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Chemical Coordination and Integration

TOPIC 1

Hormones and Their Chemical Nature

- 01** Match the following columns and select the correct option from the codes given below.

[NEET (Oct.) 2020]

Column I	Column II
A. Pituitary hormone	1. Steroid
B. Epinephrine	2. Neuropeptides
C. Endorphins	3. Peptides, proteins
D. Cortisol	4. Biogenic amines

- | | A | B | C | D |
|-----|---|---|---|---|
| (a) | 4 | 1 | 2 | 3 |
| (b) | 3 | 4 | 2 | 1 |
| (c) | 4 | 3 | 1 | 2 |
| (d) | 3 | 4 | 1 | 2 |

Ans. (b)

Option (b) is correct match which is as follows

Pituitary hormones are chemically peptides and proteins.

Epinephrine is a biogenic amine.

Endorphins are neuropeptides.

Cortisol is a steroid hormone.

- 02** Hormones stored and released from neurohypophysis are

[NEET (Oct.) 2020]

- (a) thyroid stimulating hormone and oxytocin
(b) oxytocin and vasopressin

- (c) follicle stimulating hormone and leutinizing hormone
(d) prolactin and vasopressin

Ans. (b)

Neurohypophysis (pars nervosa) is also known as posterior pituitary which stores and releases two hormones called oxytocin and vasopressin, which are actually synthesised by the hypothalamus and are transported axonally to neurohypophysis.

- 03** GnRH, a hypothalamic hormone, needed in reproduction, acts on

[NEET 2017]

- (a) anterior pituitary gland and stimulates secretion of LH and oxytocin
(b) anterior pituitary gland and stimulates secretion of LH and FSH
(c) posterior pituitary gland and stimulates secretion of oxytocin and FSH
(d) posterior pituitary gland and stimulates secretion of LH and relaxin

Ans. (b)

GnRH is a hypothalamic hormone. It stimulates the anterior lobe of pituitary gland to secrete LH and FSH.

- 04** Hypersecretion of growth hormone in adults does not cause further increase in height because

[NEET 2017]

- (a) growth hormone becomes inactive in adults
(b) epiphyseal plates close after adolescence
(c) bones loose their sensitivity to growth hormone in adults
(d) muscle fibres do not grow in size after birth

Ans. (b)

Chronic hypersecretion of Growth Hormone (GH) leads to gigantism or acromegally depending on the age of the individual.

If its hypersecretion occurs before the ossification of epiphyseal plates, it causes exaggerated and prolonged growth in long bones. It results in gigantism.

In adults, hypersecretion of GH leads to accromegaly. No increase in height occurs because of the ossified epiphyseal plate.

- 05** The amino acid, tryptophan is the precursor for the synthesis of

[NEET 2016, Phase I]

- (a) thyroxine and tri-iodothyronine
(b) oestrogen and progesterone
(c) cortisol and cortisone
(d) melatonin and serotonin

Ans. (d)

Melatonin and serotonin are derivatives of tryptophan amino acid while thyroxine and tri-iodothyronine are iodinated tyrosine amino acid derivatives.

- 06** Which of the following pairs of hormones are not antagonistic (having opposite effects) to each other?

[NEET 2016, Phase I]

- | | | |
|-----|--------------|---------------------------|
| (a) | Insulin | Glucagon |
| (b) | Aldosterone | Atrial Natriuretic Factor |
| (c) | Relaxin | Inhibin |
| (d) | Parathormone | Calcitonin |

Ans. (c)

Relaxin hormone which is secreted by posterior pituitary gland relaxes the pubic symphysis during parturition while inhibin decreases the secretion of FSH from anterior pituitary.

- 07** Name a peptide hormone which acts mainly on hepatocytes, adipocytes and enhances cellular glucose uptake and utilisation. [NEET 2016, Phase II]

- (a) Insulin (b) Glucagon
(c) Secretin (d) Gastrin

Ans. (a)

Insulin is the peptide hormone which enhances the uptake of glucose molecules by liver cells (hepatocytes) and fat cells (adipocytes) for its cellular utilisation. Such an activity of insulin brings down the level of glucose in the blood.

- 08** Which one of the following hormones is not involved in sugar metabolism? [CBSE AIPMT 2015]

- (a) Cortisone (b) Aldosterone
(c) Insulin (d) Glucagon

Ans. (b)

Aldosterone is not involved in sugar metabolism. It is a steroid hormone (mineralocorticoid) produced by the outer section (zona glomerulosa) of the adrenal cortex in the adrenal gland. It plays a central role in the regulation of blood pressure mainly by acting on the distal tubules and collecting ducts of the nephron, increasing reabsorption of ions and water in the kidney, to cause the conservation of sodium, secretion of potassium, increase in water retention and decrease in blood pressure and blood volume.

- 09** Which one of the following hormones though synthesised elsewhere, is stored and released by the master gland? [CBSE AIPMT 2015]

- (a) Antidiuretic hormone
(b) Luteinising hormone
(c) Prolactin
(d) Melanocyte stimulating hormone

Ans. (a)

Antidiuretic Hormone (ADH) or vasopressin is a peptide hormone synthesised in the hypothalamus, but stored and released from the posterior pituitary lobe.

