22. Chemical Coordination and Integration

Question 1. Define the following:

(a) Exocrine gland

(b) Endocrine gland

(c) Hormone

Answer:

(a) Endocrine glands

These are ductless glands (no tube to carry to various parts).

Their secretions are directly released into the blood which carries them to various parts of the body.

(b) Exocrine glands

The exocrine glands have ducts.

The secretions from these glands are carried through the ducts.

The ducts may open outside the body to release the secretions (e.g. sweat, milk) or may be released on to another surface within the body (e.g. Digestive juices)

(c) Hormones

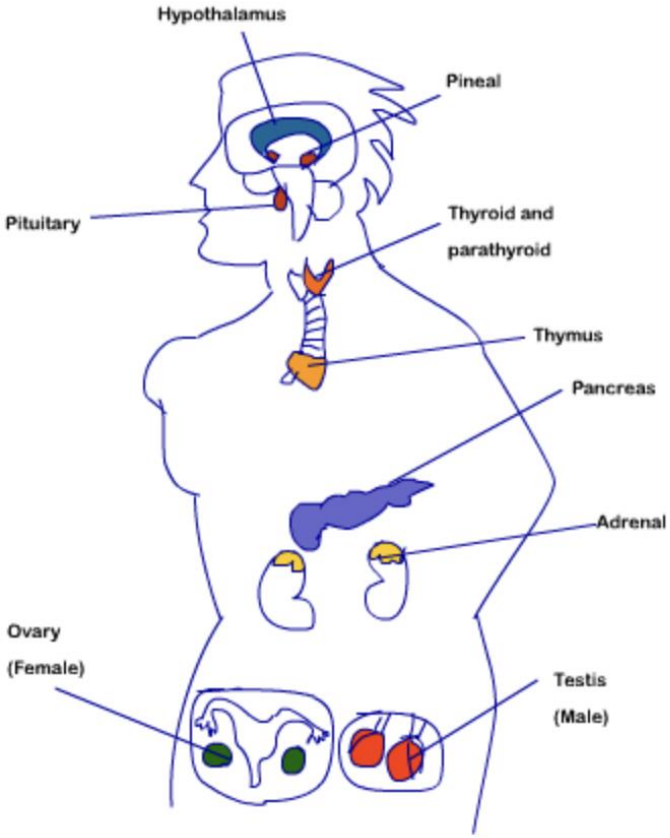
These are chemical messengers that regulate physiological processes in living organisms.

They act upon specific cells/tissues/organs which are called target cells/tissues/organs.

There are many types of hormones that act on different aspects of bodily functions and processes like growth and development.

Question 2. Diagrammatically indicate the location of the various endocrine glands in our body.

Answer: The endocrine gland in our body are as follows:



Question 3. List the hormones secreted by the following:

(a) Hypothalamus

(b) Pituitary

(c) Thyroid

(d) Parathyroid

(e) Adrenal

(f) Pancreas

(g) Testis

(h) Ovary

(i) Thymus

(j) Atrium

(k) Kidney

(l) G-I Tract

Answer:

a. Hypothalamus: Releasing Hormone and Inhibiting Hormone
b. Pituitary: Growth Hormone, Prolactin, Thyroid Stimulating Hormone, Adrenocorticotrophic Hormone, Luteinizing Hormone, Follicle Stimulating Hormone, Melatonin
c. Thyroid: Tetraiodothyronine, Triiodothyronine
d. Parathyroid: Parathyroid Hormone
e. Adrenal: Adrenalin or Epinephrine, Noradrinaline or Norepinephrine, Corticoids
f. Pancreas: Glcuagon, Insulin
g. Testis: Testosterone
h. Ovary: Estrogen, Progesterone
i. Thymus: Thymosin
j. Atrium: Atrial Natriuretic Factor
k. Kideny: Erythropoietin
l. G I Tract: gastrin, secretin, cholecystokinin (CCK) and gastric inhibitory peptide (GIP).

Question 4. Fill in the blanks:

Hormones Target gland

(a) Hypothalamic hormones _____

(b) Thyrotrophin (TSH) _____

(c) Corticotrophin (ACTH) _____

(d) Gonadotrophins (LH, FSH) _____

(e) Melanotrophin (MSH) _____

Answer :

(a) Hypothalamic hormones – Pituitary gland

(b) Thyrotrophin (TSH) – Thyroid gland

(c) Corticotrophin (ACTH) – adrenal cortex

(d) Gonadotrophins (LH, FSH) – Testis and ovaries

(e) Melanotrophin (MSH) – Pigment cells of the dermis of the skin

Question 5. Write short notes on the functions of the following hormones:

(a) Parathyroid hormone (PTH)

(b) Thyroid hormones

(c) Thymosins

(d) Androgens

(e) Estrogens

(f) Insulin and Glucagon

Answer: Functions of the following hormones are as follows :
(a) Parathyroid Hormone (PTH) The parathyroid glands secrete a peptide hormone called parathyroid hormone (PTH). PTH acts on bones and stimulates the process of bone resorption (dissolution/demineralization). PTH also stimulates reabsorption of by the renal tubules and increases absorption from the digested food. It plays a significant role in calcium balance in the body.

(b) Thyroid Hormones Thyroid hormones play an important role in the regulation of the basal metabolic rate. These hormones also support the process of red blood cell formation. Thyroid hormones control the metabolism of carbohydrates, proteins and fats. The Maintenance of water and electrolyte balance is also influenced by thyroid hormones. Thyroid gland also secretes a protein hormone called thyrocalcitonin (TCT), which regulates the blood calcium levels.

