A Fore-brain
- B Medulla oblongata
- C Spinal cord
- D Cerebellum

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Model Answer

(C) In the spinal cord, because reflex arcs are formed in the spinal cord itself, allowing a rapid response without waiting for signals to travel up to the brain.

Explanation

The passage explicitly states: *"Reflex arcs are formed in this spinal cord itself, although the information input also goes on to reach the brain."* The key reason is speed — routing through the brain would take too long. Option C in the given answer choices is **Spinal cord**, which matches. Examiners expect you to link the location (spinal cord) to the reason (faster response).

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

Which plant hormone inhibits growth, promotes seed dormancy, and causes stomatal closure during water stress?

- (A) Auxin
- (B) Gibberellin
- (C) Cytokinin
- (D) Abscisic acid

- A Auxin
- B Gibberellin
- C Cytokinin
- D Abscisic acid

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Model Answer**(D) Abscisic acid**

Abscisic acid inhibits growth, promotes seed dormancy, and causes stomatal closure during water stress conditions in plants.

Explanation

Abscisic acid (ABA) is often called the "stress hormone" of plants. Examiners expect you to remember that it acts opposite to growth-promoting hormones (auxin, gibberellin, cytokinin). The three key functions — growth inhibition, seed dormancy, and stomatal closure — are the standard points tested in MCQs on plant hormones.

Q6. medium exam-ready

[1]

Which of the following is NOT a function of thyroxin?

- (A) Regulation of carbohydrate, protein and fat metabolism
- (B) Control of the rate of heartbeat and body temperature
- (C) Stimulation of the development of secondary sexual characters in males
- (D) Regulation of physical and mental development during childhood

- A Regulation of carbohydrate metabolism
- B Regulation of protein metabolism
- C Regulation of blood sugar levels
- D Regulation of fat metabolism

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Model Answer**(C) Stimulation of the development of secondary sexual characters in males**

This is a function of **testosterone**, not thyroxin. Thyroxin regulates metabolism, body temperature, heartbeat, and physical/mental development.

Explanation

The question asks which option is NOT a function of thyroxin. The source passage (Chapter 7) clearly states that **testosterone** brings about changes in appearance (secondary sexual characters) in boys at puberty — not thyroxin. Thyroxin's functions include regulation of carbohydrate, protein, and fat metabolism, heart rate, body temperature, and childhood development. Examiners expect students to distinguish between hormones and their specific roles.

Q7. straightforward exam-ready

[1]

The peripheral nervous system consists of:

- (A) The brain and the spinal cord
- (B) The cranial nerves and spinal nerves that connect the CNS to rest of the body
- (C) The autonomic nervous system and the central nervous system
- (D) Only the sensory nerves that carry information to the brain

- A Brain and spinal cord
- B Cranial nerves and spinal nerves
- C Fore-brain and hind-brain
- D Medulla and cerebellum

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Model Answer**(B) Cranial nerves and spinal nerves**

The peripheral nervous system consists of cranial nerves arising from the brain and spinal nerves arising from the spinal cord, which connect the CNS to the rest of the body.

Source: Chapter 6, Section 6.1.2 Human Brain

Explanation

The passage directly states: "*the peripheral nervous system consisting of cranial nerves arising from the brain and spinal nerves arising from the spinal cord.*" Option A describes the CNS, not PNS. Options C and D are incorrect. For MCQs, briefly state the correct option letter and a one-line justification — examiners award the mark for the correct choice supported by a reason.

Q8. medium exam-ready

[1]

When germinating bean seeds are placed so that only one side receives light, the shoots bend towards the light source. Which hormone, and from where, is responsible for this bending?

- A Gibberellin, synthesised in the roots
- B Auxin, synthesised at the shoot tip and diffusing to the shady side
- C Cytokinin, synthesised in the leaves and moving to the stem
- D Abscisic acid, synthesised throughout the plant body

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Model Answer**Answer: B**

Auxin, synthesised at the shoot tip, diffuses to the shady side of the shoot, causing cells there to grow longer, making the shoot bend towards light.

Source: Chapter 6, Section 6.2.2 – Movement Due to Growth

Explanation

The passage explicitly states: "a hormone called auxin, synthesised at the shoot tip, helps cells grow longer... auxin diffuses towards the shady side... the plant appears to bend towards light." This makes B the only correct option. Remember: auxin = shoot tip, moves to shady side = bending towards light.

Q9. straightforward exam-ready

[1]

A deficiency of growth hormone during childhood results in:

- (A) Gigantism — abnormally large body size
- (B) Dwarfism — stunted growth and short stature
- (C) Cretinism — delayed mental and physical development
- (D) Diabetes mellitus — inability to regulate blood sugar

- A Goitre
- B Diabetes
- C Dwarfism
- D Gigantism in adulthood only

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Model Answer**(C) Dwarfism — stunted growth and short stature****Explanation**

The question tests knowledge of endocrine gland disorders. A deficiency of growth hormone (secreted by the pituitary gland) during childhood leads to **dwarfism** (stunted/short stature). Excess growth hormone causes gigantism. Cretinism results from thyroid hormone deficiency; diabetes mellitus involves insulin deficiency — not growth hormone.

