UNIQUE STUDY POINT

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Class: X	**Subject:** Science	**Session:** 2025-26
Chapter: 06 - Control and Coordination	**Time:** 1½ Hours	**Max. Marks:** 40

General Instructions:

1. All questions are compulsory.
2. This question paper contains 20 questions divided into five sections A, B, C, D and E.
3. Section A contains 10 MCQs of 1 mark each.
4. Section B contains 4 questions of 2 marks each.
5. Section C contains 3 questions of 3 marks each.
6. Section D contains 1 question of 5 marks.
7. Section E contains 2 Case Study Based questions of 4 marks each.

SECTION A - Multiple Choice Questions (1 mark each)

Q1. Which of the following is NOT a function of thyroxin hormone?

(a) Regulates carbohydrate metabolism
(b) Regulates protein metabolism
(c) Regulates fat metabolism
(d) Regulates blood sugar level

Q2. The system that uses hormones for control and coordination is called:

(a) Nervous system
(b) Endocrine system
(c) Circulatory system
(d) Excretory system

Q3. Which gland is called the "master gland" of the endocrine system?

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

Q4. Gibberellins help in:

(a) Cell division
(b) Growth of stem
(c) Wilting of leaves
(d) Root formation

Q5. The hormone responsible for development of female secondary sexual characteristics is:

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

Q6. Chemical coordination in plants is achieved through:

(a) Neurons
(b) Hormones
(c) Enzymes
(d) Muscles

Q7. The growth of pollen tubes towards ovules is an example of:

(a) Phototropism
(b) Geotropism
(c) Chemotropism
(d) Hydrotropism

Q8. Receptors are specialized tips of:

(a) Muscle cells
(b) Nerve cells
(c) Blood cells
(d) Epithelial cells

Q9. Which part of the brain is protected by the skull?

(a) Only cerebrum
(b) Only cerebellum
(c) Entire brain
(d) Only medulla

Q10. Excess secretion of growth hormone in adults causes:

(a) Dwarfism
(b) Acromegaly
(c) Cretinism
(d) Diabetes

SECTION B - Short Answer Questions (2 marks each)

Q11. What is the role of hypothalamus in hormone regulation? Give one example.

Q12. Why are some movements in animals and plants not caused by growth? Give one example each.

Q13. How does chemical coordination differ from electrical coordination in terms of speed and reach?

Q14. State two differences between nervous control and hormonal control in animals.

SECTION C - Short Answer Questions (3 marks each)

Q15. Explain how tendrils of a pea plant support the plant in climbing. What type of tropism is involved?

Q16. Name any three plant hormones and state one function of each.

Q17. How does information travel from one neuron to another? Explain the role of synapse.

SECTION D - Long Answer Question (5 marks)

Q18. Compare and contrast the nervous system and endocrine system as coordination systems in animals. Discuss their advantages and limitations.

SECTION E - Case Study Based Questions (4 marks each)

Q19. **Case Study 1:** During a medical camp, doctors identified several children with abnormally short height despite adequate nutrition. After investigation, it was found that these children had deficiency of a particular hormone secreted by the pituitary gland. The doctors prescribed hormone replacement therapy to help these children grow normally.

Based on this case, answer the following questions:

(a) Which hormone deficiency causes short stature in children? (1 mark)

(b) Which gland secretes this hormone? (1 mark)

(c) What would happen if this hormone is secreted in excess during childhood? Explain why early diagnosis is important. (2 marks)

Q20. **Case Study 2:** A biology student conducted an experiment to study plant hormones. She applied a paste containing auxin on one side of a plant stem. After a few days, she observed that the stem bent away from the side where auxin was applied. She also noticed that when she applied auxin evenly on all sides, the plant grew taller without any bending.

Based on this experiment, answer the following questions:

(a) Why did the stem bend away from the side where auxin was applied? (1 mark)

(b) What happened when auxin was applied evenly? Why? (1 mark)

(c) Explain how this experiment demonstrates the role of auxin in plant growth. (2 marks)

DETAILED ANSWER KEY - PAPER 03

SECTION A - Answers to MCQs

Ans 1. (d) Regulates blood sugar level

Thyroxin regulates carbohydrate, protein, and fat metabolism but does not directly regulate blood sugar levels. Insulin regulates blood sugar.

Ans 2. (b) Endocrine system

The endocrine system uses chemical messengers called hormones for control and coordination in the body.

Ans 3. (c) Pituitary gland

The pituitary gland is called the master gland because it controls the functioning of other endocrine glands through its hormones.

Ans 4. (b) Growth of stem

Gibberellins, like auxins, help in the growth of the stem and promote overall plant growth.

Ans 5. (c) Oestrogen

Oestrogen is the female sex hormone responsible for development of female secondary sexual characteristics and regulating the menstrual cycle.

Ans 6. (b) Hormones

Plants use hormones (chemical substances) for coordination as they lack a nervous system.

Ans 7. (c) Chemotropism

The growth of pollen tubes toward ovules is chemotropism, a directional growth response to chemical stimuli released by ovules.

Ans 8. (b) Nerve cells

Receptors are specialized tips of nerve cells (neurons) that detect environmental stimuli and are usually located in sense organs.

Ans 9. (c) Entire brain

The entire brain is protected by the skull (cranium), which forms a bony box around it for protection.

Ans 10. (b) Acromegaly

Excess secretion of growth hormone in adults causes acromegaly, characterized by enlargement of bones in hands, feet, and face.

SECTION B - Answers to Short Answer Questions

Ans 11.

The hypothalamus plays an important regulatory role in hormone secretion. It produces releasing hormones that control the pituitary gland's activity.