- 10** Identify the hormone with its correct matching of source and function. [CBSE AIPMT 2014]

- (a) Oxytocin – Posterior pituitary, growth and maintenance of mammary glands
(b) Melatonin – Pineal gland, regulates the normal rhythm of sleepwake cycle
(c) Progesterone – Corpus luteum, stimulation of growth and activities of female secondary sex organs
(d) Atrial natriuretic factor – Ventricular wall increases the blood pressure

Ans. (b)

Melatonin is a hormone present in animals, plants and microbes. In animals melatonin allows the regulation of circadian rhythms.

Oxytocin is a neurohypophysial hormone which stimulates the muscle contraction (smooth muscle) in the wall of uterus during childbirth.

Progesterone is a female hormone produced by the corpus luteum after ovulation.

This hormone maintains the wall of uterus throughout the pregnancy.

ANF stimulates the secretion of Na and H_2O by the kidneys and helps in regulating blood pressure.

- 11** A person entering an empty room suddenly finds a snake right in front on opening the door. Which one of the following is likely to happen in his neurohormonal control system? [CBSE AIPMT 2012]

- (a) Sympathetic nervous system is activated releasing epinephrine and norepinephrine from adrenal medulla
(b) Neurotransmitters diffuse rapidly across the cleft and transmit a nerve impulse
(c) Hypothalamus activates the parasympathetic division of brain
(d) Sympathetic nervous system is activated releasing epinephrine and norepinephrine from adrenal cortex

Ans. (a)

Epinephrine and nor-epinephrine are secreted by adrenal medulla (under the control of sympathetic nervous system) in response to stress of any kind or during emergency situations.

These are also called emergency hormones. Thus, they would be released when the person enters an empty room and suddenly finds a snake.

- 12** Which one of the following pairs of hormones are the examples of those that can easily pass through the cell membrane of the target cell and bind to a receptor inside it (mostly in the nucleus)? [CBSE AIPMT 2012]

- (a) Insulin and glucagon
(b) Thyroxine and insulin
(c) Somatostatin and oxytocin
(d) Cortisol and testosterone

Ans. (d)

Cortisol and testosterone are lipid soluble hormones, which can directly pass through the cell membrane of the target cell and bind with intercellular receptors.

- 13** What is correct to say about the hormone action in humans? [CBSE AIPMT 2012]

- (a) Glucagon is secreted by β -cells of islets of Langerhans and stimulates glycogenolysis
(b) Secretion of thymosine is stimulated with ageing
(c) In females, FSH first binds with specific receptors on ovarian cell membrane
(d) FSH stimulates the secretion of oestrogen and progesterone

Ans. (c)

FSH hormone is one of the gonadotropins secreted by anterior lobe of pituitary. It is a proteinaceous hormone, so binds with extra cellular or membrane bound receptors.

- 14** Which one of the following pairs is incorrectly matched? [CBSE AIPMT 2010]

- (a) Glucagon – Beta cells (source)
(b) Somatostatin – Delta cells (source)
(c) Corpus luteum – Relaxin (secretion)
(d) Insulin – Diabetes mellitus (disease)

Ans. (a)

In pancreatic islets, alpha or A-cells constitute about 15% of pancreatic islets cells and secrete glucagon. Its molecule consists of a single polypeptide chain of 29 amino acid residues. Glucagon intensifies glycogenolysis, deamination and gluconeogenesis and inhibits glycogenesis in liver cells. It also intensifies lipolysis in adipose tissue. Thus, it is a promoter of catabolic metabolism.

15 Foetal ejection reflex in human female is induced by
[CBSE AIPMT 2009]

- (a) pressure exerted by amniotic fluid
- (b) release of oxytocin from pituitary
- (c) fully developed foetus and placenta
- (d) differentiation of mammary glands

Ans. (b)

Oxytocin (child birth hormone) secreted by neurohypophysis of pituitary gland stimulates contraction of uterus muscles. It stimulates labour pain for child birth. When secretion of progesterone hormone declines it will result in making the end of pregnancy. As the sensory impulse of increasing labour pain reaches hypothalamus, more and more oxytocin is released from posterior pituitary under a positive feedback regulation, it dilates the cervix (vaginal stretching).

16 The blood calcium level is lowered by the deficiency of
[CBSE AIPMT 2008, 1999]

- (a) parathormone
- (b) thyroxine
- (c) calcitonin
- (d) Both (a) and (c)

Ans. (a)

The chief cells of the parathyroid secrete parathormone. Its deficiency causes the lowering of blood calcium level. This increases the excitability of nerves and muscles causing cramps and convulsions. This causes parathyroid tetany characterised by sustained contractions of the muscles of larynx, face, hands and feet.

Calcitonin is secreted when calcium level is high in blood. It has an opposite action to that of parathyroid hormone and lowers the calcium level by suppressing release of calcium ions from the bones.

Thyroxine is secreted from the thyroid gland. It regulates the metabolic rate of the body and thus, maintain basal metabolic rate, stimulate protein synthesis and therefore, promote growth of the body tissues.

17 In human adult females, oxytocin
[CBSE AIPMT 2008]

- (a) is secreted by anterior pituitary
- (b) stimulates growth of mammary glands
- (c) stimulates pituitary to secrete vasopressin
- (d) causes strong uterine contractions during parturition

Ans. (d)

Oxytocin hormone is secreted from the posterior lobe of pituitary gland.

It promotes contraction of uterine muscle during parturition and contraction of myoepithelial cells of lactating breast, squeezing milk into the large ducts behind the nipple.

Because of its role oxytocin is called birth hormone.

