

CHAPTER 7

CONTROL AND CO-ORDINATION

Syllabus

Tropic movements in plants; Introduction of plant hormones; Control and co-ordination in animals; Nervous system; Voluntary, involuntary and reflex action; Chemical co-ordination: Animal hormones.

Trend Analysis

List of Concepts	2018	2019	2020
Tropic movements and introduction of plant hormones	1 Q (2 M)	1 Q (5 M)	
Control and coordination in animals	1 Q (3 M)	Or 1 Q (5 M)	1 Q (4 M)



TOPIC - 1

Control and Co-ordination in Plants



Revision Notes

Introduction

- All the living organisms respond and react to the changes that happen in the environment around them.
- The changes in the environment to which the organisms respond and react are called stimuli such as light, heat, cold, smell, touch etc.
- Both plants and animals respond to stimuli but in a different manner.
- **Plant Movements:** The movements of the individual plant parts or organs of a plant like shoot, root, etc, are due to some external stimuli like light, force of gravity, chemical substance, water, etc.
- **Tropic Movement:** It is the directional growth movement of a plant organ in response to an external stimulus. Growth towards the stimulus is positive tropism and growth away from the stimulus is negative tropism.

TOPIC - 1

Control and
Co-ordination in Plants

TOPIC - 2

Control and
Co-ordination in Animals

- **Hormones:** They are the chemical substances which co-ordinate and control the activities of living organisms and also their growth. They are functional in small concentration at the site remote from their production.
- **Plant Hormones:** They are the chemical compounds produced naturally in plants which control the growth and other physiological functions at a site, far away from the place of secretion. They are required in very small amount and help to coordinate growth, development and responses to the environment.
- **Main plant hormones are:**

(a)	Auxins	Synthesized at shoot tip. Helps the cells to grow longer. Involved in tropic movements of plants.
(b)	Gibberellin	Helps in the growth of the stem.
(c)	Cytokinins	Promotes cell division. Present in greater concentration in fruits and seeds.
(d)	Abscisic Acid	Inhibits growth. Cause wilting of leaves. Also called as Stress hormone.
(e)	Ethylene (H₂C=CH₂)	A gaseous hormone which helps in artificial ripening of fruits.



Mnemonics

Concept: Plant Hormone

Mnemonics: A CAGE

Interpretation:

A - Auxins

C - Cytokinins

A - ABA

G - Gibberellins

E - Ethylene

How is it done on the GREENBOARD?

Q. What are plant hormones? Name the plant hormones responsible for the following :

(a) Growth of stem

(b) Promotion of cell division

(c) Inhibition of growth

(d) Elongation of cells

3

and development are known as plant hormones.

Step II: Auxin/Gibberellins

Step III: Cytokinins

Step IV: Abscissic acid

Step V: Auxins / Gibberellins

Solution:

Step I: Chemical substances which help the plant to coordinate growth

Ans. Correct option: (c)

Explanation: Gibberellin induces internodal growth and overcome the phenotypic expression of dwarfism in certain plants. It has little or no effect when they are applied to the normal plant. 1

Q. 6. Assertion (A): Phototropism is a directional growth movement.

Reason (R): It occurs in the direction of light.

Ans. Correct option: (a)

Explanation: Phototropism is the movement or bending of light towards light. Hence, it is known as directional growth movement. 1

C Very Short Answer Type Questions

✓ Short Answer Type Questions-I

2 marks each

Q. 1. How does auxin promote phototropism?

U [CBSE, 2016]

Ans. Auxin, a plant hormone synthesised at the shoot tips, 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 light while growing. This phenomenon is called phototropism. 1+1

[CBSE Marking Scheme, 2016]

Detailed Answer:

Auxin is the hormone which is usually synthesised in the young tip of roots and shoots. When light is coming from one side of the plant, it diffuses away from light towards the shady side of the shoot

which stimulates the cells to grow longer, resulting in the bending of shoot towards light, thus auxin promotes phototropism. 2

Q. 2. Name the plant hormone that promotes growth. How do these hormones bring about phototropism in the shoots of a plant? U

Ans. Plant hormone that promotes growth is Auxin.

Light falls on one side of the plant, auxin diffuse towards shady side of the shoot.

Auxin stimulates the cells to grow longer on shady side.

Plant appears to bend towards light. 1 + 1

Q. 3. How do the shoot and roots of a plant respond to the pull of earth's gravity? A

Ans. In geotropism, the roots of the plant always grow downwards while the shoots always grow upwards, away from the earth. 1+1

✓ Short Answer Type Questions-II

3 marks each

Q. 1. (a) What is tropism?

(b) How do auxins promote the growth of a tendril around a support? U [Delhi, Set- III, 2020]

Ans. (a) Tropism: It is the directional growth movement of a plant organ in response to an external stimulus.

(b) Auxins produced in the shoot tip move downwards in the plant. These auxins cause cell elongation in the growing tissues. In the tendrils, auxins move away from the point of contact with the supporting object. More growth occurs on the side away from the support. As a result of unequal growth on the two sides, the tendril coils around the support. 1+2=3

Q. 2. What are plant hormones? Name the plant hormones responsible for the following:

(a) Growth of stem

(b) Promotion of cell division

(c) Inhibition of growth

(d) Elongation of cells R [Board Delhi, Set- I, 2019]

Ans. Plant hormones – Chemical substances which help the plant to coordinate growth and development. 1

(a) Auxins/ Gibberellins

(b) Cytokinins

(c) Abscisic Acid / ABA

(d) Auxins/ Gibberellins $\frac{1}{2} \times 4$

[CBSE Marking Scheme, 2019]

Q. 3. Explain giving reasons the bending of the shoot tip of a plant towards light source coming from one side of the plant. R [CBSE SQP, 2019]

Q. 1. What is meant by tropic movement? R

Ans. Plant growth movements in response to stimuli from a particular direction are called tropic movements. The direction of movement is always related to the direction of stimulus. 1

AI Q. 2. Define phototropism. R

Ans. Movement or bending of the shoot towards the direction of light is called phototropism. 1

Q. 3. Give one example of chemotropism. R

Ans. The growth of pollen tube towards ovule. 1

Q. 4. State the main functions of abscisic acid in plants. R

Ans. Abscisic acid inhibits the growth of plants. 1

Ans. When growing plant shoot tip detects light a hormone called auxin is synthesised in the shoot tip which is sensitive to light.

Auxin diffuses towards the shady side of the stem. It stimulates the growth of cells on the shady side of the plant which causes bending of the plant to the other side.

This gives the appearance that the stem of the plant bends in the direction of light. 3

[CBSE Marking Scheme, 2019]

AI Q. 4. What is geotropism? Draw a labelled diagram of a potted plant showing positive geotropism and negative geotropism.

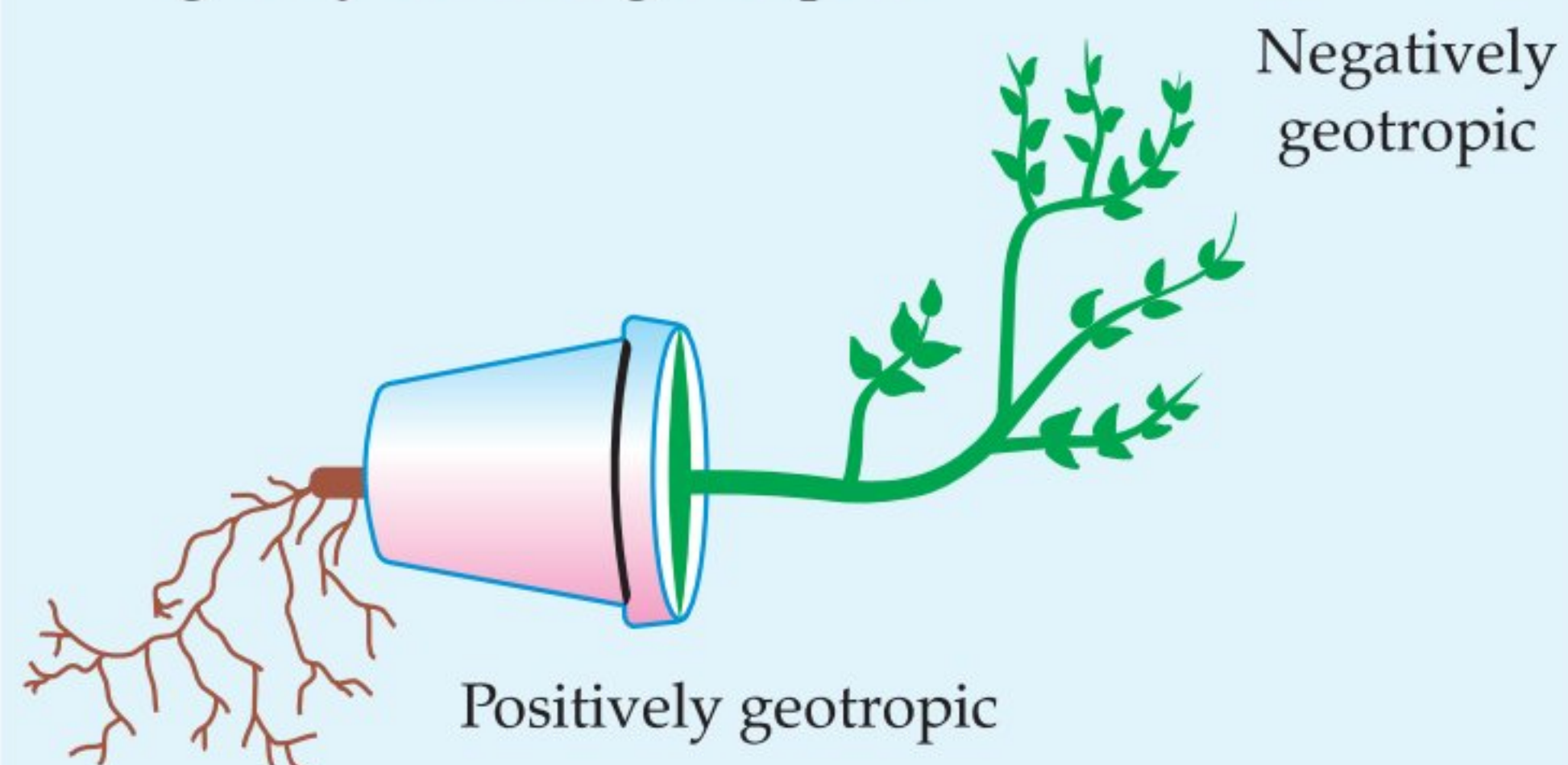
[U] [CBSE Comptt. Set-I, II, III-2018]

OR

Define positive geotropism and negative geotropism. Give one example of each.

[R] [CBSE Term I, 2016]

Ans. The upward growth of shoots and downward growth of roots in response to the pull of earth's gravity is called geotropism.



[CBSE Marking Scheme, 2018] [3]

Detailed Answer:

The movement of plant part in response to gravity is called geotropic movement and the phenomenon involved is called geotropism.

When the tip of the stem grows away from the earth's gravitational forces, it is known as negative geotropism and when the root tips grow towards gravity, it is known as positive geotropism.