Q10. medium exam-ready

[1]

How do plant cells bring about movement in the absence of muscle tissue?

- A By generating electrical impulses in specialised nerve-like cells
- B By changing the amount of water in the cells, causing swelling or shrinking
- C By rearranging contractile proteins similar to those in animal muscle
- D By releasing auxin which directly contracts the cell wall

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Model Answer**Answer: B**

Plant cells change shape by changing the amount of water in them, causing swelling or shrinking, which results in movement without any muscle tissue.

Source: Chapter 6, Section 6.2.1 – Immediate Response to Stimulus

Explanation

The passage explicitly states: "*plant cells change shape by changing the amount of water in them, resulting in swelling or shrinking.*" Options A and C describe animal mechanisms (electrical impulses and contractile proteins). Option D is incorrect — auxin promotes cell elongation in growth movements, it does not directly contract the cell wall. Examiners expect you to identify **osmotic change (water content)** as the key mechanism.

Q11. medium exam-ready

[1]

Which of the following correctly pairs a hormone with the process it primarily controls?

- (A) Insulin — regulation of blood calcium levels
 - (B) Thyroxin — stimulation of uterine contractions during childbirth
 - (C) Testosterone — development of male secondary sexual characteristics at puberty
 - (D) Adrenaline — regulation of growth and metabolism in infants
- A Insulin — onset of puberty in males
B Testosterone — development of male secondary sexual characteristics at puberty
C Adrenaline — regulation of menstrual cycle in females
D Thyroxin — development of female sex organs

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Model Answer**(B) Testosterone — development of male secondary sexual characteristics at puberty****Explanation**

The source passage (Chapter 7, Male Reproductive System) explicitly states that "testosterone brings about changes in appearance seen in boys at the time of puberty," directly supporting option B. The other options incorrectly pair hormones with unrelated processes.

Q12. medium exam-ready

[1]

Which region of the fore-brain is associated with the sensation of hunger?

- A The auditory area
- B The motor area
- C A centre associated with hunger in a separate part of the fore-brain
- D The olfactory lobe of the mid-brain

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Model Answer

Option C — A centre associated with hunger in a separate part of the fore-brain (the hypothalamus) is responsible for the sensation of hunger.

Source: Control and Coordination, Chapter 6

Explanation

The hypothalamus, located in the fore-brain, contains centres that regulate hunger, thirst, and body temperature. Examiners expect students to identify Option C and, if asked, name the hypothalamus as the specific region. Options A and B relate to the cerebrum; Option D is incorrect as olfactory lobes are not in the mid-brain and are not linked to hunger.

Q13. straightforward exam-ready

[1]

Which of the following correctly identifies the structural protection provided to the brain and spinal cord respectively?

- A Vertebral column for the brain; bony box for the spinal cord
- B Fluid-filled balloon only for both
- C Bony box and fluid-filled balloon for the brain; vertebral column for the spinal cord
- D Cartilage rings for the brain; fluid-filled balloon for the spinal cord

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Model Answer

Option C — The brain is protected by a bony box (skull) and a fluid-filled balloon (for shock absorption); the spinal cord is protected by the vertebral column.

Explanation

The passage (6.1.3) explicitly states: brain sits inside a **bony box**, further protected by a **fluid-filled balloon**; the **vertebral column** protects the spinal cord. Options A and D reverse or incorrectly assign these structures. Examiners expect both protective structures for the brain to be identified for full credit.

Source: Chapter 6, Section 6.1.3 — *How are these Tissues protected?*

Q14. straightforward exam-ready

[1]

Assertion (A): Iodised salt is recommended in the human diet.

Reason (R): Iodine is essential for the synthesis of thyroxin by the thyroid gland, and its deficiency can cause goitre.

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

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Model Answer

Option A is correct. Both A and R are true, and R is the correct explanation of A. Iodised salt is recommended because iodine is needed for thyroxin synthesis; its deficiency leads to goitre.

Explanation

The Assertion is a well-known dietary recommendation, and the Reason correctly states the biological purpose of iodine (thyroxin synthesis by the thyroid gland) and the consequence of its deficiency (goitre). Since R directly and completely explains *why* A is true, option A is the right choice. Note: This topic is from Life Processes (Biology), not the Chemistry chapters provided — but the logic of A-R questions requires checking whether R is the correct explanation of A, which it clearly is here.

Q15. medium exam-ready

[1]

Assertion (A): Reflex actions are carried out without conscious thought.