18 Feeling the tremors of an earthquake a scared resident of seventh floor of a multistoried building starts climbing down the stairs rapidly. Which hormone initiated this action?
[CBSE AIPMT 2007]

- (a) Thyroxin
- (b) Adrenaline
- (c) Glucagon
- (d) Gastrin

Ans. (b)

Adrenaline hormone is responsible for this action, as adrenaline hormone is known as 3F hormone, i.e. fright, flight and fight.

19 In the human female, menstruation can be deferred by the administration of
[CBSE AIPMT 2007]

- (a) LH only
- (b) combination of FSH and LH
- (c) combination of estrogen and progesterone
- (d) FSH only

Ans. (c)

When the production of progesterone and estrogen hormone stops in blood this leads to shedding of the lining of uterine endometrium. Therefore, by supply of oestrogen and progesterone the menstruation can be deferred.

20 Compared to a bull a bullock is docile because of
[CBSE AIPMT 2007]

- (a) higher levels of thyroxin
- (b) higher levels of cortisone
- (c) lower levels of blood testosterone
- (d) lower levels of adrenaline/noradrenaline in its blood

Ans. (c)

Testes are degenerated due to which testosterone level in blood is reduced. This hormone promotes the growth of many body tissues such as muscles.

21 Withdrawal of which of the following hormones is the immediate cause of menstruation?
[CBSE AIPMT 2006]

- (a) Oestrogen
- (b) FSH
- (c) FSH-RH
- (d) Progesterone

Ans. (d)

Menstruation is caused by the reduction of oestrogen and progesterone.

Hormone level, (especially progesterone) at the end of monthly ovarian cycle. The first effect is decreased stimulation of the endometrial cells by these two hormones followed rapidly by involution of the endometrium itself to about 65% of its previous thickness.

22 Which hormone causes dilation of blood vessels, increased oxygen consumption and glucogenesis?
[CBSE AIPMT 2006]

- (a) ACTH
- (b) Insulin
- (c) Adrenaline
- (d) Glucagon

Ans. (c)

Adrenaline (epinephrine) is a hormone produced by adrenal medulla and is secreted in great amounts during emotional states. It elevates the glucose level in blood stream (by glucogenesis) which is accompanied by increase in oxygen consumption, body temperature, heat production. Adrenaline also causes an increase in the flow of blood by dilating the blood vessels.

Insulin regulates the glucose level in blood.

ACTH (Adreno Corticotropic Hormone) is secreted by anterior pituitary and stimulates the adrenal cortex.

Glucagon is a polypeptide hormone secreted by the alpha cells of islets of Langerhans of pancreas. It also acts to promote glycogenolysis.

23 Sertoli cells are regulated by the pituitary hormone known as
[CBSE AIPMT 2006]

- (a) FSH
- (b) GH
- (c) prolactin
- (d) LH

Ans. (a)

Sertoli cells are the cells that line the seminiferous tubules in the testis. These cells protect the spermatids and convey nutrients to both the developing and mature spermatozoa. Sertoli cells are regulated by FSH (Follicle Stimulating Hormone) as the FSH receptors are confined to the Sertoli cells.

FSH stimulates Sertoli cells to produce androgen-binding protein and inhibin and together with testosterone, promotes the proliferation of Sertoli cells.

24 A steroid hormone which regulates glucose metabolism is
[CBSE AIPMT 2006]

- (a) cortisol
- (b) corticosterone
- (c) 11-deoxycorticosterone
- (d) cortisone

Ans. (a)

Cortisol (a steroid hormone) is the principal glucocorticoid hormone of many mammals including humans (corticosterone is more abundant in some small mammals). It regulates the glucose metabolism and promotes gluconeogenesis, especially during starvation and raises blood pressure.

Cortisone is an inactive form of cortisol.

25 Chemically hormones are
[CBSE AIPMT 2004]

- (a) biogenic amines only
- (b) proteins, steroids and biogenic amines
- (c) proteins only
- (d) steroids only

Ans. (b)

Chemically hormones are of different nature like protein hormones (hypothalamic hormones), steroids (sex hormones) and biogenic amines (like thyroxin hormone).

26 Which of the following hormones is not a secretion product of human placenta?
[CBSE AIPMT 2004]

- (a) Human chorionic gonadotropin
- (b) Prolactin
- (c) Oestrogen
- (d) Progesterone

Ans. (b)

Prolactin is secreted by anterior pituitary gland (not human placenta) which stimulates mammary gland development during pregnancy and lactation after child birth.

Placenta is a connection between the uterine wall of mother and the foetus. It helps in exchange of material between these two. Placenta secretes human chorionic gonadotropin, oestrogen and progesterone.

27 Which one of the following hormones is a modified amino acid?
[CBSE AIPMT 2004]

- (a) Epinephrine
- (b) Progesterone
- (c) Prostaglandin
- (d) Oestrogen

Ans. (a)

Epinephrine is synthesised from amino acid tyrosine. While oestrogen and progesterone are modified steroids and prostaglandins are basically fat.

28 Mainly which type of hormones control the menstrual cycle in human beings?
[CBSE AIPMT 2002]

- (a) FSH
- (b) LH
- (c) FSH, LH, estrogen
- (d) Progesterone

Ans. (c)

Follicle Stimulating Hormone (FSH), Luteinising Hormone (LH) and estrogen all play an important role in controlling the menstrual cycle in human females.

