6 Control and Coordination

Fastrack Revision

- **Coordination in Animals:** In animals, control and coordination is provided by nervous tissues which are made up of an organised network of nerve cells or neurons, and are specialised for conducting information *via* electrical impulses from one part of the body to another.
- **Neurons:** These are the structural and functional units of nervous system. A neuron comprises of dendrite (acquires information), cell body (acquired information travels as an electrical impulse) and axon (transmits electrical impulse from cell body to dendrite of next neuron).
- **Synapse:** It is a small gap between two neurons where nerve impulse passes from one neuron to another. It is the junction between the nerve ending of axon of one neuron and the dendrite of next neuron. Here, electrical impulse is converted into chemical signal for onward transmission.
- **Reflex Action:** It is an involuntary and rapid response to a stimuli that is controlled through the spinal cord *via* relay neuron. *e.g.* withdrawal of hand on touching hot object.
- **Reflex Arc:** It is the pathway through which nerve impulses pass during a reflex action.
  Reflex arcs are formed in the spinal cord. This provides more active reflex actions to happen by stimulating spinal motor neurons, without the suspension of routing signals through the brain.
  The following flow chart shows the flow of signal in a reflex arc :
  Receptor → Sensory neuron → Spinal cord (Relay neuron) → Motor neuron → Effector muscle.
- **Central Nervous System (CNS):** It includes the brain and spinal cord.
- **Peripheral Nervous System (PNS):** It consists of all the nerves, *i.e.,* the cranial and spinal nerves, connecting the central nervous system with different parts of the body.
- **Brain:** It is the main coordinating centre of the body which enables an organism to think and take decisions. Forebrain, midbrain and hindbrain are three parts of the brain. Brain is protected by a fluid filled balloon that acts as a shock absorber and is enclosed in a bony case known as cranium (skull or brain box).
  - **Forebrain:** It is the main thinking part of the brain. It is specialised in hearing, smell, sight etc. It controls the movement of voluntary muscles (leg muscles) and the centre associated with hunger is also located in it.
  - Involuntary actions like blood pressure, salivation and vomiting are controlled by the medulla in the hindbrain.
  - Cerebellum, a part of hindbrain, is responsible for precision of voluntary actions and maintaining the posture and balance of the body.
- **Coordination in Plants:** It occurs *via* electrochemical means to convey information from one cell to another.
- **Sensitivity of Plants:** It refers to the ability of a plant to detect changes in water content and responding by changing their shapes such as swelling or shrinking of cells *e.g.,* drooping of leaves of 'Touch-me-not' plant on touching it.
- **Plant Movements:** It occurs in response to a stimuli and can be of two types, *i.e.*, tropic or nastic.
  - **Tropic Movements:** These movements of plant occur in the direction of stimulus, *e.g.*, phototropism (stimulus-light), geotropism (stimulus-gravity), hydrotropism (stimulus-water) and chemotropism (growth of pollen tube towards ovule).
  - **Nastic Movements:** These movements occur irrespective of direction of stimulus, *e.g.*, drooping of leaves of touch-me-not plant on touching it.
- **Chemical coordination** involves chemical compounds or hormones that are released for coordination.
- **Plant Hormones:** These are the chemical substances naturally produced in plants for regulation of growth, development and responses to the environment. They are also called phyto-hormones. Main plant hormones are:
  - **Auxin**, synthesised at shoot tip, helps the cells to grow longer.
  - **Gibberellins** help in the growth of the stem.
  - **Cytokinins** promote cell division and are present in greater concentration in fruits and seeds.
  - **Abscisic acid** inhibits growth and causes wilting of leaves. It is a stress hormone.

MNEMONICS

Concept : *Plant Hormones*
Mnemonics: A CAGE
Interpretation:

A – Auxins	*C – Cytokinins*
A – Abscisic Acid	*G – Gibberellins*
E – Ethylene	

- **Animal Hormones:** These are chemical compounds or messengers, secreted in small quantities by endocrine glands, to coordinate their activities and growth.
  - **Endocrine Glands:** These are ductless glands which act at distant sites on target organs. These include pituitary, thyroid, pancreas, adrenal glands, testis and ovaries.

List of different endocrine glands and their functions are given below:

Endocrine Glands	Functions
Thyroid gland	Produces thyroxine hormone that regulates carbohydrate, protein and fat metabolism in the body.
Adrenal gland	Produces adrenaline that prepares the body for emergency situations.
Pancreas	Produces insulin which regulates blood sugar levels in our body.
Testis	Produces testosterone required for development of male secondary sexual characteristics such as beard and moustaches during puberty.
Pituitary gland	Secretes growth hormone that regulates the growth and development of the body.
Ovaries	Produces oestrogen needed for development of female sex organs, regulates menstrual cycle.

- **Hormonal Disorders:** They occur when glands malfunction and hormone production is affected.
- **Dwarfism:** Deficiency of growth hormone.
- **Gigantism:** Excessive secretion of growth hormone.
- **Diabetes:** Reduced amount of insulin is secreted by pancreas which is responsible to control blood sugar levels.
- **Goitre:** Deficiency of iodine causing less secretion of thyroxine hormone.
- **Feedback Mechanism:** It is the regulation of amount and the timing of hormonal secretion since the excess or deficiency of hormones has a harmful effect on our body.

Practice Exercise

Multiple Choice Questions

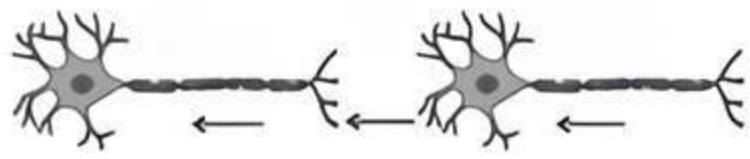
Q 1. Receptors are usually located in sense organs. Gustatory receptors are present in: *(CBSE SQP 2023-24)*

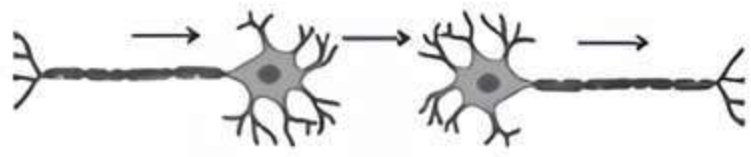
a. tongue
b. nose
c. eye
d. ear

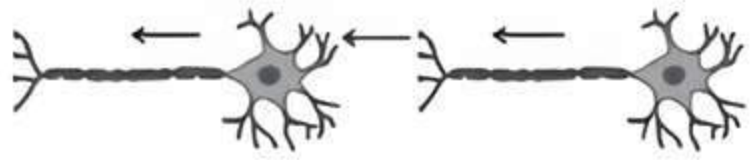
Q 2. In a neuron, conversion of electrical signal to a chemical signal occurs at/in:

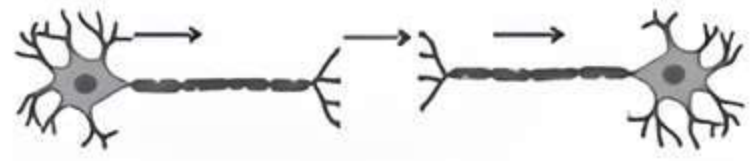
a. cell body
b. axonal end
c. dendritic end
d. axon

Q 3. What is the correct direction of flow of electrical impulses?

a. 

b. 

c. 

d. 