In the above figure, stem shows negative geotropism while roots show positive geotropism.

COMMONLY MADE ERROR

- ➔ Students often draw rough diagram without proper labelling.

ANSWERING TIP

- ➔ Lay stress on drawing correct and labelled diagrams. Make sure the lines are properly marked. Lines which are not properly marked will deduct your marks.

Q. 5. Give one example of following plants:

- (a) Which is (i) positively phototropic and (ii) negatively geotropic.
- (b) Which is positively hydrotropic as well as positively geotropic?
- (c) Which synthesises auxin? [R] [CBSE Term I, 2015]

Ans. (a) (i) Positively phototropic: Shoot

(ii) Negatively geotropic: Shoot

(b) Root

(c) Shoot tip [CBSE Marking Scheme, 2015] a+1+1

✓ Long Answer Type Questions

5 marks each

Q. 1. What is hydrotropism? Design an experiment to demonstrate this phenomenon.

[U] [CBSE Outside Delhi, Set-I, 2019]

Ans. The movement/response of part of plant (root) towards water 1

Experiment:

- (i) Soak the seeds in water overnight. ½
- (ii) Place moist cotton in a perforated petridish. ½
- (iii) Put the soaked seeds in the petridish & place it on a beaker. 1
- (iv) Roots pass through pores and grow downwards. 1
- (v) After sometime roots will bend towards base of petridish having moisture. 1

[CBSE Marking Scheme, 2019]

Detailed Answer:

Hydrotropism is the movement of a plant towards or away from water. *Example:* Plant roots bend towards the source of water.

Experiment to demonstrate hydrotropism:

Requirements: Bean seeds, a deep tray, sand water and a porous flower pot.

Procedure:

- (i) Fill the tray (big enough to accommodate porous pot) with sand and insert some seeds in it.
- (ii) Make a pit in the sand and place the porous pot in it.
- (iii) Fill water in the porous pot.
- (iv) Leave the arrangement for about a week.

Observation: After about a week, when seeds are taken out, it is observed that roots grow in the direction of the porous pot. This shows hydrotropism in roots. 1 + 4

COMMONLY MADE ERROR

- ➔ Sometimes, students skip steps in writing the experiment.

ANSWERING TIP

- ➔ It is necessary to write all the steps of experiment in proper sequence.

AI Q. 2. What are plant hormones? Give four different types of plant hormones and state their functions briefly. [DDE 2017]

[R] [CBSE Term I, 2016]

Ans. The chemical compounds released by stimulated cells for control and coordination in plants are called plant hormones or phytohormones.

Auxin — Controls growth
Gibberellins — Helps growth in stem
Cytokinin — Promotes cell division
Abscisic acid — Inhibits growth, wilting of leaves

[CBSE Marking Scheme 2016] 1 + 4

Q. 3. (a) Write the names and one function of each of any three growth hormones in plants.

(b) In the absence of muscle cells, how do plant cells show movement? [U] [CBSE Term-I, 2014]

Ans. (a) Three growth hormones in plants are:

- (i) **Auxin:** It is synthesized in the young tip of roots and shoots. It promotes elongation and division of cell and root formation.
- (ii) **Gibberellins:** They help in the growth of the stem.
- (iii) **Cytokinins:** They promote cell division and delay leaf ageing.

(b) Plant cells shows two types of movements:

- (i) Tropic movements are growth movements in response to an environment stimulus. This type of movement may occur in response to gravity (geotropism), light (phototropism), water (hydrotropism), chemical (chemotropism), etc.
- (ii) Nastic movement are independent of the direction of stimulus. This type of movement may occur in response to chemicals, temperature, touch etc.

This shows that plant cell can show movements in response to different stimuli although they do not have muscle cells. 3 + 2



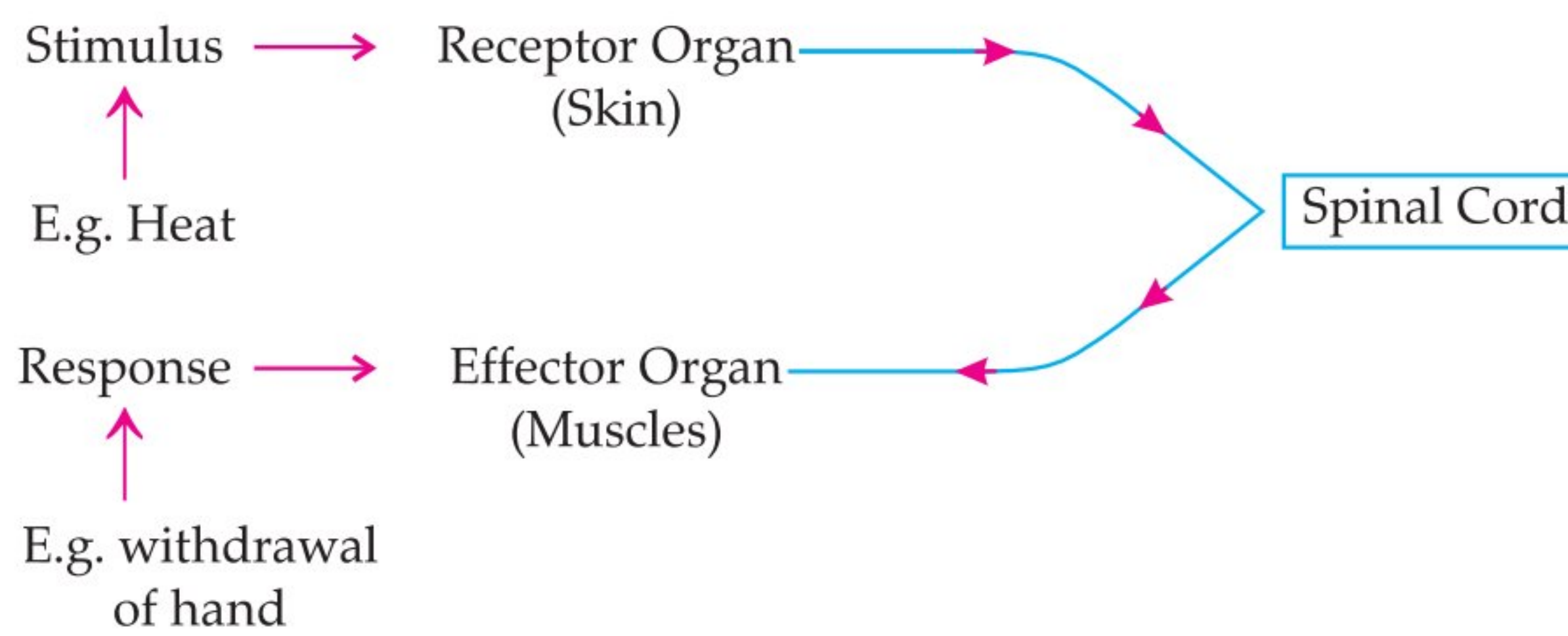
TOPIC - 2

Control and Co-ordination in Animals

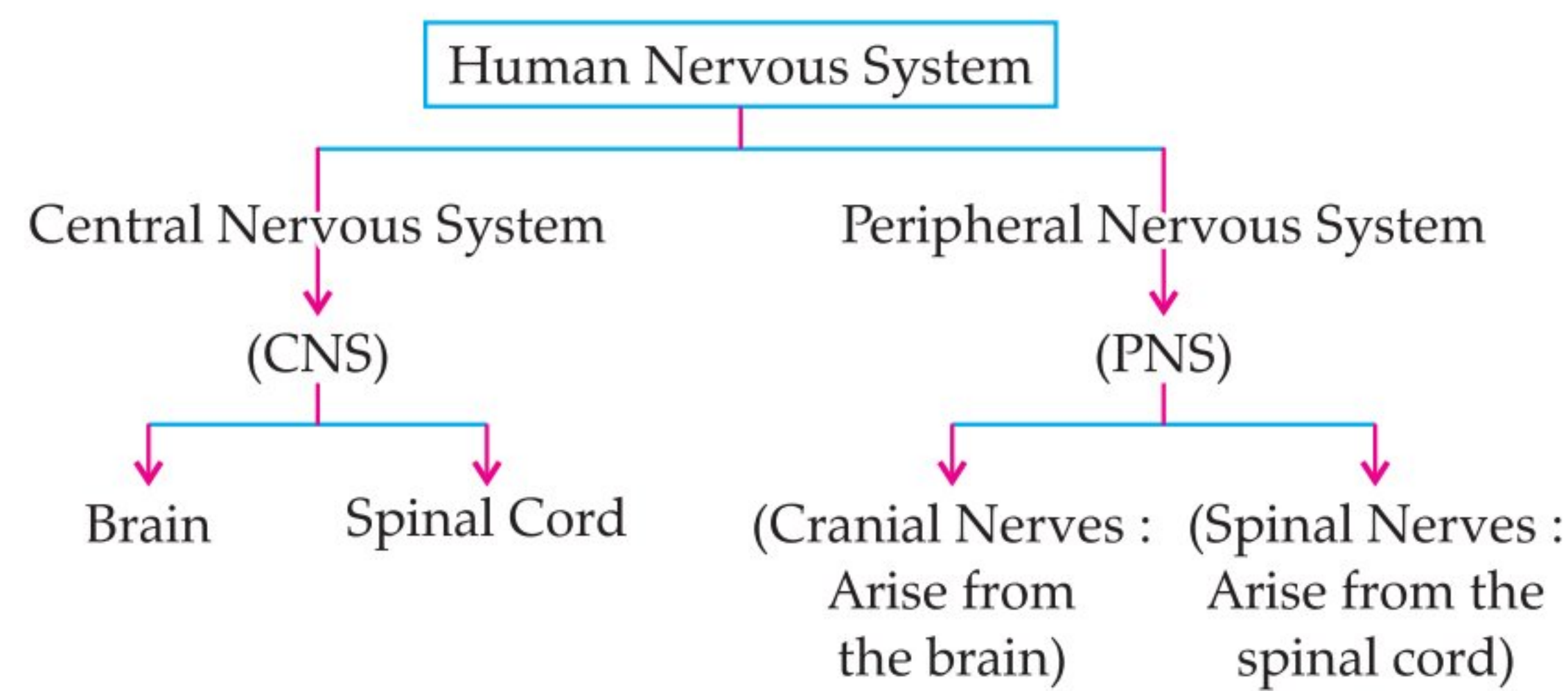


Revision Notes

- Control and coordination is brought about in all animals with the help of two main systems: nervous system and endocrine system.
- **Nervous system:** It is the system of conducting tissues that receives the stimulus and transmits it to other parts of the body forming a network of nerves. It is involved in receiving information (sensation) and generating responses to that information (motor response).
- The units which make up the nervous system are called **nerve cells or neurons**.
- The **receptors** pass the information to the brain through a type of nerve cells called sensory neurons.
- Motor neurons transmits the information from the brain to the effector organs, mainly muscles and glands.
- **Nerve Impulse:** It is the information in the form of chemical and electrical signals passing through neurons. These impulses are carried by dendrites towards the cell body.
- **Synapse:** The point of contact between the terminal branches of axon of one neuron with the dendrite of another neuron is called synapse.
- **Voluntary Action:** These are the actions which need thinking and are performed knowingly *i.e.* these are controlled by conscious thought. *e.g.,:* Speaking to a friend, writing a letter etc.
- **Involuntary Action:** These are not under the control of the will of an individual and are automatic response to a stimulus which is not under the voluntary control of the brain. It occurs without the conscious choice of an organism. *e.g.,:* Touching a hot plate unknowingly.
- **Reflex action:** It is quick, sudden and immediate response of the body to a stimulus. *e.g.,* Knee jerk, withdrawal of hand on touching hot object.
- **Reflex arc:** The pathway through which nerve impulse passes during reflex action is called reflex arc. *i.e.* it is pathway through which the reflex action occurs.