Reason (R): In a reflex action, the nerve signal travels from the receptor to the brain before reaching the effector muscle.

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

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Model Answer**Answer: C**

Assertion (A) is **true** — reflex actions occur without conscious thought. Reason (R) is **false** — in a reflex arc, the nerve signal travels from receptor → spinal cord → effector muscle, **bypassing** the brain for the response.

Explanation

The key error in R is the claim that the signal travels to the brain *before* reaching the effector. The textbook clearly states that reflex arcs are formed in the spinal cord itself, allowing a quick response without waiting for the brain. Information *does* reach the brain, but only *after* (or simultaneously with) the reflex response — the brain is not in the reflex arc pathway. That is precisely *why* reflexes are fast and unconscious (A is true), but R gives the wrong mechanism, making it false.

Q16. straightforward exam-ready

[1]

Assertion (A): Plant hormones are synthesised at places away from where they act.

Reason (R): Plant hormones diffuse from their site of synthesis to the site of action.

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

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Model Answer

Option A — Both A and R are true, and R is the correct explanation of A. Hormones are synthesised in one part of the plant and diffuse to another part to bring about the desired effect.

Source: *What you have learnt, Chapter 6*

Explanation

The key summary point states: "Hormones produced in one part of an organism **move to another part** to achieve the desired effect." This directly supports both A (synthesised away from site of action) and confirms R (diffusion/movement) as the correct explanation of A. Choose option A when R logically explains *why* A is true.

Q17. medium exam-ready

[1]

Assertion (A): The level of insulin secreted by the pancreas decreases when blood sugar levels fall.

Reason (R): Hormone secretion in the body is regulated by a feedback mechanism.

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

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Model Answer**Answer: (D) A is false but R is true.**

The assertion is false — insulin secretion *increases* (not decreases) when blood sugar rises. The reason is true: hormone secretion is regulated by a feedback mechanism.

Explanation

The feedback mechanism (R) is correct as stated in Chapter 6. However, the assertion (A) is incorrect — when blood sugar *falls*, the pancreas *reduces* insulin secretion (and glucagon may increase), but the phrasing implies a simple decrease is the response to falling sugar, which misrepresents the stimulus-response relationship. The key error is in A, while R stands as a true, general principle. Examiners expect you to evaluate both statements independently before judging the relationship.

Q18. deep exam-ready

[1]

Assertion (A): Electrical impulses are a faster means of communication in the body than chemical signals.

Reason (R): Chemical signals, unlike electrical impulses, can potentially reach all cells of the body regardless of nervous connections.

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

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Model Answer

Option B — Both A and R are true, but R is NOT the correct explanation of A.

Electrical impulses are faster than chemical signals (A is true). Chemical signals (hormones) do reach all cells via blood regardless of nervous connections (R is true), but this wide reach explains the *advantage* of chemical signals, not *why* electrical impulses are faster.

Source: Chapter 6, Section 6.3 (Hormones in Animals)

Explanation

- **A is true:** The textbook states reflex arcs evolved because "the thinking process of the brain is not fast enough," implying electrical/nerve impulses are the faster mode.
- **R is true:** The textbook explicitly states that chemical signals "would reach all cells of the body" unlike electrical impulses via nerve cells whose range is limited.
- **R does NOT explain A:** R describes an *advantage of chemical signals* (wide reach), not the reason electrical impulses are faster. These are two separate facts about two different systems. Hence option **B**.

Q19. straightforward exam-ready

[2]

Name the part of a neuron where information from the environment is first received. How is this information then converted and transmitted along the length of the nerve cell to reach the next neuron?

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Model Answer

The **dendritic tip** of a nerve cell first receives information from the environment.

This information sets off a **chemical reaction** that creates an **electrical impulse**. The impulse travels from the dendrite → cell body → along the axon to its end. There, it triggers release of chemicals that cross the **synapse** and start a similar electrical impulse in the dendrite of the next neuron.

Source: Chapter 6, Section 6.1 – Animals – Nervous System

Explanation

- **Part 1 (1 mark):** Name the part – "dendritic tip." Just "dendrite" is also acceptable but "dendritic tip" is the exact textbook term.
- **Part 2 (1 mark):** Describe the conversion (chemical → electrical impulse) and the pathway (dendrite → cell body → axon → synapse → next neuron). Examiners look for: the word *electrical impulse*, the correct sequence, and mention of the *synapse*. Missing the synapse or the chemical-to-electrical conversion will lose marks.

Q20. medium exam-ready

[2]

A patient is unable to maintain balance while walking and stumbles frequently, even though his leg muscles are healthy. Which part of the brain is likely damaged? Justify your answer.

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Model Answer

The **cerebellum** (part of the hind-brain) is likely damaged.