Q 4. Sensory nerve of a reflex arc carries information from the receptor cells to the: *(CBSE 2023)*

a. spinal cord
b. brain
c. muscles of the effector organ
d. bones of the receptor organ

Q 5. Which is the correct sequence of the components of a reflex arc?

a. Receptors → Muscle → Sensory neuron → Motor neuron → Spinal cord
b. Receptors → Motor neuron → Spinal cord → Sensory neuron → Muscle
c. Receptors → Spinal cord → Sensory neuron → Motor neuron → Muscle
d. Receptors → Sensory neuron → Spinal cord → Motor neuron → Muscle

Q 6. Which of the following statements are true about the brain?

(i) The main thinking part of brain is hindbrain.
(ii) Centres of hearing, smell, memory, sight, etc., are located in forebrain.
(iii) Involuntary actions like salivation, vomiting, blood pressure are controlled by the medulla in the hind brain.
(iv) Cerebellum does not control posture and balance of the body.

a. (i) and (ii)
b. (i), (ii) and (iii)
c. (ii) and (iii)
d. (iii) and (iv)

Q 7. Spinal cord originates from:

a. cerebrum
b. medulla
c. pons
d. cerebellum

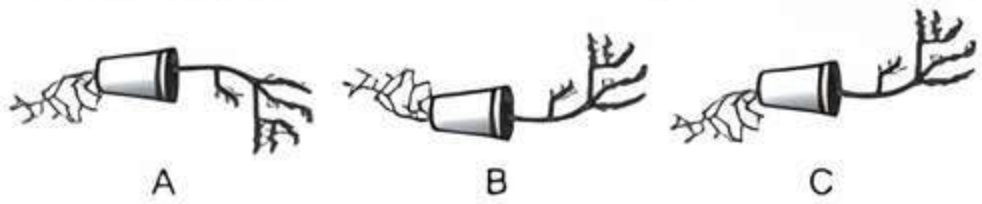
Q 8. Involuntary actions in the body are controlled by:

a. medulla in forebrain
b. medulla in midbrain
c. medulla in hindbrain
d. medulla in spinal cord

Q 9. The growth of tendril in pea plants is due to:

a. effect of light
b. effect of gravity
c. rapid cell divisions in tendrillar cells that are away from the support
d. rapid cell divisions in tendrillar cells in contact with the support

Q 10. Observe the three figures given below. Which of the following depicts tropic movements appropriately? *(CBSE SQP 2022-23)*



a. *B* and *C*
b. *A* and *C*
c. Only *B*
d. Only *C*

Q 11. The growth of pollen tubes towards ovules is due to:

a. hydrotropism b. chemotropism
c. geotropism d. phototropism

Q 12. The substance that triggers the fall of mature leaves and fruits from plants is due to:

a. auxin b. gibberellins
c. abscisic acid d. cytokinin

Q 13. In plants, the role of cytokinin is: *(CBSE 2023)*

a. promote cell division
b. wilting of leaves
c. promote the opening of stomatal pore
d. help in the growth of stem

Q 14. The directional movement in plants as shown in figure is due to which plant hormone?

a. Cytokinins b. Abscisic acid
c. Ethylene d. Auxin

Q 15. Choose the incorrect statement about insulin.

a. It is produced from pancreas
b. It regulates growth and development of the body
c. It regulates blood sugar level
d. Insufficient secretion of insulin will cause diabetes

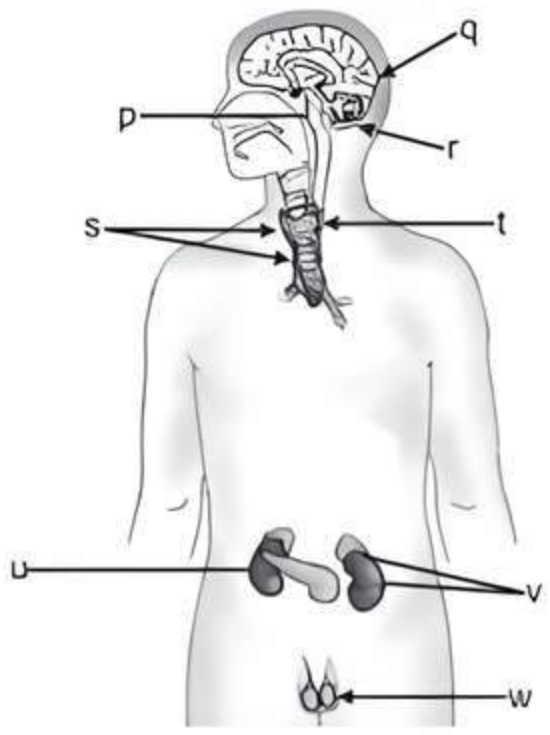
Q 16. Dramatic changes of body features associated with puberty are mainly because of secretion of:

a. oestrogen from testes and testosterone from ovary
b. oestrogen from adrenal gland and testosterone from pituitary gland
c. testosterone from testes and oestrogen from ovary
d. testosterone from thyroid gland and oestrogen from pituitary gland

Q 17. Select the mis-matched pair:

a. Adrenaline : Pituitary gland
b. Testosterone : Testes
c. Oestrogen : Ovary
d. Thyroxin : Thyroid gland

Q 18. Refer to the given figure depicting locations of several endocrine glands in a human female and answer the following questions.



Identify the labelled glands and select the option with any four correct labels.

a. u-Pancreas, w-Ovary, p-Hypothalamus, q-Pineal
b. p-Pituitary, t-Thyroid, u-Adrenal, w-Ovary
c. s-Parathyroid, q-Pineal, v-Ovary, u-Thyroid
d. q-Pituitary, t-Adrenal, p-Hypothalamus, v-Pancreas

Q 19. Which of the following endocrine glands is unpaired?

a. Adrenal b. Testes c. Pituitary d. Ovary

Q 20. In humans, the life processes are controlled and regulated by:

a. reproductive and endocrine systems
b. respiratory and nervous systems
c. endocrine and digestive systems
d. nervous and endocrine systems

Assertion & Reason Type Questions

Directions (Q. Nos. 21-25): *Each of the following questions consists of two statements, one is Assertion (A) and the other is Reason (R). Give answer:*

a. Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
b. Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
c. Assertion (A) is true but Reason (R) is false.
d. Assertion (A) is false but Reason (R) is true.

Q 21. Assertion (A): A neuron transmits message in both directions.
Reason (R): Neuron is specialised for conducting information *via* electrical impulses from one part of body to another.