29 When both ovaries are removed from rat which hormone is decreased in blood?
[CBSE AIPMT 2002]

- (a) Oxytocin
- (b) Prolactin
- (c) Estrogen
- (d) Gonadotropic releasing factor

Ans. (c)

If both the ovaries are removed from rat then the blood plasma level of oestrogen will be affected as it is produced by theca interna cells of Graafian follicles. Oestrogen regulates growth and development of female accessory reproductive organs, secondary sexual characters and sexual behaviour.

30 Melanin protects from
[CBSE AIPMT 2002]

- (a) UV-rays
- (b) visible rays
- (c) infra-red rays
- (d) X-rays

Ans. (a)

Melanin is a protective pigment synthesised from **tyrosine**. Melanocytes under the influence of melanocyte secreting hormone secrete melanin which protects the body from harmful effects of UV rays.

31 Adrenaline directly affects
[CBSE AIPMT 2002]

- (a) SA node
- (b) β -cells of Langerhans
- (c) dorsal root of spinal cord
- (d) epithelial cells of stomach

Ans. (a)

The hormone adrenaline (epinephrine) is secreted by adrenal medulla and directly affects SA node thereby increasing heart rate. This hormone is responsible for the alarming reactions. It also increases breathing and blood glucose level.

32 Which steroid is used for transformation?
[CBSE AIPMT 2002]

- (a) Cortisol
- (b) Cholesterol
- (c) Testosterone
- (d) Progesterone

Ans. (b)

Cholesterol forms a major component of animal cell membranes. Liposomes (artificially created spheres surrounded by a phospholipid bilayer like a membrane) are used for transformation (transgenics).

33 Secretion of progesterone by corpus luteum is initiated by
[CBSE AIPMT 1999]

- (a) thyroxine
- (b) LH
- (c) MSH
- (d) testosterone

Ans. (b)

LH (Luteinising Hormone), secreted by anterior pituitary, stimulates the corpus luteum to secrete the hormone progesterone.

34 Hormones thyroxine, adrenaline and the pigment melanin are formed from
[CBSE AIPMT 1997]

- (a) tryptophan
- (b) glycine
- (c) tyrosine
- (d) proline

Ans. (c)

Tyrosine is the precursor of : (a) hormone epinephrine (i.e. adrenaline) and thyroid hormones, (b) neurotransmitter dopamine, (c) melanin (the black pigment of skin).

35 Which one of the following hormones stimulates the 'let down' (release) of milk from the mother's breasts when the baby is sucking?
[CBSE AIPMT 1995]

- (a) Progesterone
- (b) Oxytocin
- (c) Prolactin
- (d) Relaxin

Ans. (b)

Oxytocin induces contraction of the mammary gland muscles, helps in the flow of milk from mammary glands to mouth of the child, hence, called 'milk ejection hormone'.

36 ADH or vasopressin is [CBSE AIPMT 1991]

- (a) enzyme that hydrolyses peptides
- (b) hormone secreted by pituitary that promotes reabsorption of water from glomerular filtrate
- (c) hormone that promotes glycogenolysis
- (d) energy rich compound connected with muscle contraction

Ans. (b)

ADH or vasopressin is synthesised in hypothalamus and stored and released by neurohypophysis or posterior lobe of pituitary gland. It controls the permeability of wall of collecting tubules and DCT of renal tubules to water, which stimulates reabsorption of water so, it controls the osmoregulation.

37 Insulin is [CBSE AIPMT 1990]

- (a) vitamin (b) lipid
- (c) hormone (d) enzyme

Ans. (c)

Insulin is earliest known hormone. It is also called **hypoglycemic** or **antidiabetic factor**, as it decreases glucose level in blood and prevents occurrence of diabetes. It is secreted by β -cells of the islets of Langerhans.

38 Addition of a trace of thyroxine or iodine in water containing tadpoles will [CBSE AIPMT 1990]

- (a) keep them in larval stage
- (b) hasten their metamorphosis
- (c) slow down their metamorphosis
- (d) kill the tadpoles

Ans. (b)

Thyroxine controls tissue differentiation and metamorphosis of tadpole larva into frog. **Gundernatch** (1912) proved that metamorphosis of tadpole into adult frog is controlled by thyroxine. Addition of thyroxine in water will hasten the metamorphosis.

39 Which hormone possesses anti-insulin effect? [CBSE AIPMT 1988]

- (a) Cortisol (b) Calcitonin
- (c) Oxytocin (d) Aldosterone

Ans. (a)

Cortisol is a glucocorticoid, secreted by adrenal cortex. It is primarily meant for carbohydrate metabolism, which increases the rate of gluconeogenesis (conversion of proteins in liver into sugars) and decreases peripheral utilisation of glucose, thus it possess anti-insulin effect.

TOPIC 2 Human Endocrine System: Major Glands

40 Match the following columns and select the correct option.

[NEET (Sep.) 2020]

Column I	Column II
A. Pituitary gland	1. Grave's disease
B. Thyroid gland	2. Diabetes mellitus
C. Adrenal gland	3. Diabetes insipidus
D. Pancreas	4. Addison's disease

	A	B	C	D
(a)	3	2	1	4
(b)	3	1	4	2
(c)	2	1	4	3
(d)	4	3	1	2

Ans. (b)

The correct option is (b). It can be explained as follows

Grave's disease occurs is due to excess secretion of thyroid hormones (T3 and T4).

Diabetes mellitus is due to hyposecretion of insulin from β -cells of pancreas.