- **Response:** Responses are of three main types:
 - (a) **Voluntary:** Controlled by fore brain. e.g., talking, writing.
 - (b) **Involuntary:** Controlled by mid and hind brain. e.g., heartbeat, vomiting, respiration.
 - (c) **Reflex action:** Controlled by spinal cord. e.g., withdrawal of hand on touching a hot object.
- **Need of Reflex Actions:** In some situations such as touching a hot object, pinching etc. we need to act quickly, otherwise our body would be harmed. Hence, this response is generated from spinal cord instead of brain.
- **Human nervous system:** The nervous system of vertebrates (including humans) is divided into the central nervous system (CNS) and the peripheral nervous system (PNS).



- Human brain is the main coordinating centre of the body. It has three major parts: Forebrain, midbrain and hind brain.
 - (a) **Fore-brain:** It is the most complex or specialized part of the brain. It consists of cerebrum. The main functions of forebrain are as follows:
 - (i) Main thinking part of the brain.
 - (ii) Control the voluntary actions.
 - (iii) Store information (memory).
 - (iv) Receives sensory impulses from various parts of the body and integrate it.
 - (v) It is the centre associated with hunger.
 - (b) **Mid-brain:** Controls involuntary actions.
 - (c) **Hind-brain:** It has three parts:
 - (i) **Cerebellum:** Controls posture and balance, precision of voluntary actions. e.g., picking pen.
 - (ii) **Medulla:** Controls involuntary actions. e.g., blood pressure, salivation, vomiting.
 - (iii) **Pons:** Controls voluntary actions and helps in regulation of respiration.
- Spinal cord is a cylindrical structure and a part of the central nervous system. It is made up of nervous tissue that extends from medulla oblongata in the brain stem to the lumbar region of vertebral column. It functions primarily in the transmission of nerve signals.
- **Glands and hormones secreted by them:**

No.	Gland	Hormones	Functions	Target Site
1.	Hypothalamus	(i) Releasing hormones (RH) (ii) Growth inhibiting hormones	Regulates secretion of pituitary hormones.	Pituitary gland
2.	Pituitary Gland	(i) Growth hormone (GH)	Controls growth-dwarfism and gigantism.	Various body cells which undergo growth
3.	Thyroid Gland	(i) Thyroxin (ii) Triiodothyronine (iii) Thyrocalcitonin (TCT)	Regulate basal metabolic rate, RBC formation. Regulate Ca level.	Body tissues

4.	Adrenal Gland	(i) Adrenaline (ii) Nor adrenaline (iii) Corticoids	Increase alertness, pupillary dilation, piloerection, sweating and heart beat.	Body tissues
5.	Pancreas	(i) Insulin (ii) Glucagon	Regulates glucose homeostasis, stimulates glycogenesis, controls carbohydrate metabolism. Maintains glucose levels, stimulates gluconeogenesis.	Tissues
6.	Testis	(i) Testosterone (ii) Androgens	Plays a role in development of male reproductive tissues and promotes secondary sexual characters in male.	Male body tissues
7.	Ovary	(i) Estrogen (ii) Progesterone	Helps in development of female secondary sexual characters. Support pregnancy.	Female body tissues



Mnemonics

Concept: Reflex Arc

Mnemonics: RACEE forms Reflex Arc

Interpretation:

R-Receptor

A-Afferent or Sensory Nerve

C-Centre (Brain or Spinal cord)

E-Efferent or Motor Curve

E-Effector

How is it done on the GREENBOARD?

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

(a) Thyroid (b) Pituitary

(c) Pancreas

3

Step II: Growth hormone regulates growth and development of body.

Step III: Insulin regulates/ decreases blood sugar level Or Glucagon, regulates / increases blood sugar.

Solution:

Step I: Thyroxine regulates carbohydrate, protein and fat metabolism.



Objective Type Questions

1 mark each

A Multiple Choice Questions

Q. 1. In humans, the life processes are controlled and regulated by

(a) reproductive and endocrine system

(b) respiratory and nervous system

(c) endocrine and digestive system

(d) nervous and endocrine system [NCERT Exemp.]

Ans. Correct option: (d)

Explanation: In humans, the life processes are controlled and regulated by nervous and endocrine system. Both the systems work together to maintain the homeostasis.

Q. 2. Junction between two neurons is called

- (a) cell junction.
- (b) neuro muscular junction.
- (c) neural joint.
- (d) synapse.

[NCERT Exemp.]

Ans. Correct option: (d)

Explanation: Synapse is a junction or gap across which a nerve cell can send an impulse to another neuron. Impulse is the signal that travels along the length of a nerve fibre and ends in the release of neuro-transmitters.

Q. 3. 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.

[NCERT Exemp.]

Ans. Correct option: (b)

Explanation: In a neuron, conversion of electrical signal to a chemical signal occurs at axonal end. When an electrical signal reaches the axonal end of a neuron, it releases a chemical substance. This chemical diffuses towards the dendritic 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.

Q. 4. In a synapse, chemical signal is transmitted from

- (a) dendritic end of one neuron to axonal end of another neuron.
- (b) axon to cell body of the same neuron.
- (c) cell body to axonal end of the same neuron.
- (d) axonal end of one neuron to dendritic end of another neuron.

[NCERT Exemp.]

Ans. Correct option: (d)

Explanation: Synapse is a microscopic gap between two neurons where chemical signal is transmitted from axonal end of one neuron to dendritic end of another neuron.

Q. 5. Electrical impulse travels in a neuron from

- (a) Dendrite → axon → axonal end → cell body.
- (b) Cell body → dendrite → axon → axonal end.
- (c) Dendrite → cell body → axon → axonal end.
- (d) Axonal end → axon → cell body → dendrite.

[NCERT Exemp.]

Ans. Correct option: (c)

Explanation: Electrical impulse travels in a neuron from dendrites to axonal end. The dendrites pick up the impulses from receptor and pass them to the cell body and then along the axon to its end. At the axonal end, these impulses release neuro-transmitter that crosses the synapse and start a

similar impulse in dendrite of the next neuron.

Q. 6. The brain is responsible for

- (a) thinking.
- (b) regulating the heart beat.
- (c) balancing the body.
- (d) all of the above.

[NCERT Exemp.]

Ans. Correct option: (d)

Explanation: Brain is a part of central nervous system. It functions as a control centre of the nervous system.

B Assertions and Reasons Type Questions

Directions: In the following questions, a statement of assertion (A) is followed by a statement of reason (R). Mark the correct choice as:

- (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. 1. Assertion (A): Units which make up the nervous system are called neurons.

Reason (R): Nerve impulses are carried by dendrites towards the cell body.

Ans. Correct option: (b)

Explanation: Both the statements are true. Nervous system is the system of conducting tissues that receives the stimulus and transmits it to other parts of the body forming a network of nerves. It is involved in receiving information (sensation) and generating responses to that information (motor response). The units which make up the nervous system are called nerve cells or neurons. Nerve impulses are always transmitted across a synapse from the axon terminals of one neuron to the dendrite /cell body of the next neuron.

Q. 2. Assertion (A): Nerve impulse is a one way conduction.

Reason (R): Nerve impulse is transmitted from dendrite to axon terminals.

Ans. Correct option: (c)

Explanation: Nerve impulses are always transmitted across a synapse from the axon terminals of one neuron to the dendrite / cell body of the next neuron but never in the reverse direction. Since, the neurotransmitter is present only in the axon terminals and not in the dendrite or cell body, it cannot be released from the dendrite or cell body even if the impulse reaches there.

Q. 3. Assertion (A): Our body maintains blood sugar level.

Reason (R): Pancreas secretes insulin which helps to regulate blood sugar levels in the body.

Ans. Correct option: (a)

Explanation: Pancreas secretes insulin which helps to regulate blood sugar levels in the body. If the

sugar level in blood rises, 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.

Q. 4. Assertion (A): Failure of secretion of growth hormone from an early age causes dwarfism in the patient.

Reason (R): Growth hormone stimulates the body growth and elongation of long bones.

Ans. Correct option: (a)

Explanation: Growth hormone is secreted by the anterior lobe of pituitary gland. It stimulates body growth. The failure of secretion of growth hormone from an early age causes dwarfism while excessive secretion of this hormone from childhood leads to gigantism.

Q. 5. Assertion (A): Males have more stature than females during puberty.

Reason (R): This is because of presence of thyroxin in the blood of females.

Ans. Correct option: (c)

Explanation: Males have more stature than females because of action of male sex hormone called testosterone, which is secreted by testis in males. Testosterone controls the development of secondary sexual characters in males.

Thyroxin increases the metabolic rate of the body and maintains BMR.

C Very Short Answer Type Questions

Q. 1. Name the two components of peripheral nervous system. [R] [CBSE Term I, 2016]

Ans. Cranial nerves arising from the brain and the spinal nerves arising from the spinal cord.

[CBSE Marking Scheme, 2016] 1

Q. 2. Mention the part of the brain which controls the involuntary actions like blood pressure, salivation etc. [R] [CBSE Term I, 2016]

Ans. Medulla in the hindbrain.

[CBSE Marking Scheme, 2016] 1

Q. 3. Name the hormones in humans which regulates carbohydrate, protein and fat metabolism in the body. Mention the site where it is synthesized.

[U] [CBSE Term I, 2016]

Ans. The hormone is thyroxin.

The site where it is synthesized is thyroid gland.

[CBSE Marking Scheme, 2016] 1

Q. 4. Define feedback mechanism of hormones. [R]

Ans. The mechanism that controls the flow of hormones is called feedback mechanism of hormones. 1

[AI] Q. 5. Name two components of central nervous system in humans. [R]

Ans. Brain and spinal cord. [½ + ½]

Q. 6. Name the largest cell present in the human body. [R]

Ans. Neuron. 1

[AI] Q. 7. Name the part of the brain which controls posture and balance of the body. [R]

Ans. Cerebellum. 1

Q. 8. Mention the part of the body where gustatory and olfactory receptors are located. [R]

Ans. Tongue and Nose. [½ + ½]

✓ Short Answer Type Questions-I

2 marks each

Q. 1. Different parts of brain are associated with specific functions. Name the part of human brain which performs the following functions:

- (a) Sensation of feeling full
- (b) Vomiting
- (c) Picking up a pencil
- (d) Riding a bicycle

[U] [CBSE Comptt. Set-I, II, III-2018]

Ans. (a) Forebrain

(b) Medulla/ Hind Brain

(c) Cerebellum/ Hind Brain

(d) Cerebellum/ Hind Brain $\frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2}$
[CBSE Marking Scheme, 2018]

Q. 2. Define neuron. Name the parts of neuron where:

- (i) Information is acquired.
- (ii) Impulse must be converted into chemical signal for onward transmission. [U] [CBSE Term-I, 2015]

Ans. The unit which makes up the nervous system is called neurons.