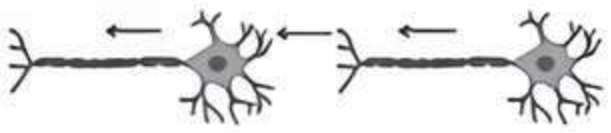
Q 22. Assertion (A): Cerebellum controls the coordination of body movement and posture.
Reason (R): Medulla oblongata controls and regulates the centre for coughing, sneezing and vomiting.

Q 23. Assertion (A): Movement of leaves of sensitive plant is different from movement of a shoot towards light.
Reason (R): Sensitive plant shows seismonastic movements which are due to turgidity of cells whereas the movement of shoot is a tropic movement.

Q 24. Assertion (A): Adrenaline makes the heartbeat faster, resulting in supply of more oxygen to our muscles.
Reason (R): Adrenaline is secreted directly into the blood and carried to different parts of the body.

Q 25. Assertion (A): Amount and timing of hormones released are regulated by feedback mechanisms.
Reason (R): Hypersecretion or hyposecretion of any hormone can lead to different disorders.

Answers

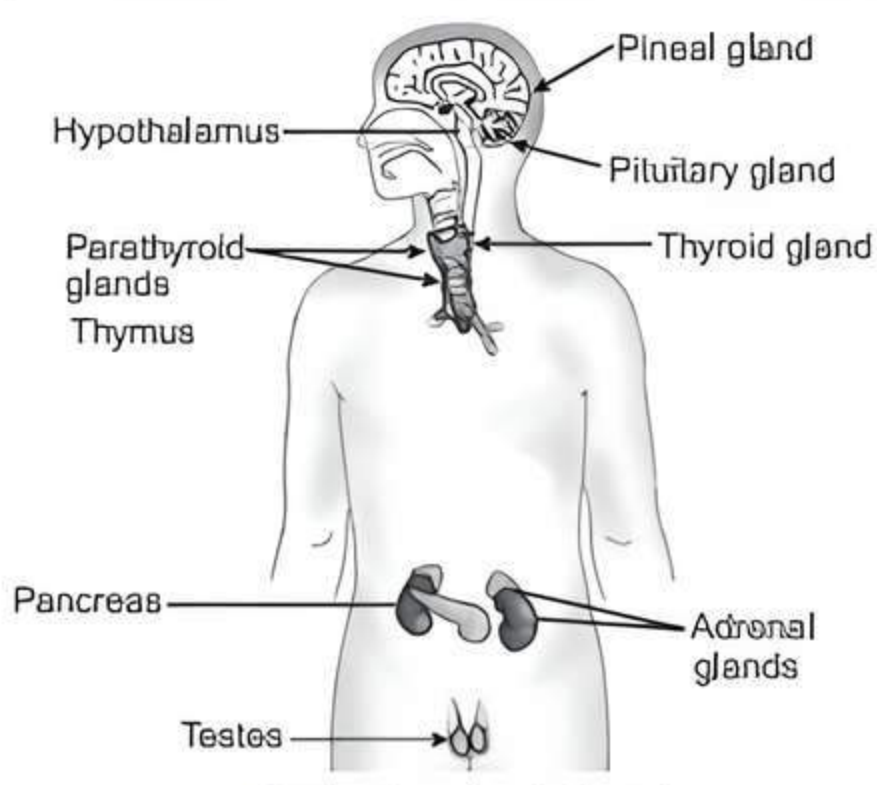
1. (a) tongue
2. (b) axonal end
3. (c) 
4. (a) spinal cord
5. (d) Receptors → Sensory neuron → Spinal cord → Motor neuron → Muscle
6. (c) (ii) and (iii)
7. (b) medulla
8. (c) medulla in hindbrain
9. (c) rapid cell divisions in tendrillar cells that are away from the support
10. (d) Only C
11. (b) chemotropism
12. (c) abscisic acid
13. (a) promote cell division
14. (d) Auxin
15. (b) It regulates growth and development of the body
16. (c) testosterone from testes and oestrogen from ovary
17. (a) Adrenaline : Pituitary gland
18. (a) u-Pancreas, w-Ovary, p-Hypothalamus, q-Pineal
    Here, p is Hypothalamus, q is Pineal gland, r is Pituitary gland, s is parathyroid gland, t is thyroid gland, u is pancreas, v is adrenal gland and w is ovary.
19. (c) Pituitary
20. (d) nervous and endocrine systems
21. (d) Assertion is false because neurons are unidirectional *i.e.*, electrical impulses enter from one end and leave through the other.
22. (b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
23. (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
24. (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
25. (b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).

Case Study Based Questions

Case Study 1

Endocrine glands are ductless glands of the endocrine system that secrete their products, hormones, directly into the blood. The major glands of the endocrine system include the pineal gland, pituitary gland, pancreas, ovaries, testes, thyroid gland, hypothalamus and adrenal glands.

Glands	Hormones
Pituitary gland	Growth hormone
Thyroid gland	Thyroxine
Pancreas	Insulin
Testes	Testosterone
Adrenal gland	Adrenaline



Endocrine glands in male

Read the above passage carefully and give the answer of the following questions:

Q 1. Dwarfism results due to:
a. excess secretion of thyroxine
b. less secretion of growth hormone
c. less secretion of adrenaline
d. excess secretion of growth hormone

Q 2. Which of the following endocrine glands is not present in males?
a. Adrenal b. Testes c. Pituitary d. Ovary

Q 3. Which of the following endocrine glands secretes digestive enzyme as well as hormones?
a. Pancreas b. Thyroxine
c. Adrenaline d. Insulin

Q 4. Which of the following statements are true about the endocrine glands?
(i) They are ductless glands.
(ii) They release their hormones into a duct.
(iii) They produce chemical messengers called hormones.
(iv) They release their hormones directly into the bloodstream.
a. (i) and (iii) b. (i), (iii) and (iv)
c. (i), (ii) and (iii) d. (i) and (iv)

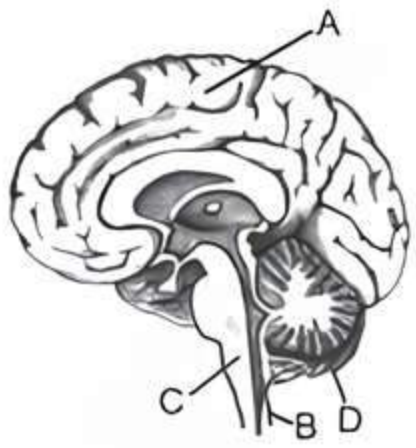
Q 5. Which of the following hormone is responsible for regulation of blood pressure?
a. Thyroxine b. Insulin
c. Testosterone d. Adrenaline

Answers

1. (b) less secretion of growth hormone
2. (d) Ovary
3. (a) Pancreas
4. (b) (I). (III) and (iv)
5. (d) Adrenaline

Case Study 2

Study the figure related to human brain and answer the questions that follow.