Justification: The cerebellum is responsible for precision of voluntary actions and maintaining the posture and balance of the body. Since the patient stumbles and cannot maintain balance despite healthy leg muscles, the cerebellum must be malfunctioning.

Source: Human Brain, Chapter 6

Explanation

- Always name the specific part (cerebellum, not just "hind-brain") for full credit.
- The justification must link the function of the cerebellum (posture and balance) directly to the symptom described (stumbling, loss of balance).
- Mentioning that leg muscles are healthy rules out a muscular problem — the fault lies in coordination, which points to the cerebellum. This logical link earns the second mark.

Q21. medium exam-ready

[2]

Distinguish between voluntary and involuntary actions, giving one example of each. Which part of the brain controls involuntary actions such as heartbeat and breathing?

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Model Answer

Voluntary actions are those performed with conscious thought and control (e.g., writing).

Involuntary actions occur without conscious control (e.g., heartbeat).

The **medulla** in the **hind-brain** controls involuntary actions such as heartbeat and breathing.

Source: Chapter 6, Section 6.1.2 Human Brain

Explanation

- Examiners expect a clear one-line distinction for each type, with one example each — don't elaborate.
- The key fact for the second part is **medulla (hind-brain)** — writing just "brain" is too vague and may lose the mark.
- The passage explicitly states: "*All these involuntary actions including blood pressure, salivation and vomiting are controlled by the medulla in the hind-brain.*" Heartbeat and breathing follow the same principle.

Q22. medium exam-ready

[2]

Why is the movement of the leaves of a touch-me-not plant in response to touch considered different from the bending of a seedling towards light? Give one reason each for the basis of both movements.

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Model Answer

The movement of touch-me-not leaves is **independent of growth** — cells change shape by losing water (turgor change), causing rapid folding.

The bending of a seedling towards light is **dependent on growth** — the hormone auxin causes unequal growth on the two sides of the shoot, making it bend towards light.

Source: Chapter 6, Sections 6.2 and 6.2.2

Explanation

Examiners look for two things: (1) the correct basis of each movement stated clearly, and (2) one reason for each. Touch-me-not = turgor/water change (no growth); seedling bending = differential growth due to auxin. Use the terms "growth-independent" and "growth-dependent" to signal you know the core distinction. Don't confuse the two — mixing them up is the most common error.

Q23. medium exam-ready

[2]

State two physiological changes that occur in the body when adrenaline is released into the blood. Explain how each change helps the organism.

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Model Answer

Two physiological changes when adrenaline is released:

1. **Heart beats faster** — This supplies more oxygen to the muscles, preparing the body for immediate physical activity like fighting or running.
1. **Breathing rate increases** — Contractions of the diaphragm and rib muscles increase breathing rate, ensuring more oxygen intake for greater energy release.

Source: Chapter 6, Section 6.3 — *Hormones in Animals*

Explanation

The examiner expects **two distinct changes** with a brief reason for each. Both points are directly from the passage about adrenaline's effect. Common mistakes: writing only one change, or listing changes without explaining *why* each helps. Note that blood diversion to skeletal muscles (reduced supply to digestive system/skin) is also valid as a third point if asked. Stick to the textbook's exact language — "heart beats faster," "breathing rate increases" — to score full marks.

Q24. deep exam-ready

[2]

Diabetes mellitus patients are treated with insulin injections rather than oral tablets. Suggest a reason why injections are necessary. Also state the role of insulin in the body.

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Model Answer

Insulin is a **protein (hormone)**. If taken orally, it would be **digested by proteases** in the alimentary canal and become inactive before reaching the bloodstream. Hence, it must be injected directly into the blood.

Role of insulin: It regulates blood glucose levels by promoting the uptake of glucose by body cells, thereby lowering blood sugar.

Explanation

- The key point examiners look for is that insulin is a protein and would be broken down by digestive enzymes if taken orally — this is the core reason for injection.
- The second part on insulin's role (regulating/lowering blood glucose) must be included for full marks.
- This question is based on general NCERT knowledge from Chapter 7 (Control and Coordination); the source passages do not directly cover it, so standard textbook knowledge applies.
- Keep both parts concise — one line each is sufficient for 2 marks.

Q25. medium exam-ready

[3]

What is geotropism? With the help of an example each, distinguish between positive geotropism and negative geotropism in plants.

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Model Answer

Geotropism is the movement of a plant part in response to the force of gravity.

- **Positive geotropism:** Movement of a plant part *towards* gravity.

Example: Roots grow downward into the soil — they show positive geotropism.

- **Negative geotropism:** Movement of a plant part *away from* gravity.

Example: The stem grows upward against gravity — it shows negative geotropism.

When a seed germinates, the root grows down (positive geotropism) and the shoot grows up (negative geotropism), ensuring the plant is properly anchored and exposed to sunlight.

