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CLASS X · SCIENCE (086) · BIOLOGY · CBSE BOARD EXAMINATION 2027

CHAPTER 6

Control and Coordination

Neuron · Auxin
Insulin

Chapter Practice Booklet · Questions only · Answers in the separate Answer Booklet

12 note blocks + 5 diagrams | 65 practice questions | 3 case studies | Board question index

INSIDE THIS BOOKLET

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STUDENT DETAILS

NAME _____

CLASS & SECTION _____

ROLL NO. _____

BOOKLET STARTED ON _____

CHAPTER TEST SCORE _____ / 20

1

READ THIS FIRST

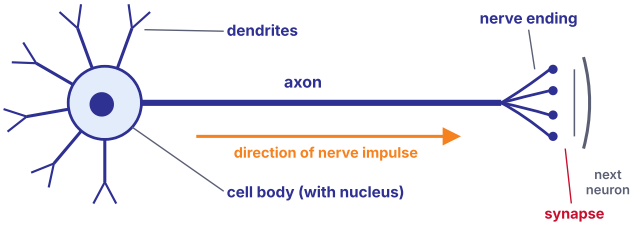
Chapter Notes

The whole chapter in short-note form: every definition, activity, diagram, formula and reason. Revise from here – you should not need the textbook again.

1 Why control and coordination?

- Living things respond to changes in their surroundings – a **stimulus** (heat, light, touch, smell, gravity, water) – with a suitable **response**.
- Every action must be **controlled** (right time, right amount) and **coordinated** (different organs working together), e.g. catching a ball uses eyes, brain, arms and legs together.
- Animals use two systems: the **nervous system** (fast, electrical) and the **endocrine system** (slower, chemical – hormones). Plants use only chemical means.
- **Receptors** are special tips of nerve cells that detect stimuli, found in sense organs: inner ear (hearing, balance), nose – **olfactory** receptors (smell), tongue – **gustatory** receptors (taste), eyes (light), skin (touch, heat, pain).

2 The neuron – unit of the nervous system



- **Dendrites** pick up information (from receptors or another neuron) and set off a chemical reaction that creates an **electrical impulse**.
- The impulse travels: dendrite → **cell body** → **axon** → **nerve ending**.
- At the end of the axon the impulse releases **chemicals**. They cross the tiny gap – the **synapse** – and start a similar impulse in the dendrite of the next neuron. In the same way impulses pass to muscle cells or glands.
- So an impulse moves in **one direction only**: chemicals are released only at the axon end.

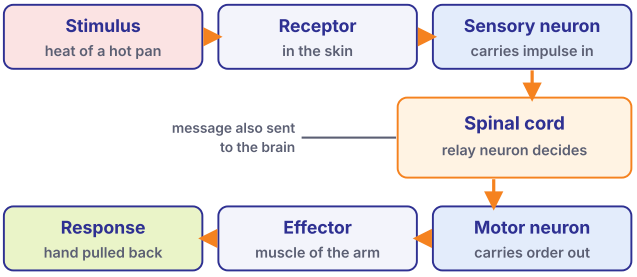
3 Kinds of neurons and nerves

Sensory neuron	Carries impulses from **receptors** to the brain or spinal cord.
Motor neuron	Carries impulses from the brain or spinal cord to **effectors** – muscles or glands.
Relay neuron	Links sensory and motor neurons inside the spinal cord or brain.

- A **nerve** is a bundle of nerve fibres (axons). Sensory nerves carry messages in; motor nerves carry orders out.
- **Voluntary** actions are done by choice (writing, talking, walking) – controlled by the forebrain. **Involuntary** actions happen without thinking (heartbeat, breathing, salivation).

4 Reflex action and reflex arc

Reflex action: a sudden, automatic, quick response to a stimulus, done without thinking, e.g. pulling the hand away from a hot pan, blinking when something comes near the eye, the knee-jerk.