Q 1. Name the parts A, B, C and D of human brain.
Q 2. What is the function of the fluid filled in the brain?
Q 3. Name the endocrine gland associated with brain.
Q 4. What constitutes the central nervous system?
Q 5. What constitutes Peripheral Nervous System (PNS)?

Answers

1. A-Cerebrum; B - Spinal cord
   C-Medulla; D - Cerebellum
2. It prevents the brain from mechanical shocks.
3. Pituitary gland
4. The brain and spinal cord constitute the central nervous system.
5. PNS contains the cranial nerves arising from the brain and spinal nerves arising from the spinal cord.

Case Study 3

Thyroid Stimulating Hormone (TSH) stimulates thyroid gland to produce thyroxine. Study the table given below:

Table: TSH levels during pregnancy

Stage of pregnancy	Normal (mU/L)	Low (mU/L)	High (mU/L)
First trimester	0.2-2.5	< 0.2	2.5-10
Second trimester	0.3-3.0	< 0.3	3.0-4.5
Third trimester	0.8-5.2	< 0.8	> 5.2

It is important to monitor TSH levels during pregnancy. High TSH levels and hypothyroidism can especially affect chances of miscarriage. Therefore, proper medication in consultation with a doctor is required to regulate/control the proper functioning of the thyroid gland.

(CBSE 2020)

Read the above passage carefully and give the answer of the following questions:

Q 1. Give the full form of TSH.
Q 2. Where is thyroid gland situated in our body?
Q 3. State the main function of TSH.
Q 4. Why do TSH levels in pregnant women need to be monitored?
Q 5. A pregnant woman has TSH level of 8.95 mU/L. What care is needed for her?

Answers

1. The full form of TSH is Thyroid Stimulating Hormone.
2. The thyroid gland is present in the neck region.
3. TSH regulates the production of thyroid hormone, *i.e.*, thyroxine by the thyroid gland.
4. It is because high and low TSH level may increase the chances of miscarriage.
5. A proper medication in consultation with a doctor is required to bring the TSH level down.

Case Study 4

Study the table related to blood thyroxine levels and answer the questions that follow.

Thyrocare Technologies Ltd.
Thyrocare House, Thane,
Mumbai - 400 607

Thyrocare

REPORT

Name :
Ref. By :
Date : 05-Jun-2010

Test	Value	Units	Normal Range
TOTAL TRIIODOTHYRONINE (T3)	94	ng/dL	(70-200)
TOTAL THYROXINE (T4)	8.70	µg/dL	(4.0-12.0)
THYROID STIMULATING HORMONE (TSH)	77.11	µIU/mL	(0.3-6.0)

- Ultra Sensitive TSH Assay

Comments :
Please correlate with clinical conditions

Q 1. What do you analyse from this blood test report?
Q 2. Which gland secretes thyroxine and TSH hormone?
Q 3. Which diet would you recommend to the affected patient?
Q 4. Enlist the alternative name for "hormones".

Answers

1. TSH level is high and thyroxine level is low.
2. Thyroid gland secretes thyroxine and pituitary gland secretes TSH hormone.
3. Iodine rich diet
4. Chemical coordinators (messengers)

Very Short Answer Type Questions

Q 1. Name the part of the neuron through which information travels as an electrical impulse.
Ans. Axon
Q 2. What is a nerve impulse?
Ans. Nerve impulse is an electrical signal transmitted along a nerve fibre (axon).

Q 3. What is reflex action?

Ans. An involuntary or instantaneous action by the human body parts in response to a stimulus is called reflex action.

Q 4. Which system facilitates communication between central nervous system and other parts of the body?

Ans. Peripheral Nervous System (PNS).

Q 5. Name the major parts of the brain.

Ans. The brain is composed of three main parts: the forebrain, midbrain and hindbrain.

Q 6. Mention the part of brain which controls the involuntary action like blood pressure.

Ans. All involuntary actions such as blood pressure are controlled by the medulla in the hindbrain.

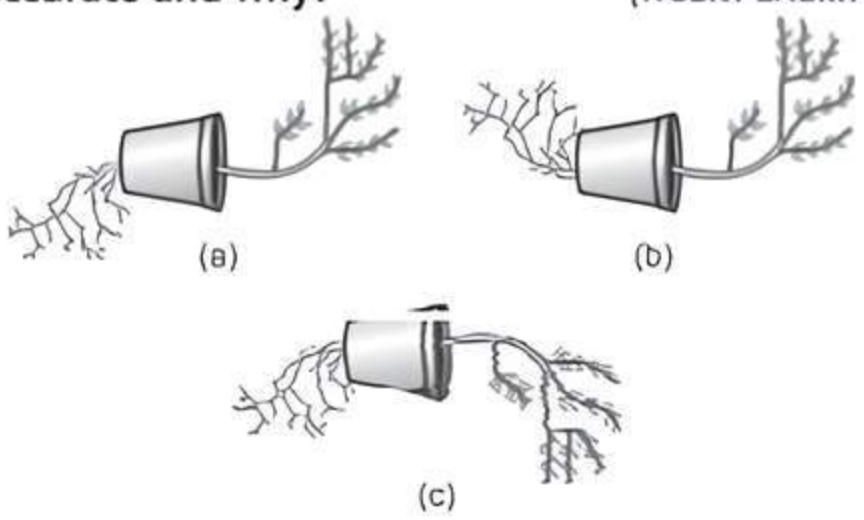
Q 7. Write the function of vertebral column.

Ans. The major function of the vertebral column is protection of the spinal cord.

Q 8. What is a tropic movement? *(NCERT EXEMPLAR)*

Ans. The directional growth movements of plants due to external stimuli are called tropic movements. It can be either towards the stimulus or away from it.

Q 9. In figures (a), (b) and (c), which appears more accurate and why? *(NCERT EXEMPLAR)*



Ans. Figure (a) is more appropriate because in a plant, shoots are negatively geotropic, hence grow upwards and roots are positively geotropic, so they grow downwards.

Q 10. What are plant hormones? *(NCERT EXEMPLAR)*

Ans. Plant hormones or phytohormones are chemical substances that regulate various physiological functions like plant growth, development and responses to the environment.

Q 11. Name the plant hormones responsible for the following:

(i) elongation of cells

(ii) growth of stem *(NCERT EXEMPLAR)*

Ans. (i) Auxin (ii) Gibberellin

Q 12. Name the diseases caused by deficiency of:

(i) iodine **(ii) insulin**

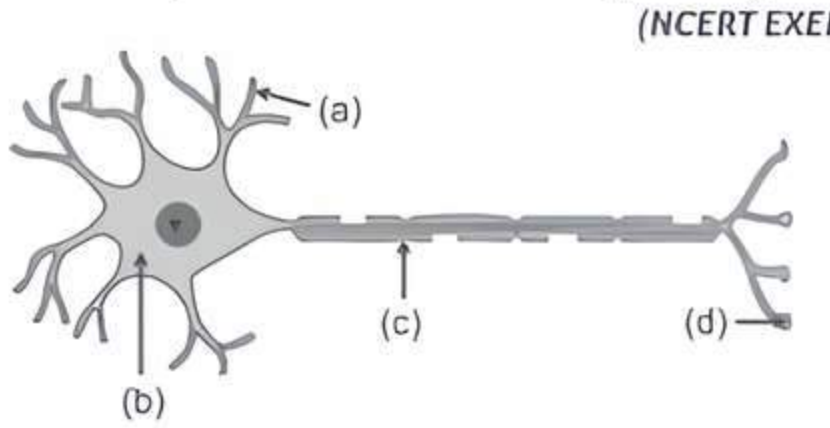
Ans. (i) Goitre (ii) Diabetes

Q 13. Name the hormone in humans which regulates carbohydrate, protein and fat metabolism in the body. Mention the site where it is synthesized.