Diabetes insipidus is due to hyposecretion of ADH from posterior pituitary. Addison's disease is due to hyposecretion of hormone from adrenal cortex.

41 Select the correct statement.

[NEET (Sep.) 2020]

- (a) Glucagon is associated with hypoglycemia
- (b) Insulin acts on pancreatic cells and adipocytes
- (c) Insulin is associated with hyperglycemia
- (d) Glucocorticoids stimulate gluconeogenesis

Ans. (d)

Statement in option (d) is correct. Rest statements can be corrected as

Glucagon is associated with hyperglycemia. Insulin acts on hepatocytes and adipocytes and is associated with hypoglycemia.

42 Which of the following conditions will stimulate parathyroid gland to release parathyroid hormone?

[NEET (Odisha) 2019]

- (a) Fall in active vitamin-D levels
- (b) Fall in blood Ca^{+2} levels
- (c) Fall in bone Ca^{+2} levels
- (d) Rise in blood Ca^{+2} levels

Ans. (b)

The fall in blood Ca^{+2} levels is the condition which will stimulate parathyroid gland to release parathyroid hormone. This hormone exerts its effects on bones and kidneys. When calcium levels are low, parathyroid hormone is released by the parathyroid glands into the blood and causes the bones to release calcium and increase levels in the bloodstream.

43 Which of the following glucose transporters is insulin-dependent?

[NEET (National) 2019]

- (a) GLUT II (b) GLUT III
- (c) GLUT IV (d) GLUT I

Ans. (c)

GLUT IV is an insulin dependent glucose transporter. It helps in the transport of glucose into muscles and adipose cells under anabolic conditions. It permits the facilitated diffusion of circulating glucose down its concentration gradient into muscle and fat cells. On the other hand, GLUT I, II and III are insulin independent glucose transporters.

44 Artificial light, extended work-time and reduced sleep-time disrupt the activity of [NEET (National) 2019]

- (a) thymus gland (b) pineal gland
- (c) adrenal gland
- (d) posterior pituitary gland

Ans. (b)

Artificial light, extended work time and reduced sleep time disrupt the activity of pineal gland. It is a small pea-shaped gland in the brain. It produces melatonin, which helps maintain circadian rhythm and regulate reproductive hormones.

45 Which of the following hormones can play a significant role in osteoporosis? [NEET 2018]

- (a) Estrogen and parathyroid hormone
- (b) Progesterone and aldosterone
- (c) Aldosterone and prolactin
- (d) Parathyroid hormone and prolactin

Ans. (a)

Estrogen and parathyroid hormone can play significant role in osteoporosis. It is caused due to the deficiency of estrogen and excessive activity of parathormones. Estrogen helps to promote the activity of osteoblast (helps in the formation of bone cells) and inhibits osteoclast (destruct the bones). On the other hand, parathormone promotes the mobilisation of calcium from bones into blood hence causes demineralisation.

The other listed hormones also contribute to osteoporosis but their effects are insignificant or very less. e.g., low level of progesterone and aldosterone causes bone loss whereas raised level of prolactin have been linked with osteoporosis.

46 Which of the following structures or regions is incorrectly paired with its function? [NEET 2018]

- (a) Hypothalamus Production of releasing hormones and regulation of temperature, hunger and thirst.
- (b) Limbic system Consists of fibre tracts that interconnect different regions of brain; controls movement.
- (c) Medulla oblongata Controls respiration and cardiovascular reflexes.
- (d) Corpus callosum Band of fibres connecting left and right cerebral hemispheres.

Ans. (b)

Limbic system consists of four major components namely hippocampus, amygdala, septal nuclei and mammillary bodies. It controls the emotional behaviour, food habits and sex behaviour of an organism. It is not involved in controlling movements.

The rest three options are correctly paired with their functions.

47 The posterior pituitary gland is not a 'true' endocrine gland because [NEET 2016, Phase II]

- (a) it is provided with a duct
- (b) it only stores and releases hormones
- (c) it is under the regulation of hypothalamus
- (d) it secretes enzymes

Ans. (b)

The posterior pituitary gland is not a 'true' endocrine gland because it only stores and releases two hormones—oxytocin and vasopressin, which are actually synthesised by the hypothalamus and are transported to the posterior pituitary through hypophysial portal system. Hence option (b) is correct.

48 Fight or flight reactions cause activation of [CBSE AIPMT 2014]

- (a) the parathyroid glands, leading to increased metabolic rate
- (b) the kidney, leading to suppression of reninangiotensin-aldosterone pathway
- (c) the adrenal medulla, leading to increased secretion of epinephrine and norepinephrine
- (d) the pancreas leading to a reduction in the blood sugar levels

Ans. (c)

Fight or flight reaction is a physiological reaction that occurs in response to emergency. Emergency hormone is secreted by adrenal medulla of adrenal gland. Adrenal medulla secretes epinephrine and nor-epinephrine commonly called catecholamines hormones which stimulates sweating, heartbeat and breathing rate.

These hormones also causes dilation of coronary artery (supplying blood to heart muscles) a bronchioles (for increasing inspiratory volume) and pupil (for better vision).

49 Which of the following statement is correct in relation to the endocrine system? [NEET 2013]

- (a) Adenohypophysis is under direct neural regulation of the hypothalamus
- (b) Organs in the body like gastrointestinal tract, heart, kidney and liver do not produce any hormones
- (c) Non-nutrient chemicals produced by the body in trace amount that act as intercellular messenger are known as hormones
- (d) Releasing and inhibitory hormones are produced by the pituitary gland

Ans. (c)

Hormones are non-nutrient chemicals, which act as intracellular messengers and are produced in trace amounts.