(i) End of dendrite tip of nerve cell.

(ii) Dendrite → cell body → axon to its ends. 1 + 1

Q. 3. Name the parts of the brain that perform the following functions:

(i) Maintaining the posture and balance of the body.

(ii) Regulating blood pressure.

(iii) Sensation of hunger or feeling full.

(iv) Seeing [R] [CBSE Term-I, 2015]

Ans. (i) Cerebellum

(ii) Hind brain

(iii) Fore brain

(iv) Fore brain. $\frac{1}{2} + \frac{1}{2} + \frac{1}{2} + \frac{1}{2}$

Q. 4. How does our body maintain blood sugar level? [U]

Ans. Pancreas secretes insulin which helps to regulate blood sugar levels in the body. If sugar level in blood rises, insulin stimulates the target cells to take up the extra glucose from the blood. 2



Short Answer Type Questions-II

3 marks each

Q. 1. A squirrel is in a scary situation. Its body has to prepare for either fighting or running away. State the immediate changes that take place in its body so that the squirrel is able to either fight or run?

A [Delhi-Set-I, 2020]

Ans. Adrenaline hormone will be secreted in the body as the squirrel is in scary situation. This will result in:

- (i) Speeding up of heartbeat
- (ii) Rise in blood pressure
- (iii) Release of more glucose in the blood. $1 \times 3 = 3$

Q. 2. Why is chemical communication better than electrical impulses as a means of communication between cells in a multi-cellular organism?

U [Delhi, Set-I, 2020]

Ans. Chemical communication is better than electrical impulses because chemical communication is mediated through hormones which can diffuse to different regions of the body, thereby allowing cells to communicate even without interacting with each

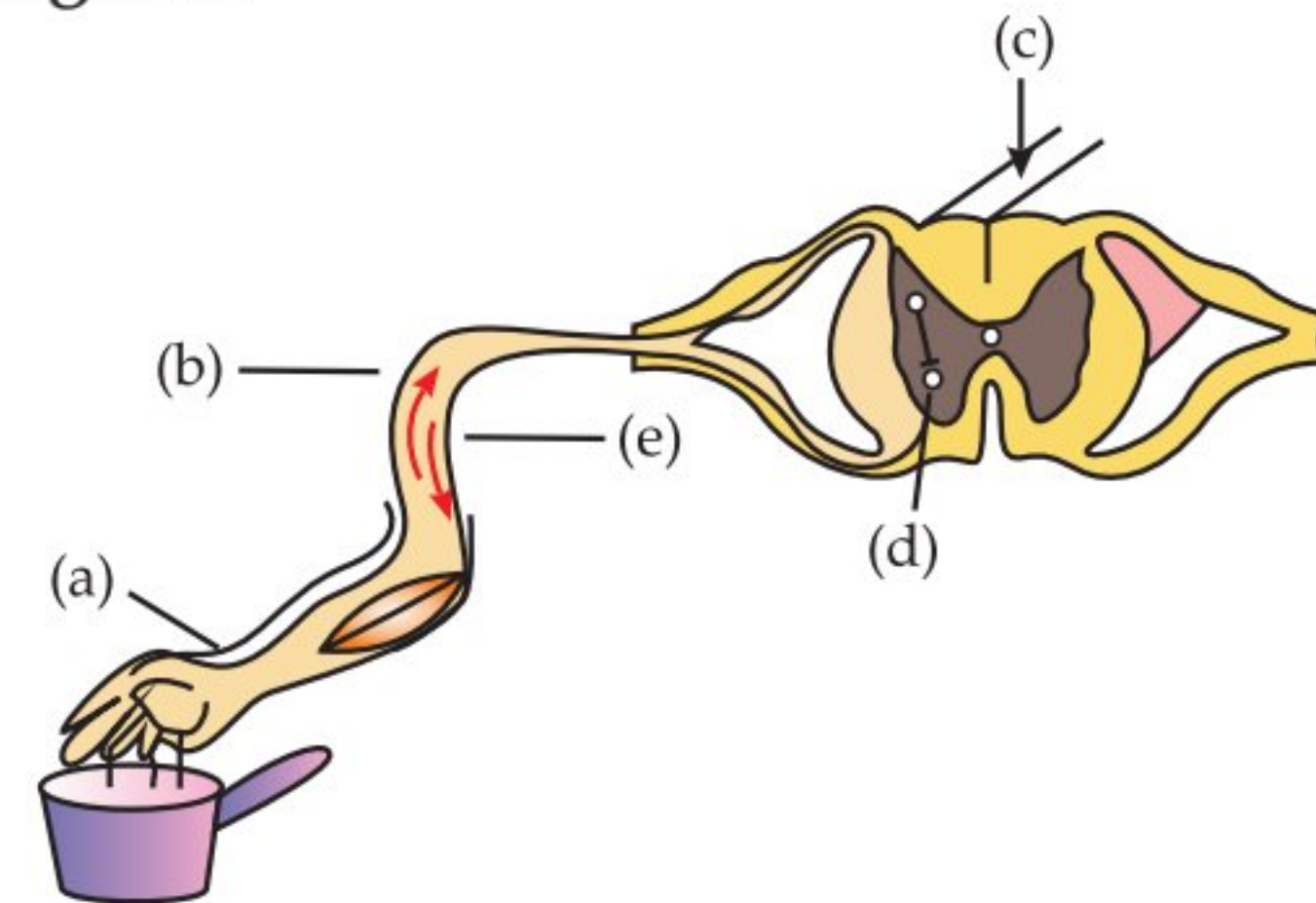
Q. 4. Why does the flow of signals in a synapse from axonal end of one neuron to dendritic end of another neuron take place but not in the reverse direction? Explain.

U [CBSE Board 2019]

other. Moreover, this type of communication can be maintained at a steady rate and is easy to regulate.

3

AI Q. 3. Name the parts (a) to (e) in the following diagram.



What is the term given to the sequence of events occurring in the diagram? U [Delhi, Set-III, 2020]

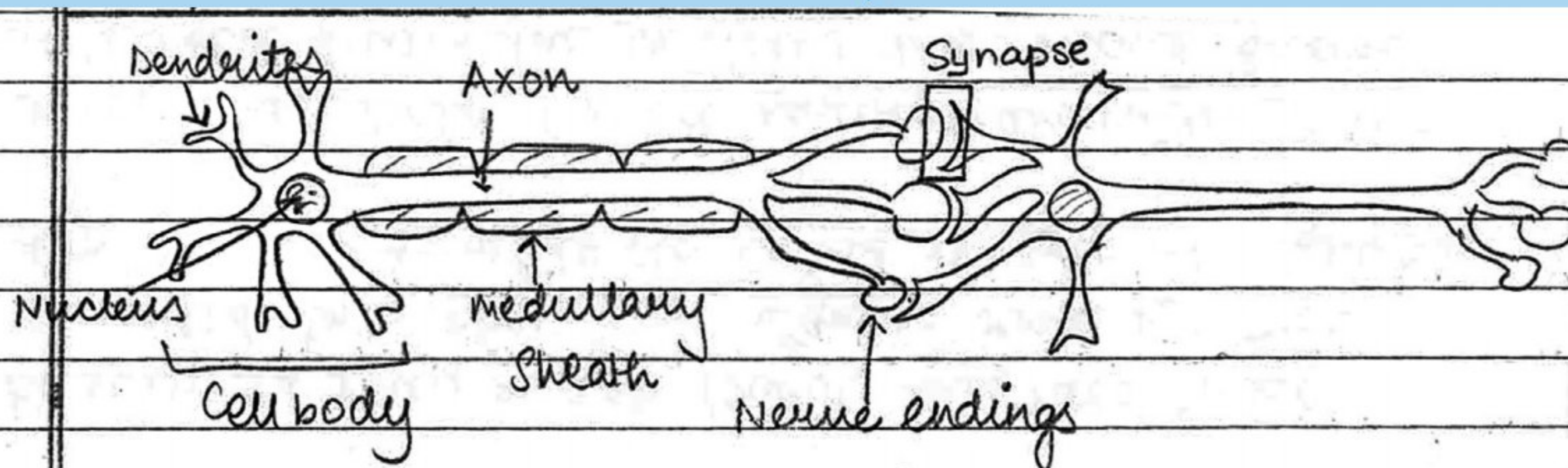
Ans. a- Receptor, b- Sensory neuron, c- Spinal cord, d- Relay neuron, e- Effector.

The term given to the sequence of events occurring in diagram is reflex arc. $2+1=3$



Topper Answer, 2019

Ans.



① The nerve impulses are transmitted from one neuron to the other in the form of electric impulses.

② They enter through

they again get converted to electrical impulses and move on.

(b) They chemicals are released, and move only in one direction and do not reverse in order to reach their destination that can be spinal cord or brain or effectors in order to deliver the message.
(They are released in one direction)

Q. 5. Trace the sequence of events which occur when a bright light is focused on your eyes.

[A] [CBSE Board Delhi, Set- I, 2019]

Ans. Receptor cells of eyes/retina → Sensory neuron → Brain / CNS → Motor neuron → Eye muscles → Pupil contracts / Eye lids close/blink
(Note: If a child writes spinal cord in place of brain give full credit to him/her) $\frac{1}{2} \times 6$

[CBSE Marking Scheme, 2019]

Detailed Answer:

When bright light is focused on our eyes, the photoreceptors generate electric impulses and pass it to the sensory neurons. They carry the stimuli to the spinal cord which transports the message to brain. The brain sends the response to the muscles of the eyelids to close by contracting the pupil.

Receptor → Sensory neuron → Spinal cord → Brain → Motor neuron → Eye → Contraction of eye muscles

Q. 6. What is feedback mechanism of hormonal regulation. Take the example of insulin to explain this phenomenon.

[U] [CBSE Board Delhi, Set-II, 2019]

Ans. **Feedback mechanism:** Mechanism by which the amount of any chemical increases or decreases resulting in secretion of the related hormone. 1
Example: When sugar level rises, insulin secretion increases. 1

When sugar level falls, insulin secretion reduces. 1

[CBSE Marking Scheme, 2019]

Detailed Answer:

Feedback mechanism of hormonal regulation is the mechanism to control the timing and amount of hormone released so that they are secreted in precise quantities. If the sugar levels in 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. 3

Q. 7. Nervous and hormonal system together perform the function of control and coordination in human beings. Justify this statement with the help of an example. [A] [CBSE Board Delhi, Set- III, 2019]

Ans. For nervous and hormonal systems to control and coordinate in human beings, hypothalamus plays an important role in receiving the neural / nerve signals from brain and release hormones. 1
E.g. In iodine deficiency, hypothalamus releases hormones to stimulate pituitary gland, it further sends stimulating hormone to thyroid gland to secrete thyroxine that regulates carbohydrate metabolism. 1 + 1

[CBSE Marking Scheme, 2019]

Detailed Answer:

In human beings, nervous and hormonal system 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 secretion of chemical messengers called hormones. For e.g. when an emergency stimulus is detected by the nervous

system, the stimulus is received and analyzed 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. 3

Q. 8. Pertaining to endocrine system, what will you interpret if :

(i) You observe swollen neck in people living in the hills.