(c) Thymosins This thymus gland secretes the peptide hormones called thymosins. Thymosins play a major role in the differentiation of T-lymphocytes, which provide cell-mediated immunity. In addition, thymosins also promote production of antibodies to provide humoral immunity.

(d) Androgens Androgens regulate the development, maturation and functions of the male accessory sex organs like epididymis, vas deferens, seminal vesicles, prostate gland, urethra, etc. These hormones stimulate muscular growth, growth of facial and axillary hair, aggressiveness, low pitch of voice, etc. Androgens play a major stimulatory role in the process of spermatogenesis (formation of spermatozoa), influence the male sexual behaviour (libido).

(e) Oestrogens Oestrogens produce wide ranging actions such as stimulation of growth and

activities of female secondary sex organs, development of growing ovarian follicles, appearance of female secondary sex characters (e.g., high pitch of voice, etc.), mammary gland development. Oestrogens also regulate female sexual behaviour.

(f) Insulin and Glucagon Glucagon acts mainly on the liver cells (hepatocytes) and stimulates glycogenolysis resulting in an increased blood sugar (hyperglycemia). In addition, this hormone stimulates the process of gluconeogenesis, which also contributes to hyperglycemia. Glucagon reduces the cellular glucose uptake and utilization. Insulin is a peptide hormone, which plays a major role in the regulation of glucose homeostasis. Insulin acts mainly on hepatocytes and adipocytes and enhances cellular glucose uptake and utilisation. Insulin also stimulates conversion of glucose to glycogen (glycogenesis) in the target cells. The glucose homeostasis in blood is thus maintained jointly by the two - insulin and glucagons.

Question 6. Give example(s) of:

(a) Hyperglycemic hormone and hypoglycemic hormone

(b) Hypercalcemic hormone

(c) Gonadotrophic hormones

(d) Progestational hormone

(e) Blood pressure lowering hormone

(f) Androgens and estrogens

Answer:

(a) Hyperglycemic hormone and hypoglycemic hormone: Hyperglycemic hormone is glucagon, while hypoglycemic hormone is insulin.

(b) Hypercalcemic hormone: Parathyroid hormone (PTH) is hypercalcemic hormone.

(c) Gonadotrophic hormones: Luteinizing hormone and follicle stimulating hormones are examples of gonadotrophic hormone.

(d) Progestational hormone: Progesterone is a progestational hormone.

(e) Blood pressure lowering hormone: Nor-adrenalin is a blood pressure lowering hormone.

(f) Androgens and estrogens: Testosterone is an example of androgen, while an example of estrogen is estradiol.

Question 7. Which hormonal deficiency is responsible for the following?

(a) Diabetes mellitus

(b) Goitre

(c) Cretinism

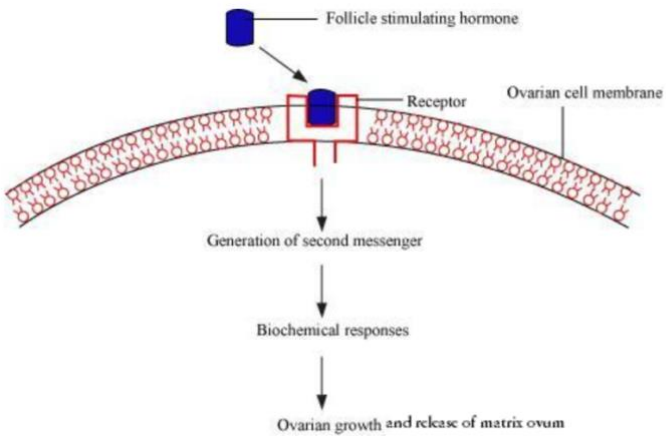
Answer:
(a) Diabetes mellitus is characterized by abnormally high glucose levels in the blood due to the deficiency of hormone, called insulin.

(b) Goitre is characterised by an abnormal enlargement of the thyroid gland due to the deficiency of thyroxin hormone in the body.

(c) Cretinism is characterized by stunted growth in the baby due to the deficiency of thyroid hormone in the body.

Question 8. Briefly mention the mechanism of action of FSH.

Answer: Follicle stimulating hormone (FSH) is secreted by the pars distalis region of the anterior pituitary.
It regulates the development, growth, and reproductive processes of the human body. In the ovary, FSH stimulates the growth and maturation of ovarian follicle. As the follicle grows and matures, it releases an inhibitory hormone known as inhibin that ends the process of FSH production.
Action of FSH: Follicle stimulating hormone produces its effect by binding to its specific receptors present on the ovarian cell membrane.
Binding of FSH hormone to its receptor leads to the formation of hormone receptor complex. The formation of this complex leads to biochemical changes in the ovarian follicle, present in the ovary. The ovarian follicles mature and release a mature ovum in the fallopian tube for fertilization.



Question 9. Match the following:

Column I	Column II
(a) T4	**(i) Hypothalamus**
(b) PTH	**(ii) Thyroid**
(c) GnRH	**(iii) Pituitary**
(d) LH	**(iv) Parathyroid**

Answer:

Column I	Column II
(a) T4	(ii) Thyroid
(b) PTH	(iv) Parathyroid
(c) GnRH	(i) Hypothalamus
(d) LH	(iii) Pituitary