Ans. The hormone which regulates carbohydrates, protein and fat metabolism in our body is thyroxine. Thyroxine hormone is secreted by the thyroid gland.

Short Answer Type-I Questions

Q 1. Label the parts of a neuron in the given figure: *(NCERT EXEMPLAR)*



Ans. (a) Dendrite (b) Cell body
(c) Axon (d) Nerve ending

Q 2. (i) Name one gustatory receptor and one olfactory receptor present in human beings.

(ii) Write (a) and (b) in the given flow chart of neuron through which information travels as an electrical impulse.

Dendrite → a → b → End point of Neuron

(CBSE 2018)

Ans.

TiP

The basic concepts should be learnt thoroughly. Gustatory receptors and olfactory receptors are the sensory receptors that are related to sense of taste and sense of smell respectively.

(i) Gustatory receptor is tongue and olfactory receptor is nose in the human beings.

(ii) The electric impulse travels from the dendrite to the cell body, and then along the axon to its end. Thus, 'a' is cell body and 'b' is axon.

Q 3. How is the mode of action in beating of the heart different from reflex actions? Give four examples. *(CBSE SQP 2022-23)*

Ans.

S. No.	Basis of Difference	Beating of heart	Reflex actions
1.	Stimulus	They do not need any kind of stimulus to work.	They required stimulus for its action.
2.	Controlled by	These actions are regulated by the brain.	These actions are regulated by the spinal cord.
3.	Skeletal muscle	They do not involve skeletal muscle.	They involve skeletal muscle.
4.	Life	These actions are performed throughout one's life.	These actions are produced in response to an event of an emergency.
5.	Nature	This action may be quick or slow.	Reflex actions are always quick.

(Any four)

Q 4. Name the part of brain which is responsible for the following actions:
(i) Maintaining posture and balance
(ii) Beating of heart
(iii) Thinking
(iv) Blood pressure *(CBSE 2023)*

Ans. (i) Cerebellum (ii) Medulla in hindbrain
(iii) Forebrain (iv) Medulla in hindbrain

Q 5. How is the movement of leaves of the sensitive plants different from the movement of a shoot towards light? *(CBSE 2019)*

Ans.

S.No.	Basis of Difference	Movement of leaf in sensitive plant	Movement of shoot towards light
1.	Nature	This movement does not depend on the direction of stimulus.	This movement depends on the direction of light (stimulus).
2.	Type	It is a nastic movement.	It is a tropic movement.
3.	Growth	It is independent of growth.	It is a growth movement.

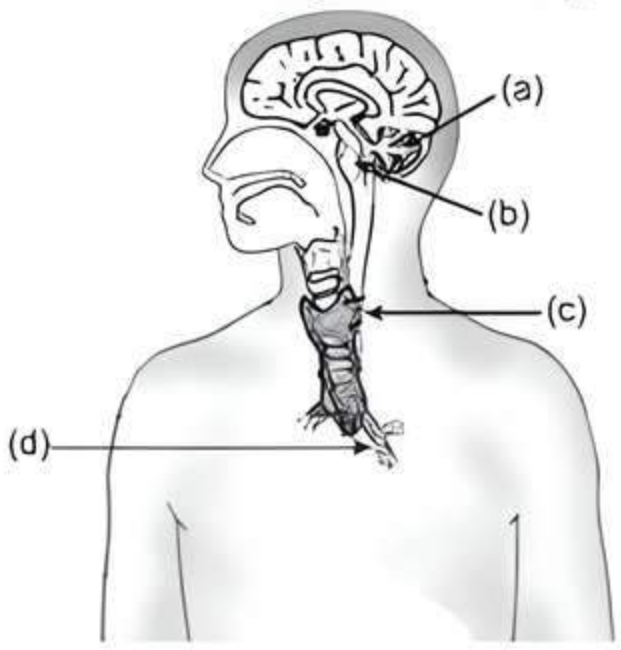
Q 6. Where are auxins synthesised in a plant? Which organ of the plant shows:
(i) positive phototropism?
(ii) negative geotropism?
(iii) positive hydrotropism? *(CBSE 2023)*

Ans. Auxins are synthesised at the shoot tip.
(i) Shoot (ii) Stem (iii) Root

Q 7. Name the hormone secreted in scary situations by animals. Write any three responses which enable the animal body to deal with it. *(CBSE 2023)*

Ans. Adrenaline is secreted in scary situations by animals. Following responses enable the animal body to deal with this situation:
(i) Heart beats faster, resulting in supply of more oxygen to our muscles.
(ii) The blood to the digestive system and skin is reduced due to contraction of muscles around small arteries in target organs.
(iii) The breathing rate also increases because of the contractions of the diaphragm and the rib muscles.

Q 8. Label the endocrine glands in the given figure:



Ans. (a) Pineal gland (b) Pituitary gland
(c) Thyroid (d) Thymus

COMMON ERROR
Many students fail to label the endocrine glands correctly.

Q 9. What will happen if intake of iodine in our diet is low? *(NCERT EXEMPLAR)*

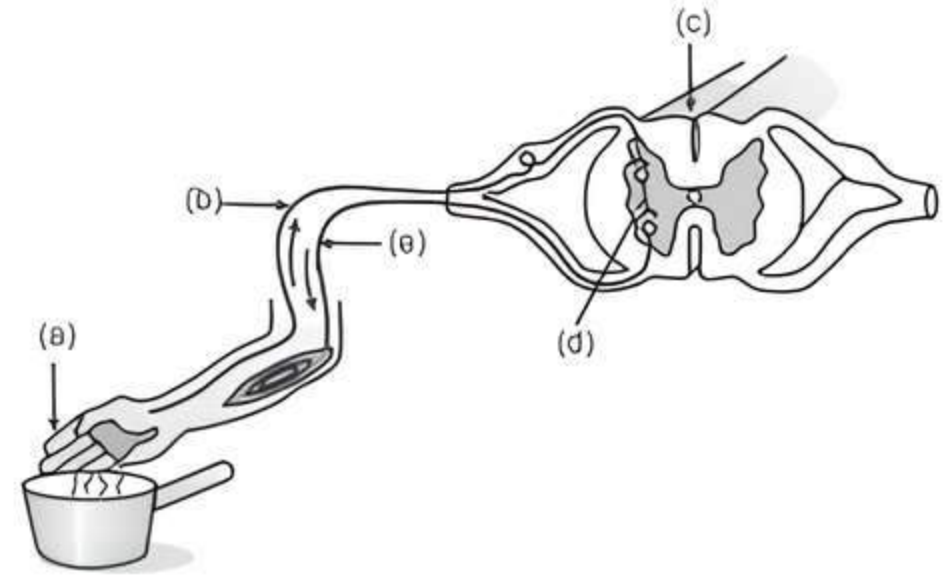
Ans. When iodine intake is low, release of thyroxine from thyroid gland will be less by which protein, carbohydrate and fat metabolisms will be affected.
A person might suffer from goitre in case of iodine deficiency in the body.