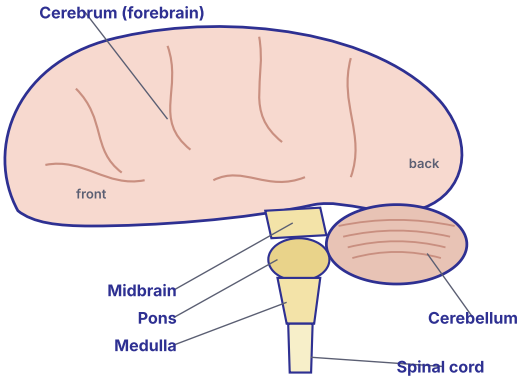
- **Reflex arc:** the pathway of a reflex – receptor → sensory neuron → relay neuron in the **spinal cord** → motor neuron → effector.
- The decision is made in the spinal cord itself, so the response is **very fast**. The message also goes to the brain, which becomes aware a little later.
- Reflex arcs evolved because the thinking process of the brain is not fast enough for danger; they work even in animals with little or no thinking brain.

5 The human nervous system

Central nervous system (CNS)	Peripheral nervous system (PNS)
Brain and **spinal cord**	**Cranial nerves** (from the brain) and **spinal nerves** (from the spinal cord)
Receives information from all parts of the body and integrates it	Links the CNS with all parts of the body

- Nerves from all over the body meet in a bundle in the spinal cord on their way to the brain.
- The **spinal cord** starts from the medulla, runs inside the backbone, controls reflexes and carries messages to and from the brain.
- The brain also sends messages to muscles: this is how voluntary actions happen.

6 The human brain



Forebrain (cerebrum)	Main **thinking** part: receives sensory impulses (sight, hearing, smell, touch) and interprets them; memory, learning, intelligence; controls **voluntary** muscles; centre for **hunger**.
Midbrain and hindbrain	Control many **involuntary** actions.
Medulla (hindbrain)	**Blood pressure, salivation, vomiting** and other involuntary actions.
Pons (hindbrain)	Joins parts of the brain; helps regulate breathing.
Cerebellum (hindbrain)	**Precision** of voluntary actions; **posture and balance** (walking in a straight line, riding a bicycle, picking up a pencil).

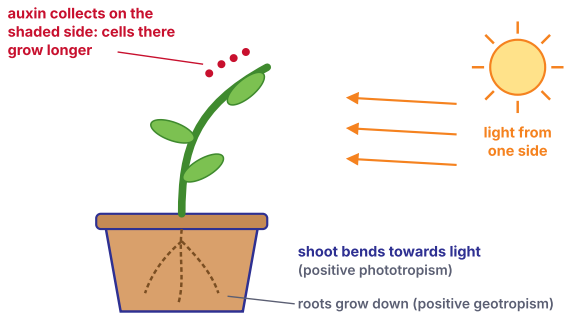
7 Protection, muscles and limits of nerves

- The **brain** sits inside a bony box, the **skull (cranium)**, inside a fluid-filled balloon that acts as a **shock absorber**. The **spinal cord** is protected by the **vertebral column** (backbone).
- **How muscles move:** muscle cells contain special **proteins** that change their shape and arrangement when an electrical impulse arrives; the cells become **shorter** and the muscle contracts.
- **Limits of electrical impulses:** (i) they reach only cells joined to nervous tissue, not every cell of the body; (ii) a cell needs time to **reset** after one impulse before it can send another, so it cannot send impulses continuously.
- So most multicellular organisms also use **chemical communication**: a hormone released into the blood reaches all cells, steadily and for a long time.

8 Coordination in plants – immediate response

- Plants have **no nervous system and no muscles**, yet they respond to stimuli in two ways: **immediate** movement, and movement due to **growth**.
- **Touch-me-not (Mimosa pudica / chhui-mui):** its leaves fold and droop at a touch. There is **no growth** involved.
- Its cells pass the information from cell to cell by **electrical-chemical** means (there is no special tissue), and the cells change shape by changing the **amount of water** in them – they swell or shrink.
- Similar water-driven movements: opening and closing of flowers and of stomata.