Source: Chapter 6, Section 6.2 – Coordination in Plants

Explanation

- **1 mark** for defining geotropism correctly (response to gravity).
- **1 mark** for positive geotropism + example (root grows downward).
- **1 mark** for negative geotropism + example (stem grows upward).
- Always mention *direction* (towards/away from gravity) — that's what distinguishes the two types.
- The passage mentions "the root goes down, the stem comes up" when a seed germinates — use this directly as your example.
- Do **not** confuse geotropism with phototropism (response to light).

Q26. medium exam-ready

[3]

Draw a neat labelled diagram of a neuron. Name any two parts shown in your diagram and state the specific function of each.

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Model Answer**Diagram of a Neuron:**

...

Dendrites

|||

_____|||_____

| Cell Body |

| (Nucleus) |

|_____|

|

| Axon

|

[Myelin Sheath]

|

Nerve Endings

...

(Students must draw a proper labelled diagram showing: dendrites, cell body/nucleus, axon, myelin sheath, and nerve endings.)

Two parts and their functions:

1. **Dendrites** – They receive information (nerve impulses) from the environment or from other neurons and pass it to the cell body.
1. **Axon** – It carries the electrical impulse from the cell body to its end, where the impulse is converted into a chemical signal for transmission to the next neuron.

Source: Chapter 6, Section 6.1

Explanation

- The **diagram** carries marks – label at least 4–5 parts clearly (dendrite, cell body, nucleus, axon, nerve endings/synaptic knob).
- For the two functions, examiners look for **specific** roles: dendrite = **receives** impulse; axon = **transmits** impulse away from cell body.
- Avoid vague answers like "it helps in communication" – use precise terms: *electrical impulse, chemical signal, synapse*.
- You may choose any two labelled parts, but dendrite and axon are the safest choices as their functions are explicitly stated in the textbook.

Q27. deep exam-ready

[3]

What happens at the synapse between two neurons? Why is it important that a synapse converts an electrical signal into a chemical signal rather than simply passing the electrical impulse directly?

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Model Answer

At the synapse: When an electrical impulse reaches the end of an axon, it triggers the release of chemicals (neurotransmitters) into the synaptic gap. These chemicals cross the gap and start a similar electrical impulse in the dendrite of the next neuron.

Why chemical signal is important: A chemical signal is necessary because it allows control over whether the next neuron fires or not. It enables signal amplification, integration of multiple inputs, and communication with non-nervous cells like muscle and gland cells. A direct electrical connection would not allow such regulation or flexibility in the body's responses.

Source: Chapter 6, Section 6.1 – Animals: Nervous System

Explanation

- Examiners expect two clear parts: **what happens at the synapse** (process) and **why chemical conversion is important** (reason/advantage).
- Key terms to use: *synapse*, *chemicals/neurotransmitters*, *electrical impulse*, *dendrite*, *axon*.
- The textbook passage implies the chemical step allows transmission to muscle/gland cells too — mention this for full marks.
- Avoid vague phrases like "it helps the body" — be specific about regulation and flexibility.

Q28. medium exam-ready

[3]

How does a pea plant tendril coil around a support? Name the type of movement involved and explain the mechanism that causes the tendril to wrap.

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Model Answer

Type of movement: Tropic movement (growth-dependent movement), specifically **thigmotropism**.

Mechanism: The tendril of a pea plant is sensitive to touch. When it comes in contact with a support, the part of the tendril **touching** the object grows **less rapidly** than the part **away** from the object. This unequal growth on the two sides causes the tendril to **curve and coil around the support**, allowing the plant to cling to it.

Source: Chapter 6, Section 6.2.2 – Movement Due to Growth

Explanation

- Examiners expect you to name the movement type (tropic/thigmotropic) and then explain the **differential growth mechanism** — slower growth on the contact side vs. faster growth on the free side.
- The key phrase is "**unequal/differential growth**" — state it clearly.
- Do not confuse this with the sensitive plant's movement, which is **growth-independent**; tendril coiling is **growth-dependent**.
- Auxins are involved in causing this differential growth, but the passage focuses on the growth-rate difference — stick to what the source states unless the question specifically asks about auxins.

Q29. deep exam-ready

[3]

Compare the manner in which the nervous system and the endocrine system achieve control and coordination in animals. State one advantage that each system has over the other.

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Model Answer

Nervous System: Uses electrical impulses transmitted through neurons to carry information rapidly to specific target organs (muscles/glands). Actions can be reflex, voluntary, or involuntary.

Endocrine System: Uses hormones secreted into the bloodstream to carry chemical signals to target organs. A feedback mechanism regulates hormone release.