Q 10. What is insulin? Why are some patients of diabetes treated by giving injections of insulin? *(CBSE 2019)*

Ans. Insulin is a hormone produced by the pancreas which helps in regulating blood sugar levels.
Patients of diabetes have high sugar level in their blood. This has ill effects on the working of vital organs of the body. Thus, diabetic patients are given injections of insulin to control their blood sugar level.

Short Answer Type-II Questions

Q 1. Name the parts (a) to (e) in the following diagram:



What is the term given to the sequence of events occurring in the diagram? *(CBSE 2020)*

Ans. (a) Receptors (skin) (b) Sensory neuron
(c) Spinal cord (d) Relay neuron
(e) Motor neuron
The term given to the sequence of events occurring here is the reflex action.

Q 2. Trace the sequence of events which occur when a bright light is focused on your eyes. *(CBSE 2019)*

Ans. The sequence of events which occur when a bright light if focused on our eyes is:

Receptor cells of eyes
↓
Sensory neuron
↓
Spinal cord
↓
Motor neuron
↓
Eye muscles
↓
Pupil contracts

Q 3. (i) Name the part of human brain which controls:
(a) voluntary actions and (b) involuntary actions.
(ii) Write the function of peripheral nervous system. Name the components of this system stating their origin. *(CBSE 2019)*

Ans. (I) (a) Forebrain (b) Hindbrain

(ii) The communication between the Central Nervous System (CNS) and the other parts of the body is facilitated by the peripheral nervous system.
PNS consists of cranial nerves arising from the brain and spinal nerves arising from the spinal cord.

Q 4. List in tabular form three distinguishing features between cerebrum and cerebellum.

Ans.

S.No.	Basis of Difference	Cerebrum	Cerebellum
1.	Initial part	It is a part of fore brain.	It is a part of hindbrain.
2.	Function	It initiates intelligence. memory and voluntary movements.	It maintains posture and equilibrium of the body.
3.	Feature	It is the main thinking part of the brain.	It is responsible for precision of voluntary actions like walking in a straight line. riding a bicycle. picking up a pencil.

Q 5. Why is chemical communication better than electrical impulses as a means of communication between cells in a multicellular organism?

Ans. Chemical communication is better than electrical impulses as a means of communication between cells in a multicellular organism because of the following reasons:

(i) Electrical impulses have limited access to only those cells that are connected by nervous tissue (neurons), whereas chemical signals can reach each and every cell of the body.

(II) Cells connected by nervous tissues, after generation and transmission of the impulse, take some time to reset in order to generate and transmit new electrical impulses whereas no such time is required for chemical communication.

Q 6. Write one example of each of the following tropic movements:
(i) Positive phototropism
(ii) Negative phototropism
(iii) Positive geotropism
(iv) Negative geotropism
(v) Hydrotropism
(vi) Chemotropism

Ans. (I) Shoot growing towards light.
(II) Roots growing away from light towards ground.
(iii) Growth of roots towards earth due to the pull of the earth.
(iv) Shoots growing away from the earth.
(v) Roots growing towards the source of water.
(vi) Growth of pollen tubes towards the ovules.

TiP
Learn and understand the concept of tropic movement in plants. Lay emphasis on examples of each type of tropic movement.

Q 7. Define geotropism. Draw a labelled diagram of a plant showing geotropic movements of its parts. *(CBSE 2020)*

Ans. The movement of the growth of the roots downwards and the shoots upwards under the stimuli of gravity is called geotropism.

Plant showing geotropism

Q 8. Explain the directional movement due to growth in response to touch in a pea plant. *(CBSE 2023)*

Ans. Pea plant climb up other plants or fences by means of tendrils. These tendrils are sensitive to touch. When they come in contact with any support, the part of the tendril in contact with the object does not grow as rapidly as the part of the tendril away from the object. This causes the tendril to circle around the object and thus cling to it. Because this growth is directional, it appears as if the pea plant is moving.

Q 9. State the functions of plant hormones. Name four different types of plant hormones.

Ans. Plant hormones help to coordinate growth, development and responses in environment.

Different types of plant hormones are given below:

(I) Auxins: They control the tropic (growth related) movements of the plants in response to light, gravity, touch, etc., by increasing the size of cells.

(ii) Gibberellins: They stimulate stem elongation and expansion of leaves.

(iiii) Cytokinins: They promote growth by stimulating cell division.

(iv) Abscisic Acid: It is a stress hormone in plants that inhibits growth in different parts of the plant body.

Q 10. Name the hormones secreted by the following endocrine glands and specify one function of each:

(i) Thyroid (ii) Pituitary (iii) Pancreas

(CBSE 2018)

Ans. **(i) Thyroid:** It secretes a hormone called thyroxine. It regulates the metabolism of fats, carbohydrates and proteins in the body.

(ii) Pituitary: It secretes growth hormone which regulates growth and development of the body.

(iii) Pancreas: It secretes insulin which helps in regulating blood sugar levels.

Q 11. We are advised to take iodised salt in our diet by doctors. Justify its importance in our body.

(CBSE SQP 2023-24)

Ans. We are advised to take iodised salt in our diet because of the following reasons:

(i) It is essential for the synthesis of thyroxin hormone.

(ii) Thyroxin regulates carbohydrate, protein and fat metabolism in the body.

(iii) Thyroxin also provides best balance for growth.

Q 12. Nervous and hormonal systems together perform the function of control and coordination in human beings. Justify this statement with the help of an example. *(CBSE 2019)*

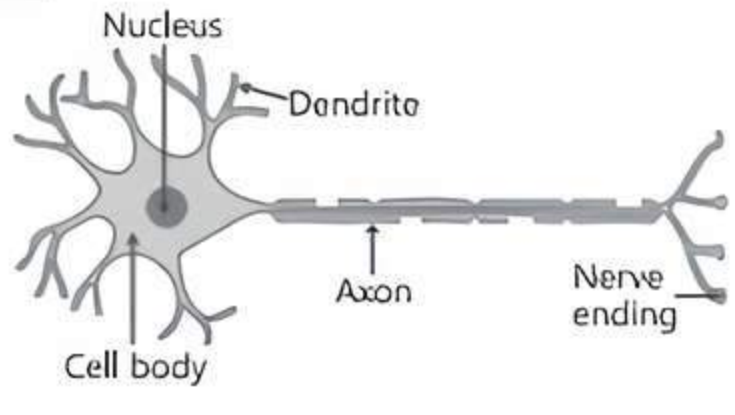
Ans. In human beings, nervous and hormonal systems work together in controlling and coordinating various life processes in the body. Nervous system work by generation and transmission of electrical impulse while hormonal system works by secreting chemical messengers called hormones.