(ii) Over secretion of Growth Hormone takes place during childhood.

(iii) Facial hair develop in boys aged 13.

[CBSE SQP, 2018-19]

Ans. (i) Less intake of Iodine (in the diet)

(ii) Will lead to gigantism

(iii) Timely secretion of testosterone.

[CBSE Marking Scheme, 2018-19] 3

Q. 9. Name the hormones by the following endocrine glands and specify one function of each:

(a) Thyroid

(b) Pituitary

(c) Pancreas

[CBSE Delhi/OD Set-2018]

Ans. (a) Thyroxine regulates carbohydrate, protein and fat metabolism/ controls metabolism for balance of body growth.

(b) Growth hormone regulates growth and development of body (or any other correct answer)

(c) Insulin, regulates/decreases blood sugar level.

OR

Glucagon, regulates increases blood sugar.

[CBSE Marking Scheme, 2018] 1+1+1



Topper Answer, 2018

Ans.

(a) Thyroid gland :- Thyroxine hormone |
Thyroxine hormone helps in metabolism of carbohydrates, fats and proteins and is thus responsible for best balanced body growth.

(b) Pituitary gland :- Growth hormone |
It regulates growth and development of body. However, its reduced secretion causes 'dwarfism' and excess secretion causes 'gigantism'.

(c) Pancreas — Insulin |
Insulin regulates the blood sugar level & brings back the excess sugar level to normal.

Q. 10. (a) Name one gustatory receptor and one olfactory receptor present in human beings.

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



[CBSE Delhi/OD Set-2018]

Ans. (a) Gustatory receptor - Tongue

Olfactory receptor- Nose

(b) (i) Cell body/cyton

(ii) Axon

[CBSE Marking Scheme, 2018] 1 + 2



Topper Answer, 2018

Ans. (a) Gustatory receptor present in tongue to detect taste.
 Olfactory receptor present in nose to detect smell.
 (b) Dendrite → Cyton/Cell body → Axon → End pt. of neuron

Q. 11. Draw a neat diagram of human brain and label on it the following parts:

(i) Mid brain

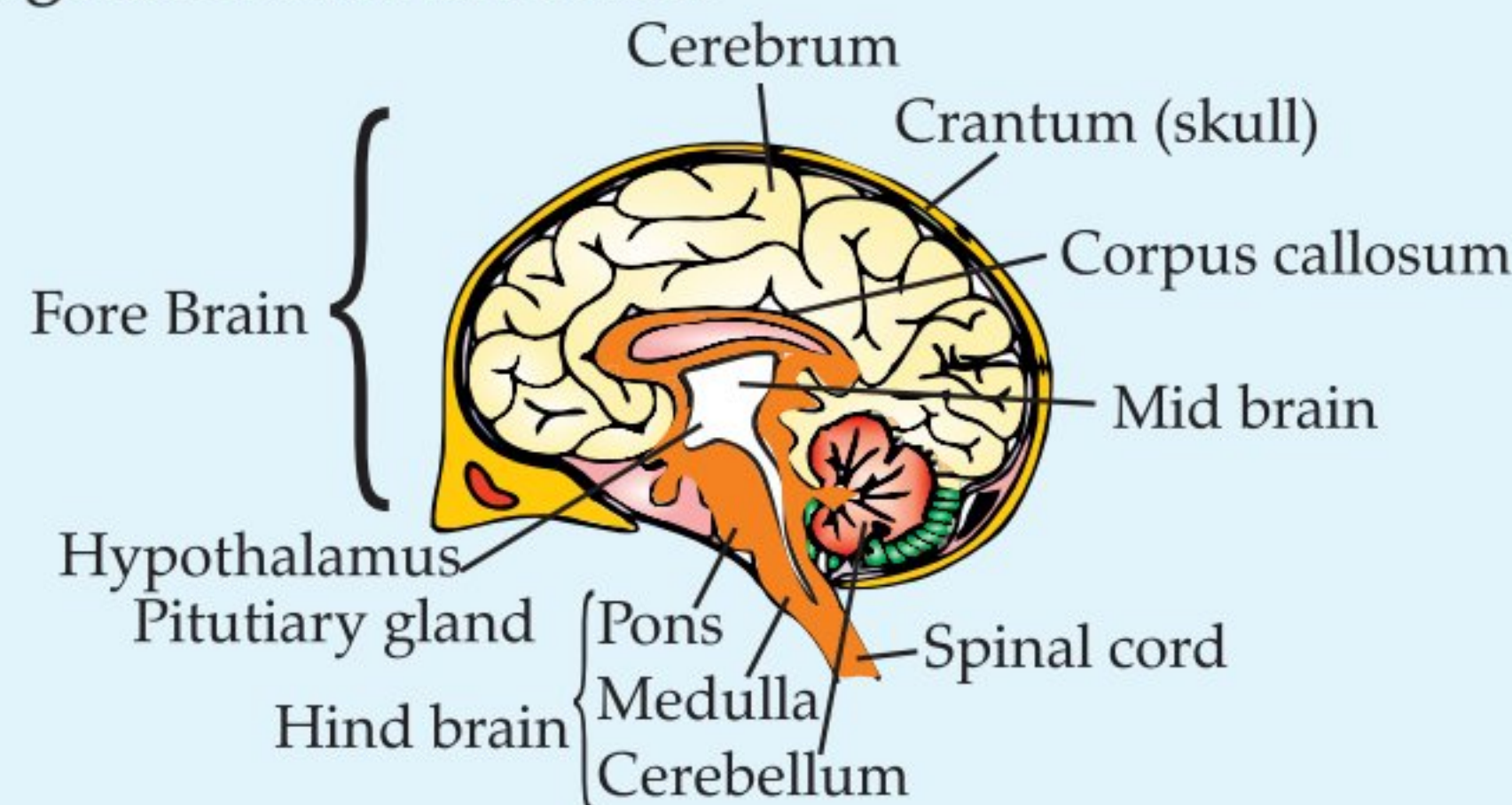
(ii) Pituitary gland

(iii) Cerebellum

(iv) Cerebrum

[AE] [DDE, 2017]

Ans. (i) Labelled diagram of Human brain:



[2 + 1]

[CBSE Marking Scheme, 2015]

COMMONLY MADE ERROR

- Students often forget to label all the parts which are asked.

ANSWERING TIP

- Carefully draw the diagram and label the asked parts carefully. Each labelling carries a mark.

Q. 12. Explain the feedback mechanism to regulate the action of the hormones with the help of one suitable example. [CBSE Term-I, 2016]

Ans. Hormones should be secreted in precise quantities. The timing and amount of hormone released are regulated by feedback mechanism. For e.g., if the sugar level in blood rises, 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.

3

[CBSE Marking Scheme, 2016]

Q. 13. (a) An old man is advised by his doctor to take less sugar in his diet. Name the disease from which the man is suffering. Mention the hormone due to imbalance of which he is suffering from this disease. Which endocrine gland secretes this hormone?

(b) Name the endocrine gland which secretes growth hormone. What will be the effect of the following on a person:

- Deficiency of growth hormone.
- Excess secretion of growth hormone.

[AE] [CBSE Term-I, 2016]

Ans. (a) The man is suffering from Diabetes mellitus.

Hormone is Insulin.

Endocrine gland that secretes insulin is pancreas.

1½

(b) The endocrine gland which secretes growth hormone is pituitary gland.

- Deficiency of growth hormone causes dwarfism.
- Excess secretion of growth hormone causes gigantism.

1½

COMMONLY MADE ERROR

- Many students write incorrect name of the hormone and the related disorder. So they are unable to score marks.

ANSWERING TIP

- Use charts and tables to learn the name of the hormones, their secretion and function.

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?

[U] [CBSE Term-I, 2016]

Ans. (a) The hormone which regulates carbohydrates, protein and fat metabolism in our body is thyroxine.

(b) Thyroxine hormone is secreted by thyroid gland.

(c) Iodised salt in diet is important because it contains iodine, which is essential for the synthesis of thyroxine hormone by the thyroid gland. In case, iodine is deficient in our diet, there would be less production of thyroxine hormone and thus there is a possibility of suffering from goitre. 1 + 1 + 1

✓ Long Answer Type Questions

5 marks each

Q. 1. (a) Why is the use of iodised salt advisable? Name the disease caused due to deficiency of iodine in our diet and state its one symptom.

(b) How do nerve impulses travel in the body? Explain. [R] [Board Outside Delhi, Set-I, 2019]

Ans. (a) Iodine is essential for functioning of thyroid / formation of thyroxine hormone. 1
Disease is Goitre 1
Swollen neck 1

(b) Impulse travels from dendrite to cell body, then along the axon to its end. At the end some chemicals are released which fill the gap of synapse, and starts a similar electrical impulse to another neuron and the impulse further travel in the body. 2

(Award marks if attempted as a flow chart also)

[CBSE Marking Scheme, 2019]

Detailed Answer:

(a) Iodine is necessary for thyroid gland to secrete thyroxine hormone which regulates carbohydrate, protein and fat metabolism in the body. Its deficiency may cause goitre. Therefore, use of iodised salt is advisable. Its key symptom is a swollen neck.

(b) The information received at the end of the dendritic tip, sets off a chemical reaction that creates an electrical impulse. This impulse travels from the dendrite to the cell body and then along axon to its end. Here, the electrical impulse sets off the release of some chemicals which cross synapse inducing similar impulse in a dendrite of the next neuron.

3+2

Q. 2. (i) Define receptor and state their location in our body. Mention any two receptors present in our forebrain and their functions.

(ii) How do nerve impulses travel in our body?

[U] [CBSE Term-I, 2016]

Ans. (i) **Receptor:** Specialised tips of some nerve cells, which receive information from the surroundings.

Location: Sense organs

Gustatory receptor - detect taste

Olfactory receptor - detect smell

(ii) The information acquired at the end of the dendritic tip of a nerve cell, sets off a chemical reaction that creates an electrical impulse, which

travels to the cell body, then along the axon to its end where it releases some chemicals across the synapses.