Endocrine cells are present in different parts of the gastrointestinal tract, e.g. gastrin, secretin, GIP.

Atrial wall of our heart secretes a peptide hormone called ANF (Atrial Natriuretic Factor), RH/IIH are produced by hypothalamus. Adenohypophysis is not directly under neural control, it is under the control of hypothalamic hormones, brought by portal system.

50 Select the answer which correctly matches the endocrine gland with the hormone it secretes and its function/deficiency symptom [NEET 2013]

Endocrine gland	Hormone	Function/deficiency symptoms
(a) Anterior pituitary	Oxytocin	Stimulates uterus contraction during child birth
(b) Posterior pituitary	Growth Hormone (GH)	Oversecretion stimulates abnormal growth
(c) Thyroid gland	Thyroxine	Lack of iodine in diet results in goitre
(d) Corpus luteum	Testosterone	Stimulates spermatogenesis

Ans. (c)

Lack of iodine in diet results in goitre.

Oxytocin is produced by neurohypophysis, which stimulates uterus contraction during child birth.

Anterior pituitary secretes Growth Hormones (GH) its over secretion stimulates abnormal growth.

Testosterone is secreted by Leydig cells of testes in males.

51 Match the source gland with its respective hormone as well as the function. [CBSE AIPMT 2011]

Source gland	Hormone	Function
(a) Posterior pituitary	Vasopressin	Stimulates resorption of water in the distal tubules in the nephron

(b) Corpus luteum	Oestrogen	Supports pregnancy
(c) Thyroid	Thyroxine	Regulates blood calcium level
(d) Anterior pituitary	Oxytocin	Contraction of uterus muscles during child birth

Ans. (a)

The pituitary gland is located in a bony cavity called **sella tursica** and is attached to hypothalamus by a stalk. It is divided anatomically into an adenohypophysis and a neurohypophysis. The neurohypophysis latter is also called pars nervosa or posterior pituitary.

It stores and releases two hormone called **oxytocin** and **vasopressin**, which are actually synthesised by the hypothalamus and are transported axonally to neurohypophysis.

Vasopressin acts mainly at the kidney and stimulates reabsorption of water and electrolytes by the distal tubules in the nephron and thereby reducing the loss of water through urine (diuresis). Hence, it is also called as Anti-Diuretic Hormone (ADH).

- 52** Given ahead is an incomplete table about certain hormones, their source glands and one major effect of each on the body in humans. Identify the correct option for the three blanks A, B and C.

[CBSE AIPMT 2011]

Gland	Secretion	Effect on body
A	Oestrogen	Maintenance of secondary sexual characters
Alpha cells of islets of Langerhans	B	Raises blood sugar level
Anterior pituitary	C	Over secretion leads to gigantism

A	B	C
(a) Placenta	Insulin	Vasopressin
(b) Ovary	Insulin	Calcitonin
(c) Placenta	Glucagon	Calcitonin
(d) Ovary	Glucagon	Growth hormone

Ans. (d)

Hypersecretion of growth hormone (somatotrophic hormone) during adulthood causes acromegaly. It is characterised by bossing of frontal bone, prominent cheek, coarse hair, hirsutism, enlarged hands and feet.

- 53** Which one of the following pairs of organs includes only the endocrine glands? [CBSE AIPMT 2008]

- (a) Parathyroid and adrenal
(b) Pancreas and parathyroid
(c) Thymus and testes
(d) Adrenal and ovary

Ans. (a)

The endocrine glands have no ducts and their secretions get absorbed into the immediate surrounding blood circulation to reach the specific organs to initiate a particular metabolic change, e.g. thyroid, parathyroid, adrenal, thymus.

- 54** A person is having problems with calcium and phosphorus metabolism in his body. Which one of the following glands may not be functioning properly? [CBSE AIPMT 2007]

- (a) Parathyroid (b) Parotid
(c) Pancreas (d) Thyroid

Ans. (a)

The parathormone secreted by parathyroid gland regulates the calcium and phosphate balance between the blood and other tissues.

- 55** Which of the following is an accumulation and release centre of neurohormones? [CBSE AIPMT 2006]

- (a) Posterior pituitary lobe
(b) Intermediate lobe of the pituitary
(c) Hypothalamus
(d) Anterior pituitary lobe

Ans. (c)

Almost all hormonal secretion by the pituitary gland are controlled by hormonal signal from hypothalamus. The neurohormones are secreted and accumulated by hypothalamus.

- 56** Melatonin is secreted by [CBSE AIPMT 2000]

- (a) skin (b) thymus
(c) pituitary (d) pineal gland

Ans. (d)

The pineal gland (epiphysis) secretes the hormone melatonin. It regulates the working of gonads by inhibiting gonadotropins and their effects. Its production is inhibited by exposure of animal to light.

- 57** Melanocyte Stimulating Hormone (MSH) is produced by [CBSE AIPMT 2000]

- (a) anterior pituitary
(b) posterior pituitary
(c) pars intermedia of pituitary
(d) parathyroid

Ans. (c)

The intermediate lobe (pars intermedium) of the pituitary gland secretes MSH which causes dispersal of pigment granules in the pigment cells (melanocytes) which give colour to the skin.

In the frogs and tadpoles, MSH is responsible for the generalised blackening of the skin.