For example, when an emergency stimulus is detected by the nervous system, the stimulus is received and analysed by CNS that send message to effectors to provide proper response. At the same time, nervous system activates adrenal gland to release adrenaline that prepares body by increasing heart rate, blood pressure, respiration etc. Thus, both these systems work together to perform functions of control and coordination.

Long Answer Type Questions

Q 1. State the structural and functional unit of the nervous system. Draw its neat labelled diagram and write two functions. *(CBSE 2014)*

Ans. Structural and functional unit of the nervous system is neuron.



The functions of neuron are given below:

(i) Passing of information takes place by the way of electric impulse inside the neuron and in the form of chemicals at synapse.

(ii) It undergoes reflex actions. For example, withdrawing of hand on touching a hot object.

Q 2. (i) Why is the flow of signals in a synapse from axonal end of one neuron to dendritic end of another neuron but not the reverse?

(NCERT EXEMPLAR)

(ii) Sameer was studying in his room. Suddenly he smells something burning and sees smoke in the room. He rushes out of the room immediately. Was Sameer's action voluntary or involuntary?

Ans. (i) When an electrical signal reaches the axonal end of a neuron, it releases a chemical substance. This chemical diffuses towards the dendrite end of next neuron where it generates an electrical impulse or signal. Hence, the electrical signal is converted into a chemical signal at the axonal end. Since these chemicals are absent at the dendrite end of the neuron, the electrical signal cannot be converted into chemical signal. Thus, the impulse always flows from axonal end of one neuron to dendritic end of another neuron.

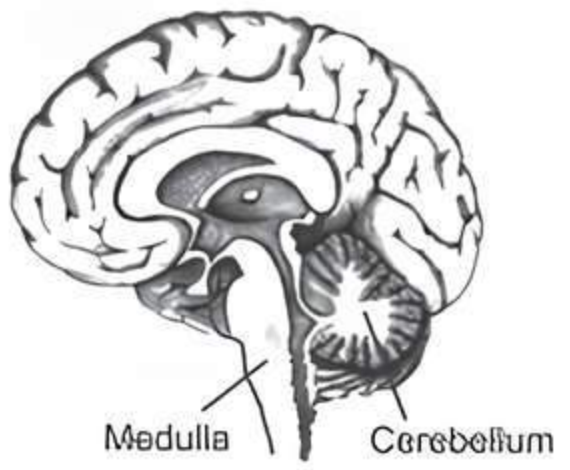
(ii) Sameer's action was voluntary because rushing out of the room was under his conscious control. The smoke and smell were perceived by the receptors in the sense organs and signals are sent to the brain. The brain, then sent signals to the effector organs, *i.e.*, the muscles, to move out of the room.

Q 3. (i) (a) Draw a neat diagram of human brain and label medulla and cerebellum.

(b) Write the functions of the above mentioned parts.

(ii) "Both overproduction and underproduction of growth hormone leads to disorders in the body." Explain.

Ans. (i) (a) Diagram of human brain:



TiP

Practice diagrams with proper labelling.

(b) Involuntary actions like blood pressure, salivation and vomiting are controlled by the medulla. Cerebellum is responsible for precision of voluntary actions and maintaining the posture and balance of the body.

(ii) Over production of growth hormone leads to gigantism and its under production leads to dwarfism.

COMMON ERROR

Many students forget to answer the sub parts of this question.

Q 4. What is hydrotropism? Design an experiment to demonstrate this phenomenon. *(CBSE 2019)*

Ans. The movement of plant parts in response to water is known as hydrotropism.

Experiment:

(i) Soak the seeds in water overnight.
(ii) Place moist cotton in a perforated petri dish.
(iii) Put the soaked seeds in the petri dish and place it on a beaker.
(iv) Roots pass through pores and grow downwards.
(v) After some time, roots will bend towards base of petri dish having moisture.

Result: This confirms that the plants move and grows towards the source of water, hence plants show hydrotropism.

TiP

Always write the experiment point-wise. Do not repeat the same point in different words.

Q 5. (i) List three points of difference between nervous and hormonal mechanisms for control and coordination in animals.

(ii) How are auxins related with the bending of plant shoot towards unidirectional light? Explain. *(CBSE 2023)*

Ans. (i)

S.No.	Basis of Difference	Nervous System Mechanism	Hormonal System Mechanism
1.	Parts	It consists of nerve impulses between PNS, CNS and brain.	It consists of endocrine system which secretes hormones directly into blood.
2.	Flow of information and response	The flow of information is rapid and the response is quick.	The information travels slowly and the response is slow.
3.	Action	Nerve impulses are not specific in their action.	Each hormone has specific actions.
4.	Effect	Effects are short lived.	It has prolonged effects.

(Any three)

(ii) When growing plants detect light, a hormone called auxin is synthesised at the shoot tip which helps the cells to grow longer. When light is coming from one side of the plant, auxin diffuses towards the shady side of the shoot. This concentration of auxin stimulates the cells to grow longer on the side of the shoot which is away from light. Thus, the plant appears to bend towards unidirectional light.

Q 6. (i) A doctor has advised Sameer to reduce sugar intake in his diet and do regular exercise after checking his blood test reports. Which disease do you think Sameer is suffering from? Name the hormone responsible for this disease and the organ producing the hormone.

(ii) Which hormone is present in the areas of rapid cell division in a plant and which hormone inhibits the growth? *(CBSE SQP 2023-24)*

Ans. (i) Sameer is suffering from diabetes. Insulin hormone helps in regulating blood sugar levels. Insulin is produced by pancreas.

(ii) Cytokinins is present in areas of rapid cell division. Abscisic acid inhibits growth.

Q 7. (i) Name the disorder which a person is likely to suffer from due to the following:

(a) Over-secretion of growth hormone

(b) Deficiency of oestrogen in female

(c) Less secretion of thyroxine

Also, name the gland that secretes each of the hormones mentioned above.

(ii) How is the timing and amount of hormone released regulated? Explain with the help of an example.

Ans. (i)

S.No.	Disorder	Gland
a.	Gigantism	Pituitary gland
b.	Menstrual Irregularities	Ovaries
c.	Goitre	Thyroid gland

(ii) Feedback mechanism of harmonic regulation is the mechanism of regulating the timing and amount of hormone released so that they are secreted in precise quantities.

COMMON ERROR

Students are unaware of the concept of feedback mechanism. So, they write vague answer.

Example: If the sugar levels in the blood rise, they are detected by the cells of the pancreas which respond by producing more insulin. As the blood sugar level falls, insulin secretion is reduced.