[CBSE Marking Scheme, 2016] 1 + 1 + 1 + 2

Q. 3. (a) Draw the structure of a neuron and label the following on it:

- Dendrite
- Cell body
- Nucleus
- Axon

(b) Name the parts of a neuron:

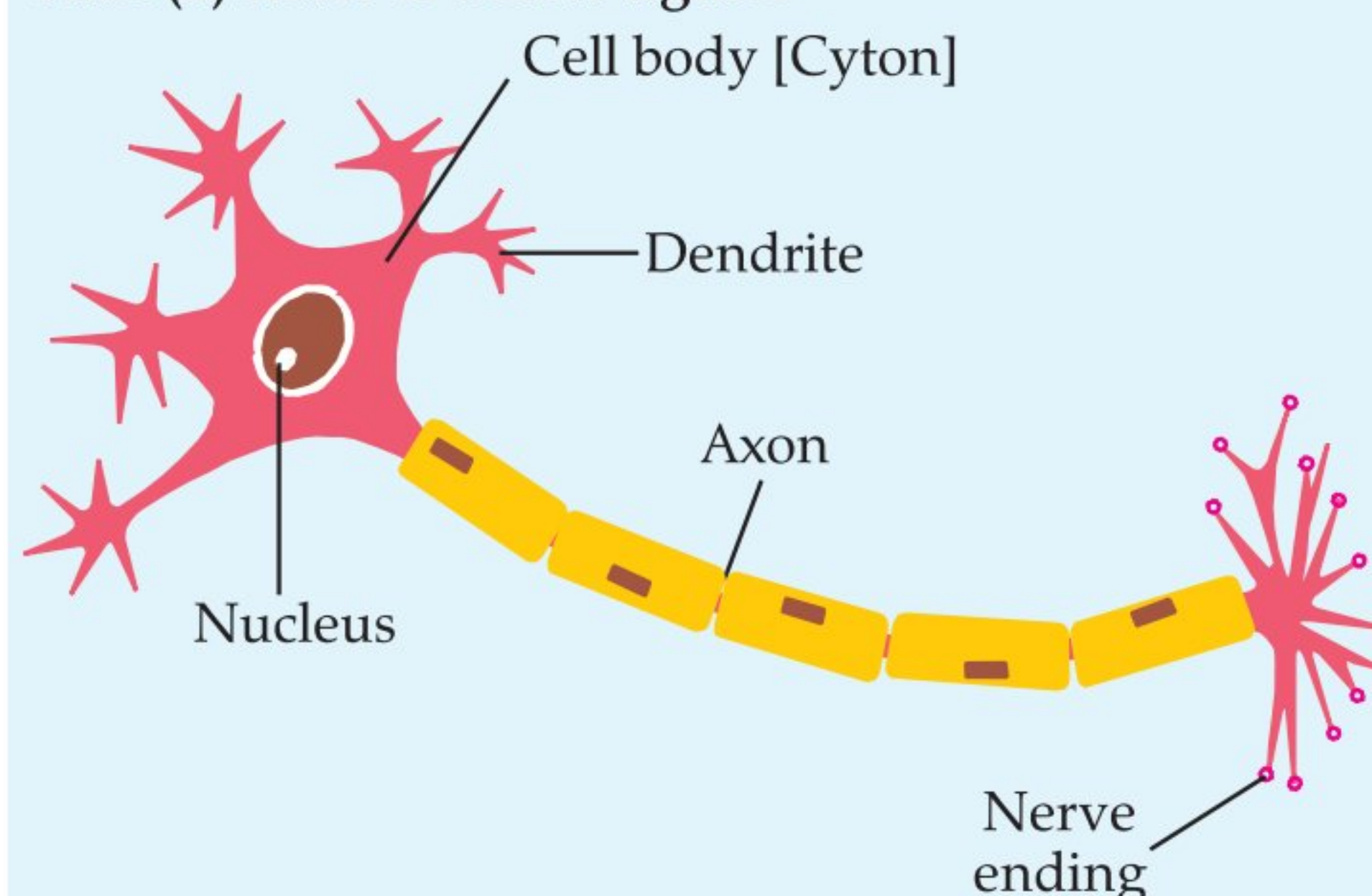
- Where information is acquired.
- Through which information travels as an electrical impulse.
- Where this impulse must be converted into a chemical signal for onward transmission.

(c) Define neuromuscular junction.

[U] [CBSE Term-I, 2016]

[NCERT Exemplar]

Ans. (a) Refer to below figure:



(b) (i) Dendrite (ii) Axon (iii) Nerve ending.

(c) Neuromuscular junction is a chemical synapse formed by the contact between a motor neuron and a muscle fibre. 2+3

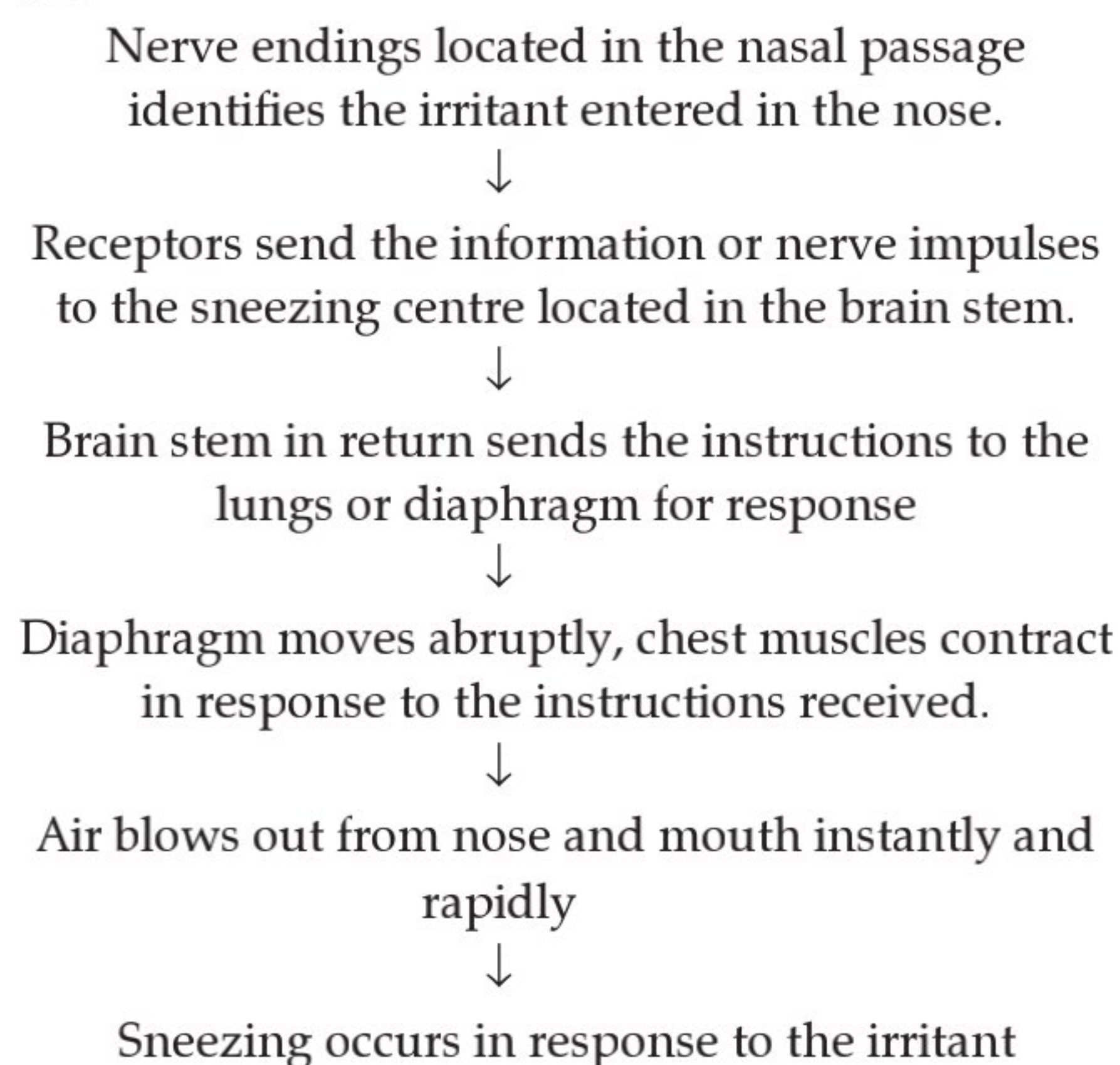
[CBSE Marking Scheme, 2016]

Q. 4. (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. [C] [DDE-2015, 17, CBSE Term-I, 2015]

Ans. (i) The pathway taken by nerve impulses in a reflex action is called the reflex arc.

Sequences of events, which occur during sneezing, are:



(ii) **Auxin:** It promotes elongation and division of cell and root formation.

Gibberellins: They help in growth of stem and also induce internodal growth in genetically dwarf varieties of plants.

Cytokinins: They promote cell division and delay leaf ageing.

Absciscic acid: It inhibits growth. 3+2

Q. 5. (i) Define reflex action. State its significance.

(ii) How do plants respond to external stimuli?

[CBSE Term-I, 2015]

Ans. (i) Reflex action: It is defined as an unconscious, automatic and involuntary response of effectors, *i.e.* muscles and glands, to a stimulus, which is monitored through the spinal cord.

Significance: It protects us from any sudden stimulus which may harm us.

(ii) Plants respond to a number of external stimuli like light, gravity, touch, chemicals, etc. They respond to external stimuli with the help of receptors and hormones. The receptors help the plants to sense the external stimulus and act accordingly. They respond to external stimuli, usually by growing towards or away from the source of stimulus. *e.g.*, auxin is a plant hormone produced in the stem tips and roots, which controls the direction of growth.

1+2+2



Visual Case-based Questions

4 marks each

Q. 1. Study the table in which the levels of Thyroid Stimulating Hormone (TSH) in women are given and answer the questions that follow on the basis of understanding of the following paragraph and the related studied concepts.

Age Range	Normal (mU/L)	Low (mU/L)
18 – 29 years	0.4 – 2.34 mU/L	< 0.4 mU/L
30 – 49 years	0.4 – 4.0 mU/L	< 0.4 mU/L
50 – 79 years	0.46 – 4.68 mU/L	< 0.46 mU/L

Women are at greater risk for developing abnormal TSH levels during menstruation, while giving birth and after going through menopause. Around 6% of women in the United States have some kind of thyroid problem compared to 3% of men. Despite claims that high TSH increases your risk for heart disease, a 2013 study found no link between high TSH and heart diseases. But a 2017 study showed that older women are especially at risk for developing thyroid cancer if they have high levels along with thyroid nodules.

(a) A 35 year old woman has TSH level 6.03 mU/L. What change should she bring in her diet to control this level?

(b) When do women face a greater risk of abnormal TSH level?

(c) State the consequence of low TSH level.

(d) Name the mineral that is responsible for synthesis of hormone secreted by thyroid gland.

[Outside Delhi, Set-I, 2020]

Ans. (a) She should take more iodine in her diet which would bring thyroxine levels to normal.