9 Movement due to growth – tropisms



Phototropism	Response to **light**: shoots bend towards light (+), roots away from it (–).
Geotropism	Response to **gravity**: roots grow down (+), shoots grow up (–).
Hydrotropism	Response to **water**: roots grow towards water.
Chemotropism	Response to **chemicals**: pollen tube grows towards the ovule.

Tendrils (pea plant): the part of the tendril in contact with a support grows **slower** than the part away from it, so the tendril coils around the support. Tropic movements are slow, as they depend on growth.

10 Plant hormones

Auxin	Made at the **shoot tip**; helps cells grow longer. With light from one side, it moves to the **shaded side**; cells there grow longer and the shoot bends towards light.
Gibberellins	Help in the **growth of the stem**.
Cytokinins	Promote **cell division**; found in large amounts where cells divide fast, as in **fruits and seeds**.
Abscisic acid	**Inhibits growth**; causes **wilting of leaves** (a stress hormone).

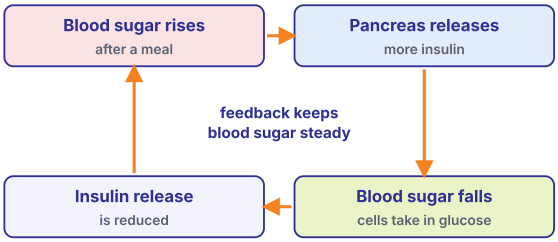
- Plant hormones are made in one part and diffuse to the area of action; they coordinate growth, development and responses to the surroundings.

11 Hormones in animals

Gland (place)	Hormone	Job
Hypothalamus (brain)	Releasing hormones	Make the pituitary release its hormones
Pituitary (brain)	Growth hormone	Growth and development; too little in childhood → **dwarfism**
Thyroid (neck)	Thyroxin (needs **iodine**)	Metabolism of carbohydrates, proteins, fats; lack of iodine → **goitre** (swollen neck)
Pancreas (below stomach)	Insulin	Controls blood sugar; too little → **diabetes**
Adrenal (on the kidneys)	Adrenaline	Prepares the body for emergencies
Testes / ovaries	Testosterone / oestrogen	Changes at **puberty**; development of reproductive organs

- Endocrine glands are **ductless**: they pour hormones straight into the blood.
- **Adrenaline** (fear, anger, a test): heart beats faster to send more oxygen to muscles; blood to the digestive system and skin is cut down; breathing becomes faster.
- **Iodised salt** gives the iodine needed to make thyroxin.

12 Feedback control of hormones



- Hormones must be released in the **right amount** at the **right time**; this is controlled by **feedback mechanisms**.
- Example: when blood sugar rises, pancreas cells detect it and release more insulin; as sugar falls, insulin release is reduced.

Nervous control	Hormonal control
Electrical impulses along nerves	Chemical messengers in the blood
Very fast; short-lived	Slower; long-lasting
Reaches only cells joined to nerves	Reaches all cells; acts on target organs

Explain why – quick answers

Common 1- and 2-mark reasons

A reflex action is quick – the spinal cord decides; the brain is not waited for.

An impulse crosses a synapse one way – chemicals are released only at the axon end.

The brain is surrounded by fluid – the fluid absorbs shocks.

We walk in a straight line – the cerebellum keeps posture and balance.

Electrical impulses are not enough – they reach only nerve-linked cells and need time to reset.

Touch-me-not leaves droop fast – cells lose water and change shape; no growth is needed.

A shoot bends towards a window – auxin on the shaded side makes those cells grow longer.

Tendrils coil round a stick – the side away from the stick grows faster.

Iodised salt is advised – iodine is needed to make thyroxin; lack causes goitre.

Some diabetics take insulin injections – their pancreas makes too little insulin.

The heart races during fright – adrenaline speeds it up to supply more oxygen to muscles.

Hormone levels stay balanced – feedback mechanisms control the amount released.