- 58** A common scent-producing gland among mammals is [CBSE AIPMT 2000]

- (a) anal gland
(b) prostate gland
(c) adrenal gland
(d) Bartholin's gland

Ans. (a)

Scent or musk glands are located around the face, feet or anus of many mammals. These secrete pheromones which may be involved in defence, recognition and territorial behaviour.

- 59** The gonadotropic hormones are produced by [CBSE AIPMT 1999]

- (a) interstitial cells of testes
(b) adrenal cortex
(c) adenohypophysis of pituitary
(d) posterior part of thyroid

Ans. (c)

The gonadotropic hormones (FSH and ICSH = LH) are secreted by anterior lobe of the pituitary (adenohypophysis). Gonadotropic Hormone (GTH) controls the function of gonads (ovary in females and testes in males).

- 60** The hormone which regulates the basal metabolism in our body is secreted from [CBSE AIPMT 1998]

- (a) pituitary (b) thyroid
(c) adrenal cortex (d) pancreas

Ans. (b)

Thyroxine (T_4) and tri-iodothyronin (T_3) hormones are secreted by the thyroid follicular cells. These hormones maintain the Basal Metabolic Rate (BMR) of the body.

61 Occurrence of Leydig's cells and their secretion is
[CBSE AIPMT 1998, 93, 91]

- (a) ovary and oestrogen
- (b) liver and cholesterol
- (c) pancreas and glucagon
- (d) testis and testosterone

Ans. (d)

The endocrine part of testis is formed of groups of cells, called interstitial cells or **Leydig's cells**, scattered in connective tissue between the sperm producing seminiferous tubules of the testis.

These cells are stimulated to produce male sex hormones, called androgens by ICSH of anterior pituitary. Testosterone is main androgen and it is a steroid hormone.

62 Which of the following endocrine gland stores its secretion in the extracellular space before discharging into the blood?
[CBSE AIPMT 1995]

- (a) Pancreas
- (b) Adrenal
- (c) Testis
- (d) Thyroid

Ans. (d)

Thyroid gland secretes thyroxine. Thyroxine hormones are stored in the lumen of the follicle, the extracellular space.

63 MSH of pars intermedia of middle pituitary is responsible for
[CBSE AIPMT 1988]

- (a) darkening of skin in lower vertebrates
- (b) light colouration of skin in lower vertebrates
- (c) Both (a) and (b)
- (d) darkening of skin in human beings

Ans. (a)

MSH controls the synthesis and dispersal of melanin granules in the chromatophores in the skin of fishes, amphibians and some reptiles (poikilothermal animals) so, it causes darkening of skin. It is non-functional in man.

TOPIC 3

Hormones and Related Disorders

64 Erythropoietin hormone which stimulates RBC formation is produced by
[NEET 2021]

- (a) alpha cells of pancreas
- (b) the cells of rostral adenohypophysis
- (c) the cells of bone marrow
- (d) juxtaglomerular cells of the kidney

Ans. (d)

The juxtaglomerular cells of kidney produce peptide hormone called erythropoietin which stimulates (erythropoiesis). It stimulates the stem cells of the bone marrow to increase red blood cell production.

65 Match the following hormones with the respective disease.
[NEET (National) 2019]

A. Insulin	(i)	Addison's disease
B. Thyroxin	(ii)	Diabetes insipidus
C. Corticoids	(iii)	Acromegaly
D. Growth hormone	(iv)	Goitre
	(v)	Diabetes mellitus

Select the correct option.

- A B C D
- (a) (ii) (iv) (iii) (i)
- (b) (v) (iv) (i) (iii)
- (c) (ii) (iv) (i) (iii)
- (d) (v) (i) (ii) (iii)

Ans. (b)

(A)-(v), (B)-(iv), (C)-(i), (D)-(iii)
The deficiency of insulin causes diabetes mellitus which is characterised by high blood sugar levels. Excess production of thyroid hormone, thyroxine causes goitre, deficiency of corticoids causes Addison's disease or adrenal insufficiency. Hypersecretion of growth hormones causes acromegaly in adults. It is characterised by enlarged hands and feet of affected person.

66 Graves' disease is caused due to
[NEET 2016, Phase II]

- (a) hyposecretion of thyroid gland
- (b) hypersecretion of thyroid gland
- (c) hyposecretion of adrenal gland
- (d) hypersecretion of adrenal gland

Ans. (b)

Graves' disease or hyperthyroidism is caused due to the secretion of excessive amount of thyroid hormone by the thyroid gland, i.e. hyperthyroidism.

67 A pregnant female delivers a baby, who suffers from stunted growth, mental retardation low intelligence quotient and abnormal skin. This is the result of
[NEET 2013]

- (a) deficiency of iodine in diet
- (b) low secretion of growth hormone
- (c) cancer of the thyroid gland
- (d) over secretion of pars distalis

Ans. (a)

Hypothyroidism during pregnancy causes defective development and maturation of the growing foetus leading to stunted growth. Low secretion of GH results in stunted growth resulting in pituitary dwarfism.

Pars distalis or anterior pituitary produces growth hormone. Prolactin (PRL), Thyroid Stimulating Hormone (TSH), Adrenocorticotrophic Hormone (ACTH), Lutenising Hormone (LH) and Follicle Stimulating Hormone (FSH).