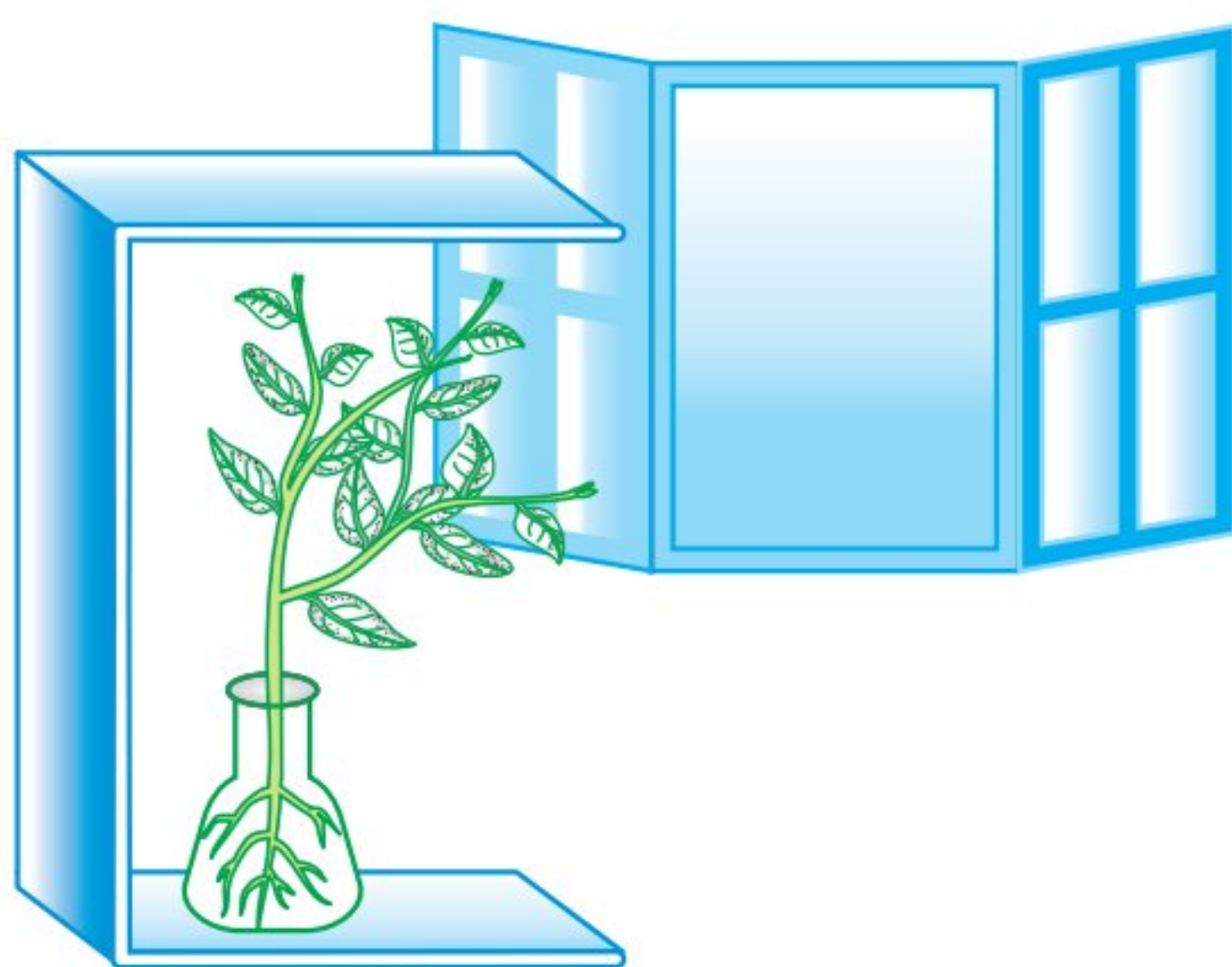
(b) During menstruation, while giving birth and after going through menopause.

(c) Low level of TSH causes – Goitre disease

(d) Iodine. 1 + 1 + 1 + 1

Q. 2. Read the given passage and answer any four questions from (a) to (e).

Plants perform chemical coordination for various activities with the help of hormones. Different hormones are produced by plants. These are the chemical compounds released by stimulated cells that diffuse to various locations in plants performing different function. There is a hormone that is synthesized in the tip of shoots. When light is coming from one side of the plant, this hormone diffuses towards the shady side of the shoot. Its concentration stimulates the cells to grow longer on the side of the shoot which is away from light. Thus, the plant appears to bend towards light while growing.



(a) The name of the hormone being described is:

- (i) Auxin
- (ii) Gibberellin
- (iii) Cytokinin
- (iv) Ethylene

(b) The movement of shoot towards light is known as

- (i) Chemotropism
- (ii) Phototropism
- (iii) Thigmotropism
- (iv) Geotropism

(c) A young plant receives sunlight from one direction only. What will happen to its roots and shoots?

(d) The stimulus in growth of pollen tube towards ovule during fertilisation is:

- (i) Pollen
- (ii) Chemical
- (iii) Light
- (iv) Water

(e) Which of the following is not associated with growth of plant?

- (i) Auxin
- (ii) Gibberellins
- (iii) Cytokinins
- (iv) Abscisic acid

Ans. (a) (i) Auxin is the hormone.

(b) (ii) The movement of shoot towards light is known as phototropism.

(c) The shoot of the plant bend towards light whereas roots bends away from the light.

(d) Chemicals

(e) (iv) Abscisic acid is a growth inhibitor hormone, it reverses the growth promoting effects of auxins and gibberellins. It causes dormancy of seeds, wilting of leaves, closing of stomata, etc. 1+1+1+1+1

Q. 3. Read the passage below and answer the following questions.

Sonia went to the market along with her mother to buy fruits. She saw the fruit dealer putting small quantity of some powder wrapped in a paper in each wooden pack containing unripe mangoes. On enquiry, the fruit dealer told him that the powder is specific chemical which will help the mangoes to ripe early. Sonia was not convinced and she discussed the incidence with his class teacher the next day.

(a) The chemical that fruit dealer had kept in wrapped paper in each box is:

- (i) Auxin
- (ii) Gibberellin
- (iii) Cytokinin
- (iv) Ethephon

(b) Is this practice healthy?

(c) All of these hormones are growth promoters except:

- (i) Gibberellin
- (ii) Ethylene
- (iii) Auxin
- (iv) Cytokinin

(d) The substance that triggers the fall of mature leaves and fruits from plants is due to

- (i) auxin
- (ii) gibberellin
- (iii) abscisic acid
- (iv) cytokinin

Ans. (a) (iv) Ethephon is the chemical which is similar with ethylene plant hormone.

(b) No, such practices should be discouraged as the gas released from chemical may cause allergy on consumption.

(c) (ii) Ethylene

(d) (iii) Abscisic acid is a growth inhibitor hormone. It is produced in plants during adverse conditions like drought, water logging, cold conditions, etc. It causes falling of fruits and flowers and induces dormancy in seeds and buds.

Auxin promotes cell elongation, root formation, etc. Gibberellin stimulates stem elongation and germination. Cytokinin helps in breaking dormancy and regulating phloem transport. 4

Q. 4. Study the table in which the levels of Thyroid Stimulating Hormone (TSH) in women are given and answer the questions that follow on the basis of understanding of the following paragraph and the related studied concepts.

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(d) Name the mineral that is responsible for synthesis of hormone secreted by thyroid gland.

A [Outside Delhi, Set- I, 2020]

- Ans. (a) She should take more iodine in her diet which would bring thyroxine levels to normal.
 (b) During menstruation, while giving birth and after going through menopause.
 (c) Low level of TSH causes – Goitre disease
 (d) Iodine. 1×4=4

Q. 5. Question numbers (a) – (d) are based on the two tables given below. Study these tables related to blood sugar levels and answer the questions that follow.

Table A (Blood glucose chart)

	Mean Blood Glucose Level (mg/dL)
Doctor's advice needed	380
	350
	315
	280
	250
Good	215
	180
Excellent	150
	115
	80
	50

Table B (Blood Report of Patient X and Y)

Time of check	Blood Glucose ranges (mg/dL)	
	Patient X	Patient Y
Before breakfast (Fasting)	< 100	70 - 130
Before lunch, supper and snack	<110	70 - 130
Two hours after meals	<140	< 180
Bedtime	<120	90 - 15

- (a) Refer to Table B showing the blood report of the levels of glucose of patients X and Y. Infer the disease which can be diagnosed from the given data. 1
 (b) Identify the hormone whose level in the blood is responsible for the above disease. 1
 (c) Which one of the following diets would you recommended to the affected patient? 1
 (i) High sugar and low fat diet.
 (ii) Low sugar and high protein diet.
 (iii) High fat and low fibre diet.
 (iv) Low sugar and high fibre diet.
 (d) Refer to the Table A and suggest the value of the mean blood glucose level beyond which doctor's advice is necessary:
 (i) 180 mg/dL
 (ii) 115 mg/dL

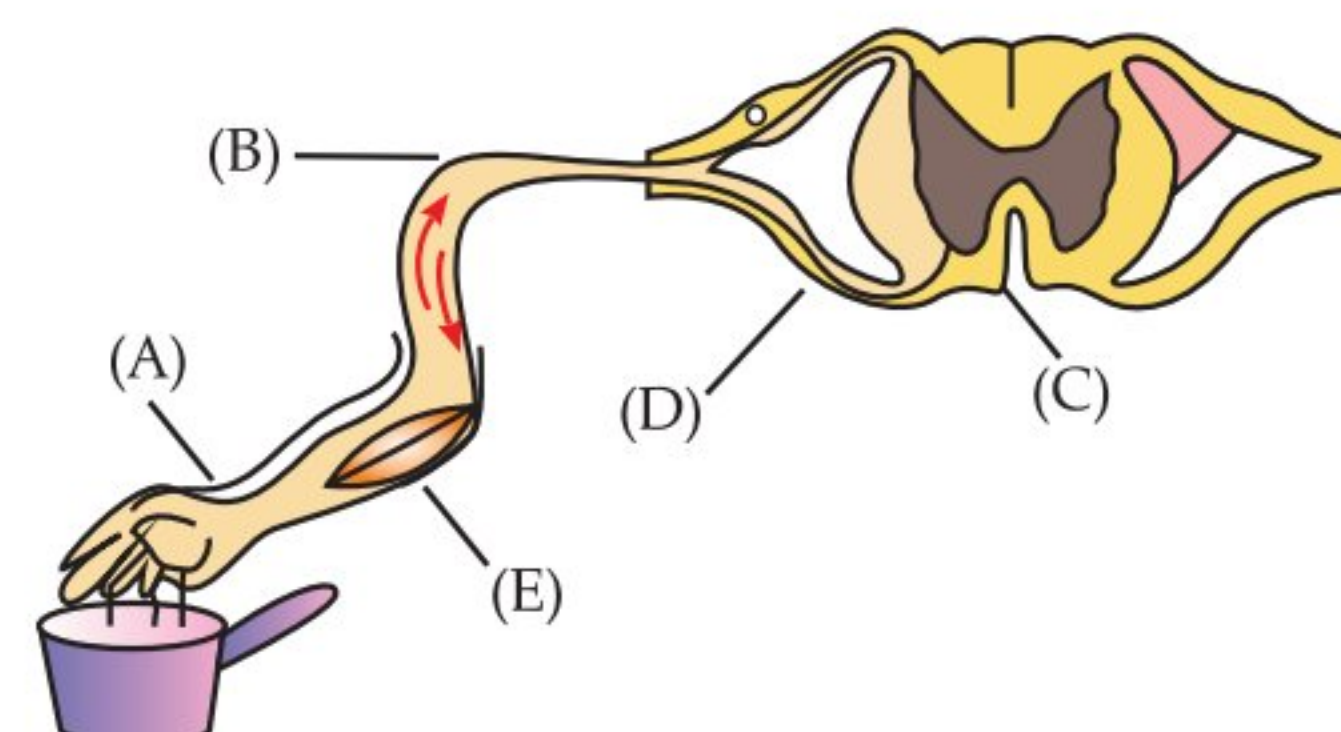
- (iii) 50 mg/dL
 (iv) 80 mg/dL

[CBSE SQP, 2019]