Exam snapshot

What the board asks, and how to prepare

SYLLABUS 2026–27

- Tropic movements in plants; introduction of plant hormones; control and coordination in animals; nervous system; voluntary, involuntary and reflex action; chemical coordination: animal hormones.

BOARD WEIGHTAGE

30 / 80

Biology = 30 marks (Section A). Unit II **World of Living** (Ch 5–8) = 25 marks. This chapter got 3 marks in the 2026 paper (an MCQ, an A–R and a 1-mark part) and up to 8 marks in 2025 papers, where it carried the 4-mark case on tropisms or the reflex arc.

MOST ASKED IN BOARD AND SAMPLE PAPERS, 2025–2027 (5 PAPERS CHECKED)

How often	Question type	Marks	Papers
★★★	Brain: parts, their functions, protection	1–5	5 of 5
★★★	Neurons, nerves, synapse, reflex arc, muscle action	1–4	3 of 5
★★☆	Hormones in animals, endocrine glands, feedback	1–3	2 of 5
★★★	Coordination in plants: tropisms, touch-me-not, plant hormones	1–4	3 of 5

MISTAKES THAT COST MARKS

- Saying the brain controls a reflex action – the **spinal cord** does; the brain is told later.
- Mixing up cerebrum and cerebellum: **cerebellum** = balance, posture, precision.
- Writing that touch-me-not shows a tropism – it is an **immediate movement without growth**, caused by changes in the water content of cells.
- Saying auxin collects on the lighted side – it moves to the **shaded** side.
- Calling insulin an enzyme, or saying hormones travel through ducts – they go straight into the **blood**.
- Writing the impulse path the wrong way: it is **dendrite → cell body → axon**.

HOW TO USE THIS BOOKLET

1. **Day 1:** Read the notes and the key tables; then Part A (NCERT).
2. **Day 2:** Part B (Exemplar) and Part C (board pattern). Do every MUST DO question first.
3. **Day 3:** Part D (case studies) and the real board questions listed in Part E.
4. **Thu 17 Dec (zero period): Biology chapter test – 20 marks, 40 minutes.**
5. Check every answer in the **Answer Booklet**. Write each mistake on the My Mistakes page (Part F).

A

PART A · NCERT PRACTICE

NCERT Practice

The ideas of every NCERT activity, in-text question and exercise, asked in new words. Finish every question.

Nervous system

A1. How is a reflex action different from walking? MUST DO [2]

A2. What happens at the synapse between two neurons? MUST DO [2]

A3. Which part of the brain maintains posture and balance of the body? [1]

A4. How do we detect the smell of an agarbatti (incense stick)? [2]

A5. What is the role of the brain in a reflex action? [2]

A6. Describe the structure of a neuron and the function of its parts. MUST DO [3]

A7. What is the function of receptors? What problems may arise if they do not work properly? [2]

A8. How are the brain and the spinal cord protected? MUST DO [2]

A9. Name the parts of the central nervous system and of the peripheral nervous system. [2]

A10. Which signals get disrupted when the spinal cord is injured? [2]

A11. What is a reflex arc? Show the path of a reflex arc by a flow chart. MUST DO [3]

Coordination in plants

A12. How does a shoot bend towards light? MUST DO [3]

A13. Name a plant hormone that promotes growth and one that inhibits growth. [2]

A14. How is the movement of leaves of the touch-me-not plant different from the movement of a shoot towards light? MUST DO [3]

A15. How do the tendrils of a pea plant climb a support? [2]

A16. Design an experiment to show hydrotropism. [3]

Hormones in animals

A17. How does chemical coordination take place in animals? [2]

A18. Why is the use of iodised salt advised? MUST DO [2]

A19. How does our body respond when adrenaline is released into the blood? MUST DO [3]

A20. Why are some patients of diabetes treated with insulin injections? [2]

A21. What is a feedback mechanism? Give an example. MUST DO [2]

A22. Compare nervous and hormonal coordination (three points). [3]

B

PART B · EXEMPLAR PRACTICE

Exemplar Practice

Exemplar-style questions, one step harder. Give a reason with every short answer.