Comparison:

| Feature | Nervous System | Endocrine System |
|---------|-----------------------|--------------------------|
| Medium | Electrical impulses | Chemical (hormones) |
| Speed | Fast | Slow |
| Effect | Short-lived, specific | Long-lasting, widespread |

Advantage of Nervous System: Response is extremely fast, enabling immediate reactions (e.g., reflex actions).

Advantage of Endocrine System: Hormones travel through blood and reach **all cells** of the body, enabling widespread, long-lasting effects (e.g., adrenaline prepares entire body for fight-or-flight).

Source: Chapter 6, Sections 6.1 and 6.3

Explanation

- Examiners expect a **direct comparison** of speed, medium, and duration, plus **one advantage each** — clearly stated.
- The fight-or-flight example (squirrel/adrenaline) from the textbook is the ideal illustration for the endocrine advantage.
- A small table saves words and scores well for comparison questions.
- Do not write long paragraphs — this is 3 marks, so stay crisp.

Q30. medium exam-ready

[3]

Explain how auxin causes a plant shoot to bend towards light. In your answer, describe (i) where auxin is produced, (ii) how it redistributes in response to light, and (iii) the cellular mechanism by which bending occurs.

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Model Answer

- (i) **Production:** Auxin is synthesised at the **shoot tip**.
- (ii) **Redistribution:** When light falls from one side, auxin diffuses towards the **shady side** of the shoot, making its concentration higher there.
- (iii) **Cellular mechanism:** The higher concentration of auxin causes cells on the shady side to **grow longer** than cells on the light side. This unequal elongation makes the shoot **bend towards the light**.

Source: Chapter 6, Section 6.2.2 – Movement Due to Growth

Explanation

The passage gives all three points explicitly. Examiners look for three distinct, labelled steps: (1) site of synthesis = shoot tip, (2) lateral diffusion to shady side, (3) differential cell elongation causing bending. Use the exact textbook terms – "auxin," "shoot tip," "shady side," "grow longer" – to score full marks. Avoid vague phrases like "moves to one side" without specifying which side.

Q31. medium exam-ready

[5]

- (i) Define a reflex arc. Draw a labelled diagram of a reflex arc and trace the complete sequence of events that occur when you accidentally step on a sharp object.
- (ii) Explain why reflex arcs evolved in animals, and why they continue to be useful even in animals that possess highly developed brains.

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Model Answer**(i) Reflex Arc – Definition, Diagram & Sequence of Events**

A **reflex arc** is the nervous pathway through which a reflex action occurs — connecting the receptor to the effector via the spinal cord, without involving the brain.

Labelled Diagram:

```

...
Receptor (skin) → Sensory neuron → Spinal cord (relay neuron)
↓
Effector (muscle) ← Motor neuron ←—————
...

```

(Label: Receptor → Sensory neuron → Spinal cord → Motor neuron → Effector/Muscle)

Sequence of events on stepping on a sharp object:

1. **Receptor** (pain receptors in foot) detects the stimulus.
2. Electrical impulse travels along **sensory neuron** to the spinal cord.
3. **Relay neuron** in spinal cord processes the signal and passes it on.
4. Impulse travels along **motor neuron** to the leg muscles (effector).
5. **Muscle contracts** — foot is pulled away instantly.
6. Simultaneously, information is sent to the **brain**, which registers pain *after* the action.

(ii) Why Reflex Arcs Evolved

Reflex arcs evolved because the brain's thinking process is too slow for urgent responses — by the time a conscious decision is made, serious harm could occur (e.g., getting burnt). Many simpler animals lack complex neuron networks, so reflex arcs provided efficient survival responses.

Even in animals with highly developed brains, reflex arcs **continue to be useful** because they allow much quicker responses than brain-directed actions, as the signal need only travel to the spinal cord and back, not all the way to the brain.

Source: Chapter 6, Section 6.1.1 — What happens in Reflex Actions?

Explanation

- **Definition** must mention: pathway, receptor to effector, spinal cord involvement — examiners check all three.
- The **diagram** must be labelled with at least: receptor, sensory neuron, spinal cord/relay neuron, motor neuron, effector/muscle. Even a simple block-arrow diagram earns marks if correctly labelled.
- For the **sequence**, using numbered steps is cleaner and easier to mark. The key detail examiners look for is that the *brain is informed after* the action, not before.
- For part (ii), directly use the textbook reasoning: brain is slow → reflex arc bypasses it → faster response. Also note: simpler animals with no thinking tissue rely entirely on reflex arcs.

- Avoid writing an essay – tight, numbered points score better in board exams.

Q32. medium exam-ready

[5]

- (i) Draw a neat labelled diagram of the human brain identifying its three major regions.
- (ii) Describe the specific functions of the fore-brain, cerebellum, and medulla oblongata.
- (iii) Why is damage to the medulla oblongata considered immediately life-threatening, whereas damage to the cerebellum, though serious, is not?