- Ans. (a) Diabetes
 (b) Insulin
 (c) (iv) low sugar and high fiber diet
 (d) (i) 180 mg/dL

1+1+1+1

Q. 6. Study the given diagram of reflex arc and answer any four questions from (a) to (e).



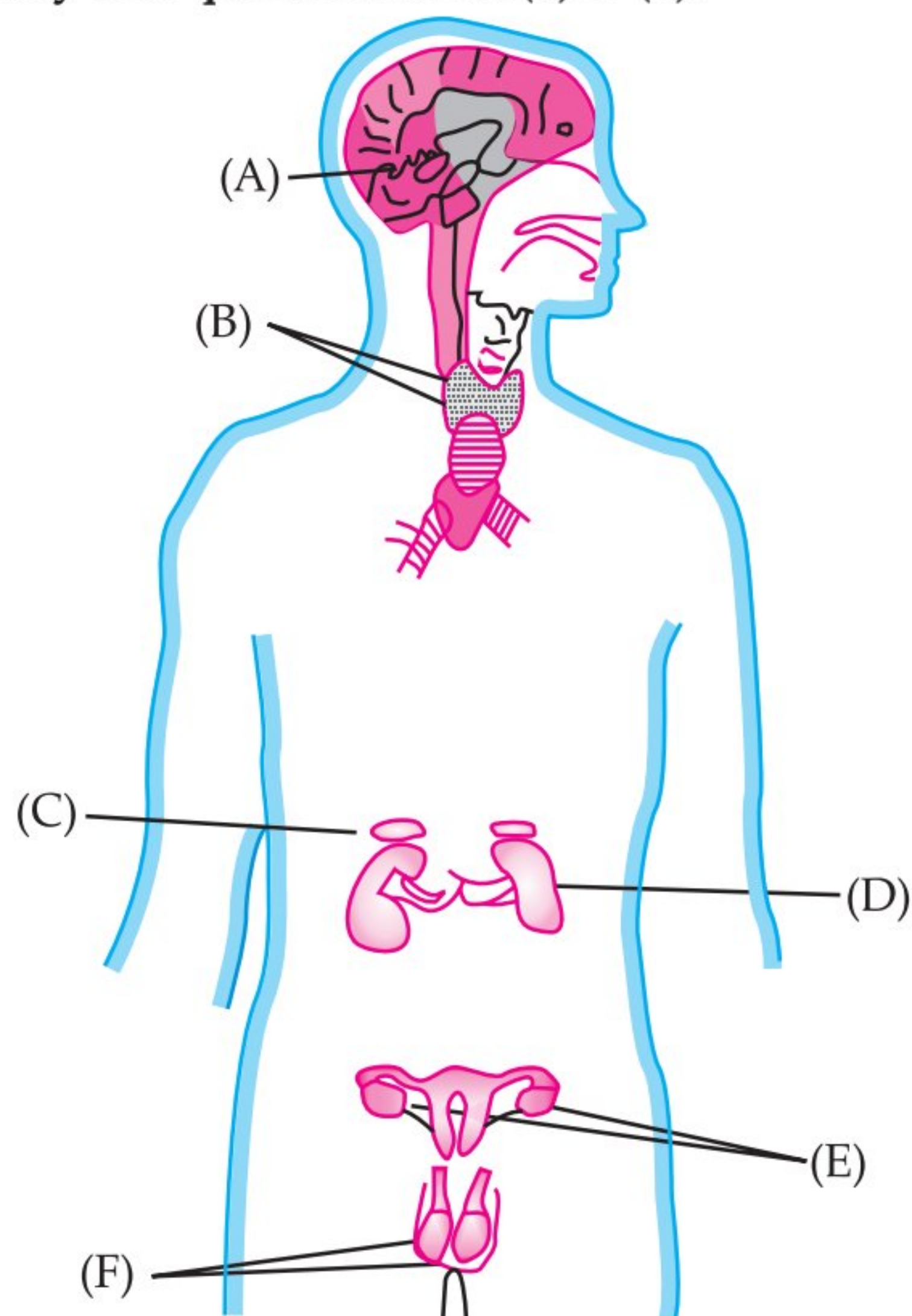
- (a) Give an example of reflex action.
 (b) The parts labelled as A and C are
 (i) Receptor and Relay neuron respectively
 (ii) Receptor and Spinal cord respectively
 (iii) Effector and Relay neuron respectively
 (iv) Effector and Spinal cord respectively
 (c) Which of these is not the function of B?
 (i) It responds to stimulus.
 (ii) It carries impulse from receptor to spinal cord.
 (iii) It carries impulse from effector to spinal cord
 (iv) None of these
 (d) The correct path of reflex action is
 (i) Receptors → Sensory neuron → Spinal cord → Motor neuron → Effector
 (ii) Receptors → Motor neuron → Spinal cord → Sensory neuron → Effector
 (iii) Effector → Sensory neuron → Brain → Motor neuron → Receptors
 (iv) Effector → Motor neuron → Brain → Sensory neuron → Receptors
 (e) Which of the following statements are true?
 1. Sudden action in response to something in the environment is called reflex action
 2. Sensory neurons carry signals from spinal cord to muscles.
 3. Motor neurons carry signals from receptors to spinal cord.
 4. The path through which signals are transmitted from a receptor to a muscle or a gland is called reflex arc.
 (i) 1 and 2 (ii) 1 and 3
 (iii) 1 and 4 (iv) 1, 2 and 3

- Ans. (a) Pulling out hand from the flame if accidentally touched is an example of reflex action.
 (b) (i) Part labelled as A is Receptor and C is Relay neuron.
 (c) Part B is Sensory neuron. It carries impulse from receptor to spinal cord.
 (d) (i) The pathway taken by nerve impulse in a reflex action is called the reflex arc. It follows a specific

pathway as: Receptors → Sensory neuron → Spinal cord → Motor neuron → Effector. 4

- (e) (iii) The statement 2 is false as sensory neurons carry signals from receptors to spinal cord. The statement 3 is false as motor neurons carry signals from spinal cord to effectors. 1

Q.7. The given diagram represents the human endocrine system. Study the diagram and answer any four questions from (a) to (e).



- (a) Identify the endocrine glands A, B, C, D, E and F in the given diagram.
 (b) The effect of chemical produced by gland F is:
 (i) Secretes insulin which controls the amount of sugar in blood.
 (ii) Secretes testosterone which controls sperm

production.

- (iii) Controls the activity of all other glands of our body.
 (iv) All of these
 (c) Which gland secretes digestive enzymes as well as hormones?
 (i) B (ii) C
 (iii) D (iv) E
 (d) Select the mis-matched pair.
 (i) A - Adrenaline (ii) F - Testosterone
 (iii) E - Estrogen (iv) B - Thyroxin
 (e) Which of the following endocrine glands is unpaired?
 (i) Adrenal (ii) Testes
 (iii) Pituitary (iv) Ovary

Ans. (a) A — Pituitary
 B — Thyroid
 C — Adrenal
 D — Pancreas
 E — Ovary
 F — Testis

- (b) (ii) Gland F is Testis. It secretes testosterone which controls sperm production/secondary sexual character.
 (c) Gland D is pancreas. It secretes both digestive enzymes as well as hormones.
 (d) (i) Adrenaline is secreted by the adrenal glands, located on top of kidneys. Growth hormone is secreted by the pituitary gland.
 (e) (iii) There are two adrenal glands, one on top of each kidney that make adrenaline hormone. Testes are paired glands presents in males, secretes male sex hormone. Pituitary gland is present just below the brain and is unpaired. It is also called master gland and as it secretes a number of hormones. Ovaries are paired glands present in females, secretes female sex hormones. 1+1+1+1+1

Know the Terms

- **Phototropism:** Growth movements of plants towards light *e.g.*, shoots bend toward light (positively phototropic) and roots move away from light (negatively phototropic)
- **Geotropism:** Growth movement of plant towards force of earth gravity.
- **Hydrotropism:** Growth movements of plant in response to external stimulus of water *e.g.*, roots bend toward the source of water.
- **Thigmotropism:** Growth movement due to the stimulus of touch with foreign body *e.g.*, tendrils.
- **Chemotropism:** Growth movements in response to some chemical stimulus *e.g.*, growth of pollen tube in style towards ovule.
- **Thermotropism:** Growth movements of plant in response to temperature, *e.g.*, seedlings curve toward warm side.
- **Growth:** Permanent or irreversible increase in dry weight, size or volume of living beings.
- **Development:** Series of changes that occur in the structure & functioning of cell, organ or organism during its life history.
- **Meristem:** A tissue, the cells of which have the capacity to undergo division and give rise to a whole plant.
- **Growth regulators:** The chemical substances which modify growth. They are either **growth promoters** *e.g.*, auxins, gibberellins and cytokinins or **growth inhibitors** *e.g.*, abscisic acid and ethylene.

- **Phytohormone:** Chemicals that regulate plant growth.
- **Auxins:** Organic substance which promotes shoot elongation when present.
- **Indole 3-Acetic acid (IAA):** A natural auxin of plants, found in all parts of plants.
- **Synthetic auxins:** Some important synthetic compounds, which show auxin like activity *e.g.*, Indole 3 - butyric acid (IBA), 2- 4, dichlorophenoxy acetic acid (2-4-D) *etc.*
- **Neuron:** Structural and functional unit of nervous system.
- **Nerve impulse:** Information in the form of electrochemical signals passing through neurons.
- **Sensory neurons:** The neurons which transmit impulses towards central nervous system.
- **Motor neurons:** The neurons which transmit impulses from central nervous system to effector organs.
- **Spinal nerves:** Nerves which arise from spinal cord. There are 31 pairs of spinal nerves in human beings.
- **Cranial nerves:** Nerves which arise from brain. There are 12 pairs of cranial nerves in humans.
- **Reflex action:** A spontaneous automatic response to a stimulus without the will of an organism.
- **Conditional reflex:** Acquired reflexes during life time of an individual *e.g.*, applying brakes of car.
- **Unconditional reflexes:** Unconditional Reflexes are natural and inborn reflexes and are transmitted from generation to generation *e.g.*, constriction of pupil in bright light.
- **Brain stem:** Medulla oblongata, pons varolii and mid brain are collectively called the brain stem.
- **Saltatory conduction:** Conduction of impulse along a myelinated nerve fibre.
- **Corpus callosum:** Band of nerve fibres that joins the cerebral hemispheres.
- **Endocrine system:** The endocrine glands and their secretions (hormones) constitute endocrine system.
- **Endocrine glands:** Ductless glands whose secretions are poured directly into the blood stream *e.g.*, thyroid glands and adrenal glands *etc.*
- **Hormones:** Chemical messengers of the body that transfer information from one set of cells to another.
- **Tropic hormone:** A hormone which stimulates another endocrine gland to secrete its hormone. *e.g.*, Thyrotropic hormone stimulates the thyroid gland to secrete thyroxine.
- **Pituitary gland:** It is the master gland which controls all other endocrine glands.