Multiple choice

1 mark each

B1. Which of these is a plant hormone? [1]

(a) Insulin (b) Thyroxin (c) Cytokinin (d) Oestrogen

B2. The tiny gap between the nerve ending of one neuron and the dendrite of the next is the: [1]

(a) dendrite (b) synapse (c) axon (d) impulse

B3. The brain is responsible for: [1]

(a) thinking (b) regulating the heartbeat
(c) balancing the body (d) all of these

B4. The growth of a pollen tube towards the ovule is an example of: [1]

(a) hydrotropism (b) chemotropism (c) geotropism (d) phototropism

B5. Iodine is needed to make the hormone: [1]

(a) adrenaline (b) thyroxin (c) auxin (d) insulin

B6. Dwarfism is caused by too little of which hormone in childhood? [1]

(a) Growth hormone (b) Insulin (c) Adrenaline (d) Testosterone

B7. Abscisic acid in plants causes: [1]

(a) cell division (b) wilting of leaves
(c) lengthening of stem (d) growth of fruit

B8. The spinal cord begins from the: [1]

(a) cerebrum (b) medulla (c) pons (d) cerebellum

B9. Which of these is an involuntary action? [1]

(a) Writing (b) Talking
(c) Salivation when food is in the mouth (d) Running

B10. After a head injury a man cannot walk in a straight line and loses balance. The part most likely affected is the: [1]

(a) cerebrum (b) cerebellum (c) medulla (d) pons

Short answer

2 marks each

B11. Name the hormones released by the testes and the ovaries, and state one function of each. [2]

B12. Why is a reflex action quicker than a voluntary action? [2]

B13. The leaves of a touch-me-not plant droop when touched, but there is no growth. How does this happen? [2]

B14. State one function each of gibberellins and cytokinins. [2]

B15. What will happen if the nerve joining a leg muscle to the spinal cord is cut? [2]

C

PART C · BOARD PATTERN

Board Pattern Practice

Question types from the 2025 and 2026 board papers and the CBSE sample papers. ★★★ = asked in 3 or more of the 5 papers checked · ★★ = 2 papers · ★ = 1 paper.

ASSERTION–REASON: HOW TO ANSWER

(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.

The brain

★★★ 5 of 5 papers · 1–5 marks

C1. Which part of the brain makes our voluntary actions precise, like threading a needle? [1]

(a) Cerebrum (b) Cerebellum (c) Medulla (d) Pons

C2. Blood pressure, salivation and vomiting are controlled by the: [1]

(a) cerebrum (b) cerebellum (c) medulla (d) hypothalamus

C3. The centre associated with hunger is in the: [1]

(a) forebrain (b) midbrain (c) cerebellum (d) medulla

C4. ASSERTION–REASON [1]

Assertion (A): The brain lies inside a fluid-filled balloon within the skull.

Reason (R): The fluid acts as a shock absorber and protects the brain.

C5. Name the two regions of the brain that control involuntary actions. Which part controls blood pressure and vomiting? [2]

C6. Name the part of the brain responsible for (i) thinking and memory (ii) posture and balance. How is the brain protected? MUST DO [3]

Neurons, nerves and reflexes

★★★ 3 of 5 papers · 1–4 marks

C7. The correct path of a nerve impulse through a neuron is: [1]

(a) Axon → cell body → dendrite → nerve ending

(b) Dendrite → cell body → axon → nerve ending

(c) Cell body → dendrite → axon → nerve ending

(d) Nerve ending → axon → cell body → dendrite

C8. A nerve that carries impulses from the spinal cord to a muscle is a: [1]

(a) sensory nerve (b) motor nerve (c) relay neuron (d) cranial nerve

C9. ASSERTION–REASON [1]

Assertion (A): Reflex actions are very fast.

Reason (R): In a reflex arc, the response is decided in the spinal cord without waiting for the brain.