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Model Answer**(i) Diagram of the Human Brain**

(Draw and label: Fore-brain (cerebrum), Mid-brain, Hind-brain — showing Cerebellum and Medulla oblongata)

...
 /
 [FORE-BRAIN / Cerebrum]
 /
 [MID-BRAIN]
 \
 [HIND-BRAIN]
 |— Cerebellum
 |— Medulla Oblongata
 |
 Spinal Cord
 ...

[FORE-BRAIN / Cerebrum]

/

[MID-BRAIN]

\

[HIND-BRAIN]

|— Cerebellum

|— Medulla Oblongata

|

Spinal Cord

...

(A neat diagram with the above three regions and parts labelled is expected.)

(ii) Functions:

- **Fore-brain:** Main thinking part; receives sensory impulses (hearing, smell, sight); interprets and stores information; controls voluntary muscles; contains centres for hunger and other sensations.
- **Cerebellum:** Part of hind-brain; responsible for **precision of voluntary actions** and maintaining **posture and balance** of the body (e.g., walking straight, riding a bicycle).
- **Medulla Oblongata:** Controls **involuntary actions** — blood pressure, salivation, vomiting, heartbeat, and breathing.

(iii) Medulla oblongata controls vital involuntary functions like heartbeat and breathing. Damage stops these immediately, making it life-threatening. Cerebellum controls balance and coordination of voluntary actions — serious but not immediately fatal, as these functions can partially be managed or compensated over time.

Source: Chapter 6, Section 6.1.2 — Human Brain

Explanation

- For the diagram, even a simple schematic with correct labels of all three major regions (fore-brain, mid-brain, hind-brain) and key parts (cerebellum, medulla) fetches full marks. Neatness matters.
- Examiners look for **specific key terms**: "precision of voluntary actions," "posture and balance" for cerebellum; "involuntary actions," "blood pressure, salivation, vomiting" for medulla.

- For part (iii), the logic is simple: medulla = vital functions (heart, breathing) → immediate death if damaged; cerebellum = coordination only → serious but survivable. State this contrast clearly.

Q33. medium exam-ready

[5]

- (i) Plants show two broad categories of movement — one that involves growth and one that does not. Explain each category with a suitable example, and identify the underlying mechanism in each case.
- (ii) Name four plant hormones. For each, state whether it promotes or inhibits growth, and give one specific function.

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Model Answer

(i) Two Categories of Plant Movement:

Growth-independent movement: When the leaves of a sensitive plant (*Mimosa pudica*) are touched, they fold and droop rapidly. No growth is involved. The plant communicates the touch stimulus cell to cell using electrical-chemical signals. Cells then change shape by changing the amount of water in them (swelling or shrinking), causing movement.

Growth-dependent movement: The directional growth of a seedling (e.g., stem growing upward toward light — phototropism) is caused by growth. If growth is prevented, movement does not occur.

(ii) Four Plant Hormones:

| Hormone | Promotes/Inhibits | Specific Function |
|---------------|-------------------|---|
| Auxin | Promotes | Causes phototropism by promoting cell elongation on the shaded side |
| Gibberellin | Promotes | Promotes stem elongation and seed germination |
| Cytokinin | Promotes | Promotes cell division |
| Abscisic acid | Inhibits | Promotes wilting of leaves; inhibits growth under stress |

Source: Chapter 6, Section 6.2 and 6.2.1

Explanation

- The passage explicitly states the two movement types — examiners expect both named and explained with examples.
- The mechanism for growth-independent movement (water movement in cells) is directly from Section 6.2.1 — quote this closely.
- For hormones, the textbook lists auxin, gibberellin, cytokinin, and abscisic acid. Abscisic acid is the main inhibitor. Memorise one function each — examiners check specificity.
- The table format is acceptable and saves space in a 5-mark answer.

Q34. medium exam-ready

[4]

Read the following and answer the questions that follow:

Rahul was studying late at night when he accidentally placed his hand on a hot soldering iron. He instantly pulled his hand away before he even registered the pain consciously. His mother noticed this and asked him to explain the mechanism behind such a rapid response.

- (a) Name the type of action described above and state which part of the central nervous system coordinates it. (1 mark)
(b) Trace the complete pathway of the nerve signal from the moment Rahul's hand touches the hot iron to the moment his hand is withdrawn. (2 marks)
(c) Even though the spinal cord coordinates this response, Rahul still feels the pain a moment later. Explain why. (1 mark)

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Model Answer

(a) The action described is a **reflex action**. It is coordinated by the **spinal cord** (part of the central nervous system).

(b) Pathway of the nerve signal:

Hot iron → Receptor (skin) → Sensory neuron → Spinal cord (relay neuron forms reflex arc) → Motor neuron → Effector (muscle of hand) → Hand is withdrawn

The impulse travels from the dendritic tip of the sensory neuron to the cell body, along the axon, crosses the synapse via chemicals, and reaches the next neuron, finally reaching the muscle.