68 Toxic agents present in food which interfere with thyroxin synthesis lead to the development of
[CBSE AIPMT 2010]

- (a) toxic goitre
- (b) cretinism
- (c) simple goitre
- (d) thyrotoxicosis

Ans. (c)

Toxic agents in food which interfere with thyroxin synthesis will lead to simple goitre. Thyrotoxicosis and toxic goitre are under the category of hyperthyroidism.

69 A health disorder that results from the deficiency of thyroxin in adults and characterised by
[CBSE AIPMT 2009]

- I. a low metabolic rate
 - II. increase in body weight
 - III. tendency to retain water in tissues is
- (a) hypothyroidism
 - (b) simple goitre
 - (c) myxoedema
 - (d) cretinism

Ans. (c)

Myxoedema (Gulls disease) occurs due to the deficiency of thyroxine in adults, it causes low BMR (by 30-40%), low body temperature, tendency to retain water in tissues, reduced heart rate, pulse rate, blood pressure and cardiac output, low sugar and iodine level in blood, muscular weakness and oedema (accumulation of interstitial fluid that causes the facial tissues to swell and look fluffy).

Decrease secretion of thyroxine hormone from thyroid gland causes **hypothyroidism**. **Simple goitre** is caused by lower intake of iodine through diet.

Cretinism occurs due to hyposecretion of thyroxine during the growth years or birth.

70 Which one of the following pairs correctly matches a hormone with a disease resulting from its deficiency? [CBSE AIPMT 2004]

- (a) Luteinising hormone – Failure of ovulation
- (b) Insulin – Diabetes insipidus
- (c) Thyroxine – Tetany
- (d) Parathyroid hormone – Diabetes mellitus

Ans. (a)

Ovulation occurs under the influence of LH and FSH of anterior pituitary gland.

Disease	Deficiency
Diabetes mellitus	Insulin
Tetany	Parathormone
Diabetes insipidus	ADH

71 Acromegaly is caused by [CBSE AIPMT 2002]

- (a) excess of STH
- (b) excess of thyroxin
- (c) deficiency of thyroxin
- (d) excess of adrenaline

Ans. (a)

Hypersecretion of growth hormone (somatotrophic hormone) during adulthood causes acromegaly. It is characterised by bossing of frontal bone, prominent cheek, coarse hair, hirsutism, enlarged hands and feet.

72 Diabetes is due to [CBSE AIPMT 1999]

- (a) iodine deficiency
- (b) hormonal deficiency
- (c) Na^+ deficiency
- (d) enzyme deficiency

Ans. (b)

Diabetes mellitus occurs due to the deficiency of hormone insulin which is secreted by **islets of Langerhans** of pancreas. It is a peptide hormone.

73 Which of the following radioactive isotope is used in the detection of thyroid cancer? [CBSE AIPMT 1995, 2002]

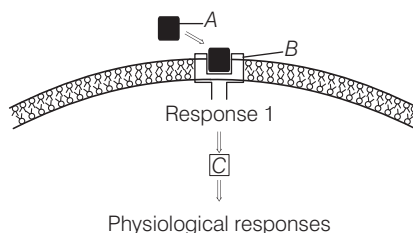
- (a) Iodine-131
- (b) Carbon-14
- (c) Uranium-238
- (d) Phosphorus-32

Ans. (a)

Radioactive iodine, i.e. Iodine-131 is administered to patients suffering from thyroid cancer for its detection.

TOPIC 4 Mechanism of Hormonal Control

74 Identify A, B and C in the diagrammatic representation of the mechanism of hormone action.



Select the correct option from the following

[NEET (Odisha) 2019]

- (a) A – Steroid hormone; B – Hormone-receptor complex, C – Protein
- (b) A – Protein hormone, B – Receptor; C – Cyclic AMP
- (c) A – Steroid hormone; B – Receptor, C – Second messenger
- (d) A – Protein hormone; B – Cyclic AMP, C – Hormone-receptor complex

Ans. (b)

In the given mechanism of hormone action, the labels are

A – Protein hormone

B – Receptor

C – Cyclic AMP

Hormones which interact with membrane bound receptors do not enter the target cell. These bind with membrane proteins (receptors) and generate second messengers which in turn regulate cellular metabolism, e.g. FSH on ovarian cell membrane.

75 How does steroid hormone influence the cellular activities? [NEET (National) 2019]

- (a) Binding to DNA and forming a gene-hormone complex
- (b) Activating cyclic AMP located on the cell membrane
- (c) Using aquaporin channels as second messenger
- (d) Changing the permeability of the cell membrane

Ans. (a)

Steroid hormones are able to bind to DNA and form a gene-hormone complex. These hormones can easily cross the lipid bilayer of the cell and do not require secondary messengers for the same. Steroid hormones bind to intracellular receptors in the nucleus to form hormone receptor complex which in turn interact with the genome.

cAMP pathway, secondary messengers and change in cell membrane permeability is required in case of proteinaceous hormones which cannot pass through lipid bilayer on their own.

76 According to the accepted concept of hormone action, if receptor molecules are removed from target organs, then the target organ will [CBSE AIPMT 1995]

- (a) not respond to the hormone
- (b) continue to respond to hormone without any difference
- (c) continue to respond to the hormone but in the opposite way
- (d) continue to respond to the hormone but will require higher concentration

Ans. (a)

Hormones are released in normal blood circulation but each hormone stimulates only a specific target organ to initiate a specific response. It is because of the presence of specific receptor protein only in the specific target cell. If these receptor molecules are removed from target organs, the organ will not respond to hormone.