C10. ASSERTION–REASON [1]

Assertion (A): A nerve impulse crosses a synapse in only one direction.

Reason (R): Chemicals are released only at the nerve ending of the axon.

C11. How does a muscle contract when it receives a nerve impulse? MUST DO [2]

C12. You touch a hot iron and pull your hand back at once. Name this action and trace its path. Where is the decision taken? MUST DO [3]

C13. Distinguish between a sensory neuron and a motor neuron. [2]

Hormones in animals

★★☆ 2 of 5 papers · 1–3 marks

C14. Adrenaline is secreted by the: [1]

(a) thyroid (b) pituitary (c) adrenal glands (d) pancreas

C15. Which endocrine gland is present in the brain? [1]

(a) Thyroid (b) Pituitary (c) Adrenal (d) Pancreas

C16. Goitre is caused by too little of which element in the diet? [1]

(a) Iron (b) Calcium (c) Iodine (d) Sodium

C17. ASSERTION–REASON [1]

Assertion (A): Hormones are released in the right amount at the right time.

Reason (R): Feedback mechanisms control the timing and amount of hormone release.

C18. State two limitations of using electrical impulses for communication in the body. How does chemical communication overcome them? MUST DO [3]

C19. Name the gland that secretes each hormone and give one function: (i) thyroxin (ii) insulin (iii) growth hormone. MUST DO [3]

C20. Which hormones bring about the changes of puberty in boys and girls? Give one change in each. [2]

Coordination in plants

★★★ 3 of 5 papers · 1–4 marks

C21. A potted plant near a window bends towards the window because: [1]

(a) auxin collects on the lighted side

(b) auxin collects on the shaded side, making cells there grow longer

(c) abscisic acid collects on the shaded side

(d) cells on the lighted side divide faster

C22. The leaves of a touch-me-not plant fold when touched because: [1]

(a) new cells grow quickly (b) cells change shape by changing their water content

(c) auxin moves to the leaves (d) gravity pulls them down

C23. ASSERTION–REASON [1]

Assertion (A): The tendrils of a pea plant coil around a support.

Reason (R): The part of the tendril away from the support grows faster than the part touching it.

C24. Name the plant hormone that (i) promotes cell division (ii) causes wilting of leaves (iii) helps the stem grow (iv) is made at the shoot tip and makes cells grow longer. [2]

C25. Give three differences between the movement of touch-me-not leaves on touch and the movement of a shoot towards light. MUST DO [3]

Long answer

5 marks

C26. (a) Name the three main regions of the human brain and give one function of each. (b) Give the functions of the medulla and the cerebellum. (c) How is the brain protected? MUST DO [5]

C27. (a) What are hormones? Why are endocrine glands called ductless? (b) Name the hormone and gland involved in (i) goitre (ii) diabetes (iii) a ‘fight or flight’ response. (c) Explain the feedback control of insulin. [5]

C28. (a) What are tropic movements? Name the tropism shown by (i) roots growing down (ii) a pollen tube growing to the ovule (iii) roots growing towards water. (b) Explain the role of auxin in phototropism. (c) Name a plant hormone that inhibits growth. [5]

PART D · SECTION A CASE STYLE

D Case-Based Questions

Each case carries 4 marks (1 + 1 + 2), as in the case-based questions of the board paper.

D1. Case Study · The Hot Tava [4]

While helping in the kitchen, Kabir touched a hot tava by mistake. His hand jerked back before he even felt the pain. A moment later he felt the burning and shouted for ice. His sister said his spinal cord had "saved" him.

(i) Name the type of action shown by Kabir's hand. [1]

(ii) Which part of the nervous system took the decision to pull the hand back? [1]

(iii) Write the path of the impulse in this action, from receptor to effector. [2]

OR

(iii) Why did Kabir feel the pain only after pulling his hand back? Why have such actions evolved? [2]

D2. Case Study · The Bending Seedling [4]

Students kept a pot of bean seedlings in a box with a small hole on one side, so light entered only from that side. After four days the shoots had bent towards the hole, while the roots grew straight down. When the pot was turned around, the shoots slowly bent the other way.