Chapter Test

Multiple Choice Questions

Q 1. Which of the following is not a reflex action?

a. Coughing
b. Blinking of eyes
c. Knee-jerk
d. Weeping

Q 2. Which of the following is not associated with growth of plant?

a. Auxin
b. Gibberellins
c. Cytokinins
d. Abscisic acid

Q 3. The movement of sunflower in accordance with the path of Sun is due to:

a. phototropism
b. geotropism
c. chemotropism
d. hydrotropism

Q 4. The given figures show movement seen in *Mimosa pudica* plant when it is touched.

Select the incorrect option regarding this.

a. The movement is directional that involves growth.
b. The movement is non-directional that occurs due to turgor changes.
c. The movement is immediate in response to stimulus.
d. The movement is in response to touch and is called thigmonasty.

Assertion and Reason Type Questions

Directions (Q. Nos. 5-6): *Each of the following questions consists of two statements, one is Assertion (A) and the other is Reason (R). Give answer:*

a. Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
b. Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
c. Assertion (A) is true but Reason (R) is false.
d. Assertion (A) is false but Reason (R) is true.

Q 5. Assertion (A): Cytokinins are present in greater concentration in areas of rapid cell division.

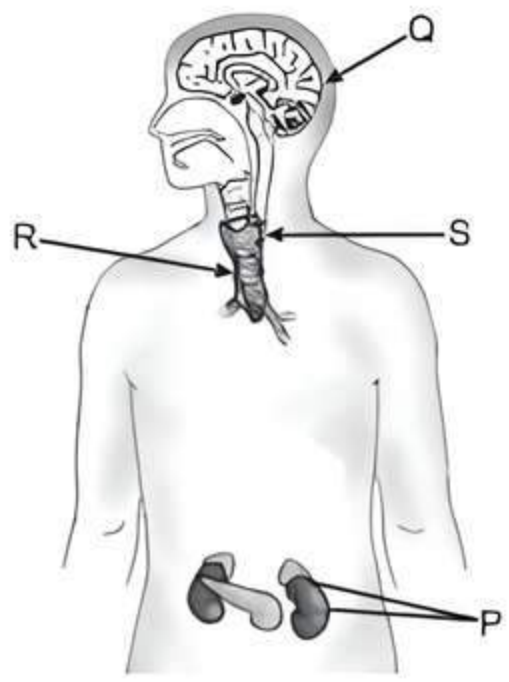
Reason (R): Cytokinins promote cell division.

Q 6. Assertion (A): Reflex actions are automatic and rapid responses to stimuli.

Reason (R): These actions are controlled by brain.

Case Study Based Question

Q 7. *Study the figure related to endocrine glands in human being (male) and answer the questions that follows.*



(i) Name the endocrine glands *P, Q, R* and *S*.

(ii) Name the hormone responsible for regulation of blood pressure. Also name the gland which secretes this hormone.

(iii) Which gland secretes digestive enzymes as well as hormones?

(iv) Which endocrine gland is present in female but not in male?

Very Short Answer Type Questions

Q 8. Name two body functions that will be affected if cerebellum gets damaged.

Q 9. Define chemotropism.

Short Answer Type-I Questions

Q 10. Tendrils encircle or coil around the object in contact with it. Elaborate.

Q 11. Write the main functions of the following:

(i) Sensory neuron
(ii) Cranium
(iii) Vertebral column
(iv) Motor neuron

Q 12. Differentiate between tropic and nastic movements.

Short Answer Type-II Questions

Q 13. (i) Draw a well-labelled diagram of human brain.
(ii) Which is the main thinking part of brain?
(iii) Which part of the brain controls involuntary actions?

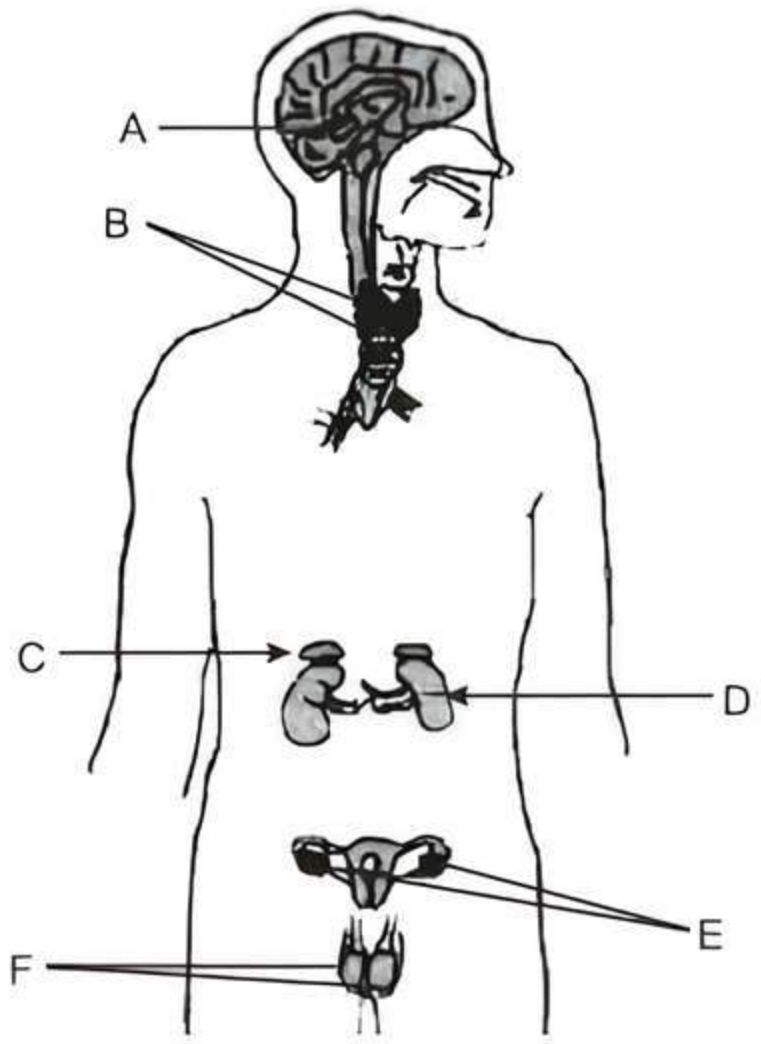
Q 14. Name the hormone which regulates carbohydrate, protein and fat metabolism in our body. Which gland secretes this hormone? Why is it important for us to have iodised salt in our diet?

Q 15. (i) Draw the structure of neuron and label cell body and axon.
(ii) Name the part of neuron:
(a) where the information is required.
(b) through which information travels as an electrical impulse.

Long Answer Type Questions

Q 16. (i) Define reflex arc. Draw a flowchart showing the sequence of events which occur during sneezing.
(ii) List four plant hormones. Write one function of each.

Q 17. (i) Identify the endocrine glands A, B, C, D, E and F in the given diagram.



(ii) List the functions of each part.