Example: When growth hormone levels are low, the hypothalamus releases growth hormone releasing factor, which stimulates the pituitary gland to secrete growth hormone. This demonstrates how the hypothalamus acts as a link between the nervous system and endocrine system.

Ans 12.

Not all movements require growth because organisms need rapid responses to environmental changes.

Animals: A cat running away from a dog - this movement is caused by muscle contraction, not growth. It is a quick response for survival.

Plants: Folding of leaves in the sensitive plant (Mimosa pudica) when touched - this movement is caused by changes in water content of cells, not growth. It is reversible and rapid.

Ans 13.

Speed: Electrical coordination (nervous system) is very fast as electrical impulses travel rapidly along neurons. Chemical coordination (hormonal) is slower as hormones must be transported through blood to reach target organs.

Reach: Electrical coordination reaches only cells connected by nervous tissue. Chemical coordination reaches all cells of the body as hormones are carried by blood throughout the organism, providing wide-ranging effects.

Ans 14.

Two differences between nervous and hormonal control:

1. **Speed of Response:** Nervous control produces rapid responses through electrical impulses, while hormonal control produces slower responses through chemical messengers in blood.

2. **Duration of Effect:** Nervous control produces short-lived effects that stop when stimulation ends, while hormonal control produces longer-lasting effects that persist even after hormone secretion stops.

[Other valid differences: Medium of transmission (electrical vs chemical), Specificity (specific pathway vs widespread), Type of response (localized vs generalized)]

SECTION C - Answers to Short Answer Questions

Ans 15.

Tendrils are thread-like structures in pea plants that help them climb by coiling around supports. The mechanism works as follows:

1. Tendrils are sensitive to touch and exhibit **thigmotropism** (touch-induced directional growth).

2. When a tendril comes in contact with a support (like a stick or fence), the part of the tendril in contact with the object does not grow as rapidly as the part away from the object.

3. This unequal growth causes the tendril to circle around the support and cling to it tightly.

This adaptation helps the weak-stemmed pea plant to climb upward toward sunlight for better

photosynthesis while using the support for mechanical strength.

Ans 16.

Three plant hormones and their functions:

1. **Auxin:** Promotes cell elongation and helps in phototropic response. Synthesized at shoot tip, it causes bending of shoots toward light.

2. **Gibberellins:** Promote stem growth and help in overall plant elongation, similar to auxins.

3. **Cytokinins:** Promote cell division and are present in high concentrations in areas of rapid cell division such as fruits and seeds.

[Other acceptable answers: Abscisic acid - inhibits growth and causes wilting of leaves]

Ans 17.

Information travels from one neuron to another through a process involving both electrical and chemical signals:

1. An electrical impulse travels along the axon of the first neuron until it reaches the nerve ending (axon terminal).

2. At the axon terminal, the electrical impulse triggers the release of chemical substances called neurotransmitters.

3. These neurotransmitters diffuse across the synapse (the small gap between two neurons).

4. The neurotransmitters bind to receptors on the dendrite of the next neuron, generating a new electrical impulse in that neuron.

Role of Synapse: The synapse ensures one-way transmission of information, prevents signal mixing, and allows for signal modulation and integration of multiple inputs.

SECTION D - Answer to Long Answer Question

Ans 18.

Comparison of Nervous System and Endocrine System:

SIMILARITIES:

- Both are coordination systems that help maintain homeostasis
- Both respond to environmental changes
- Both work together to regulate body functions

DIFFERENCES:

Aspect	Nervous System	Endocrine System
Signal Type	Electrical impulses	Chemical messengers (hormones)
Speed	Very fast (milliseconds)	Slower (seconds to hours)
Duration	Short-lived effects	Long-lasting effects

Pathway	Specific nerve pathways	Through bloodstream
Target	Specific organs/muscles	Can affect multiple organs

ADVANTAGES:

Nervous System:

• Extremely fast responses for emergencies
• Precise, localized control
• Can be voluntarily controlled

Endocrine System:

• Can reach all cells in the body
• Sustained, long-term regulation
• Energy-efficient for ongoing processes

LIMITATIONS:

Nervous System:

• Reaches only connected cells
• Cannot maintain continuous stimulation
• Requires energy for each impulse

Endocrine System:

• Slow response time
• Less precise targeting
• Difficult to stop once started

CONCLUSION: Both systems complement each other, with the nervous system providing rapid, precise control and the endocrine system providing sustained, widespread regulation.

SECTION E - Answers to Case Study Based Questions

Ans 19.

(a) Growth hormone deficiency causes short stature (dwarfism) in children.

(b) The pituitary gland secretes growth hormone.

(c) If growth hormone is secreted in excess during childhood, it leads to gigantism (abnormally tall stature).

Importance of Early Diagnosis: Early diagnosis is crucial because:
• Growth hormone therapy is most effective when started during the growth phase (childhood)
• Once growth plates in bones close after puberty, height cannot be increased
• Early treatment prevents psychological and social issues associated with abnormal height
• It ensures normal physical development and quality of life

Ans 20.

(a) The stem bent away from the side where auxin was applied because the high concentration of auxin on one side caused excessive cell elongation on that side. This unequal growth made the stem curve away from the auxin-treated side.

(b) When auxin was applied evenly on all sides, the plant grew taller without bending. This is because all sides received equal amounts of auxin, causing uniform cell elongation all around the stem, resulting in straight vertical growth.

(c) This experiment demonstrates that:
• Auxin promotes cell elongation and plant growth
• Unequal distribution of auxin causes differential growth, leading to bending (as in phototropism)
• Equal distribution promotes uniform, straight growth
• The concentration and distribution pattern of auxin determines the direction of plant growth, which is how plants respond tropically to environmental stimuli like light

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