(i) Name the response of the shoots to light. [1]

(ii) Name the hormone responsible for the bending. [1]

(iii) Explain how this hormone makes the shoot bend towards the hole. [2]

OR

(iii) Name the response of the roots, and the stimulus. How is this response different from the folding of touch-me-not leaves? [2]

D3. Case Study · The Sugar Test [4]

At a health camp, Nisha's grandfather's blood sugar was found to be very high. The doctor said his pancreas was not making enough of a hormone. Her classmate's mother had a swelling in the neck, and the doctor advised her to use iodised salt.

(i) Name the hormone that the grandfather lacks. [1]

(ii) Name the disease that the classmate's mother has. [1]

(iii) How is the level of this hormone normally kept right in a healthy person? [2]

OR

(iii) Why does lack of iodine cause the swelling? Name the gland and the hormone involved. [2]

E

PART E · REAL BOARD QUESTIONS

Board PYQ Index

Real questions from recent Science board papers and CBSE sample papers, by type. Open the official paper and solve the listed questions.

Frequency	Question type	Marks	Where asked (year: paper code, question number)	Practise here
★★★	**Brain: parts, their functions, protection**	1–5	**2026:** 31/1/1 Q4 (precision of voluntary actions) · **2025:** OD Set 1 Q22 (protection; part for balance) · **2025:** Delhi Set 1 Q38 OR (parts of the brain) · **SQP 2024–25:** Q11 (cerebellum) · **SQP 2026–27:** Q11 (regions for involuntary actions)	A3, A8–A9, B3, B8–B10, C1–C6, C26
★★★	**Neurons, nerves, synapse, reflex arc, muscle action**	1–4	**2026:** 31/1/1 Q8 (A–R, reflex action), Q14(b) (sensory vs motor nerve) · **2025:** Delhi Set 1 Q38 (case, reflex arc) · **SQP 2026–27:** Q13 (muscle contraction)	A1–A2, A4–A7, A10–A11, B2, B12, B15, C7–C13, D1
★★☆	**Hormones in animals, endocrine glands, feedback**	1–3	**2025:** OD Set 1 Q9 (endocrine gland in the brain) · **2025:** Delhi Set 1 Q30 (limits of electrical impulses)	A17–A22, B5–B6, B11, C14–C20, C27, D3
★★★	**Coordination in plants: tropisms, touch-me-not, plant hormones**	1–4	**2025:** OD Set 1 Q38 (case: tropisms, hormones) · **SQP 2024–25:** Q38 (case: phototropism, touch-me-not) · **SQP 2026–27:** Q11 OR (touch-me-not)	A12–A16, B1, B4, B7, B13–B14, C21–C25, C28, D2

PAPERS CHECKED (5)

- 2026 board paper 31/1/1 (Set 1) – first paper with separate Biology, Chemistry and Physics sections
- 2025 board paper, Outside Delhi Set 1
- 2025 board paper, Delhi Set 1
- CBSE Sample Question Paper 2024–25
- CBSE Sample Question Paper 2026–27 (the pattern for your exam)

★★★ = asked in 3 or more of the 5 papers checked · ★★ = 2 papers · ★ = 1 paper. Codes: OD = Outside Delhi. Each paper was read question by question; questions from the 2026–27 Sample Paper after Q20 were checked from a summary of the paper. Download the official papers from cbse.gov.in → Previous Year Question Papers and cbseacademic.nic.in → Sample Question Papers, and solve the exact questions listed.

F

PART F · YOUR RECORD

My Mistakes

Write down each mistake from this chapter, including the chapter test.

Every wrong answer is a free lesson. Write it here, find the rule you missed, and redo the question after three days. Bring this page to class before the chapter test.

Date	Part & Q No.	What went wrong	Correct rule or method	Redone ✓