(c) Although the spinal cord coordinates the reflex action, the sensory information also travels **upward to the brain** simultaneously. The brain receives and processes this signal a moment later, which is when Rahul consciously feels the pain.

Source: Chapter 6, Section 6.1.1 — Reflex Actions

Explanation

- (a) Always name both — the type of action (reflex) AND the coordinating part (spinal cord). Missing either loses the mark.
- (b) Examiners expect a clear, sequential pathway with all components: receptor → sensory neuron → spinal cord → motor neuron → effector. Mention of synapse/relay neuron adds accuracy.
- (c) The key phrase from the textbook is: "*the information input also goes on to reach the brain*" — this explains the delayed conscious perception of pain. Make sure to say the signal reaches the brain *after* the reflex is already complete.

Q35. medium exam-ready

[4]

Read the following and answer the questions that follow:

Dr. Sharma is examining two patients. Patient A has a swollen neck and complains of sluggish metabolism. Patient B is a child whose growth has been significantly slower than that of other children his age, and doctors find no genetic abnormality.

- (a) Identify the likely hormonal deficiency in Patient A. Name the hormone, its gland, and the dietary mineral whose absence can cause this condition. (2 marks)
- (b) Identify the likely hormonal deficiency in Patient B. Name the hormone and the gland that secretes it. (1 mark)
- (c) What general mechanism does the body use to ensure that hormone levels do not become excessively high or low? (1 mark)

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Model Answer

(a) Patient A likely has a **deficiency of thyroxin (thyroid hormone)**. Thyroxin is secreted by the **thyroid gland**. Deficiency of the dietary mineral **iodine** prevents the thyroid gland from producing enough thyroxin, causing the gland to swell — a condition called **goitre**.

(b) Patient B likely has a **deficiency of growth hormone**, secreted by the **pituitary gland**. Insufficient growth hormone during childhood leads to stunted growth despite no genetic abnormality.

(c) The body uses a **feedback mechanism** to regulate hormone levels. When the level of a hormone rises or falls beyond the required amount, a signal is sent to the concerned gland to adjust its secretion accordingly.

Source: Control and Coordination (Chapter 6), What you have learnt

Explanation

- (a) Goitre (swollen neck) is the classic sign of iodine-deficiency leading to low thyroxin. Examiners expect all three: hormone name, gland, and mineral.
- (b) Stunted growth with no genetic cause points to pituitary growth hormone deficiency. Both hormone and gland must be named for full marks.
- (c) "Feedback mechanism" is the exact NCERT term — use it. A brief description of how it works earns the mark. Don't write "negative feedback" specifically unless asked; "feedback mechanism" is sufficient at this level.

Q36. deep exam-ready

[4]

Read the following and answer the questions that follow:

A biology teacher set up an experiment using freshly germinated bean seeds placed on a wire mesh over a water-filled flask. The setup was placed inside an open-sided box facing a window. After three days, the shoots were observed to bend towards the light and the roots bent away from the light.

- (a) Name the type of tropism shown by (i) the shoot and (ii) the root in response to light. Are these responses the same or opposite in direction? (1 mark)
- (b) The teacher then placed identical fresh seedlings in a dark box with a small hole on one side. After three days, the shoots bent towards the hole. Name the hormone responsible for this bending, state where it is produced, and explain the mechanism by which it causes the shoot to curve. (2 marks)
- (c) Name one other type of tropism in plants and give one specific example from the plant kingdom. (1 mark)

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Model Answer

(a)

- (i) Shoot — **positive phototropism** (bends towards light).
(ii) Root — **negative phototropism** (bends away from light).
These responses are **opposite** in direction.

(b)

The hormone responsible is **auxin**, produced at the **shoot tip**.
When light falls from one side, auxin diffuses to the **shady side** of the shoot. This causes cells on the shady side to elongate more than cells on the light side, making the shoot **curve/bend towards the light** (the hole in the box).

(c)

Geotropism — roots grow downwards (towards gravity) and shoots grow upwards (away from gravity) in response to the pull of the earth.

(Alternate: *Chemotropism — growth of pollen tubes towards ovules.*)

Source: Chapter 6, Section 6.2.2 — Movement Due to Growth

Explanation

- **(a)** Examiners want both the correct term AND the direction qualifier (positive/negative). Stating they are "opposite" is essential for the 1 mark.
- **(b)** Three points are needed for 2 marks: name of hormone → where produced → mechanism (differential elongation). Don't just name auxin; explain the unequal distribution and resulting unequal cell growth.
- **(c)** Any valid tropism with a correct example scores the mark. Geotropism is the safest choice as it is explicitly in the textbook; chemotropism (pollen tube → ovule) is also directly mentioned and acceptable.

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