

NCERT Solution for Class 11 Biology Chapter 22  
Chemical Coordination and Integration

Exercise Questions

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1. Define the following:

- (a) Exocrine gland
- (b) Endocrine gland
- (c) Hormone

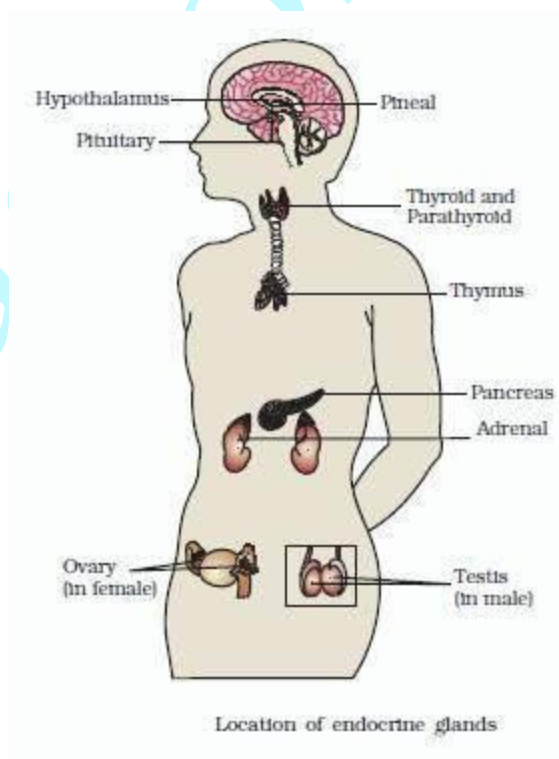
Solution:

- (a) Exocrine gland – these are the glands that liberate their secretions into ducts conveying either on the surface of the body or to particular organs of the body
- (b) Endocrine gland – these are ductless glands which liberate their secretions into the bloodstream, conveying it to target organs that are located at a distance
- (c) Hormone – It is a non-nutrient chemical that serves as a intercellular messenger and is secreted in trace amounts

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

Solution:

The diagram depicting the locations of different endocrine glands in the body are as follows:



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**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

**Solution:**

The hormones secreted by the following structures are as follows:

Name of the structure	Hormone secreted	
Hypothalamus	Releasing hormone	Inhibiting hormone
	<ul style="list-style-type: none"> <li>• Adrenocorticotropin-releasing hormone (ARH)</li> <li>• Thyrotropin-releasing hormone (TRH)</li> <li>• Lutenising hormone-releasing hormone (LH-RH)</li> <li>• Follicle-stimulating hormone-releasing hormone (FSH – RH)</li> <li>• Prolactin-releasing hormone (PRH)</li> <li>• Growth hormone – releasing hormone</li> <li>• Melanocyte stimulating hormone – releasing hormone</li> </ul>	<ul style="list-style-type: none"> <li>• Growth inhibiting hormone</li> <li>• Prolactin inhibiting hormone</li> <li>• Melanocyte stimulating hormone – inhibiting hormone</li> </ul>

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Pituitary	<p>Neurohyophysis –</p> <ul style="list-style-type: none"> <li>□ Oxytocin             <ul style="list-style-type: none"> <li>• Anti-diuretic hormone (Vasopressin)</li> </ul> </li> </ul> <p>Adenohypophysis –</p> <ul style="list-style-type: none"> <li>• Follicle-stimulating hormone(FSH)</li> <li>• Growth hormone (GH)</li> <li>• Leutinising hormone (LH)</li> <li>• Thyroid stimulating hormone (TSH)</li> <li>• Adrenocorticotropin hormone (ACTH) Intermediate lobe –</li> </ul>
	□ Melanocyte-stimulating hormone (MSH)
Thyroid	<ul style="list-style-type: none"> <li>• Calcitonin</li> <li>• Tri-iodothyronine(T<sub>3</sub>)</li> <li>• Tetraiodothyronine/Thyroxine(T<sub>4</sub>)</li> </ul>
Parathyroid	Parathormone(PTH)
Adrenal	Adrenal cortex - Mineralocorticoids, Glucocorticoids Adrenal medulla – Adrenaline, Noradrenaline
Pancreas	Glucagon, Insulin, Somatostatin
Testis	Testosterone, Androsterone
Ovary	Relaxin, Oestrogen, Progesterone,
Thymus	Thymosin
Atrium	Atrial natriuretic factor (ANF)
Kidney	Erythropoietin
G-I Tract	<p>Stomach – Gastrin</p> <p>Intestine – Secretin, Enterogastrone, Cholecystokinin, Enterocrinin, Duocrinin</p> <p>Liver - Angiotensinogen</p>

**4. Fill in the blanks:**

**Hormones Target gland**

- (a) Hypothalamic hormones \_\_\_\_\_
- (b) Thyrotrophin (TSH) \_\_\_\_\_
- (c) Corticotrophin (ACTH) \_\_\_\_\_
- (d) Gonadotrophins (LH, FSH) \_\_\_\_\_
- (e) Melanotrophin (MSH) \_\_\_\_\_

**Solution:**

- (a) Hypothalamic hormones – Pituitary gland
- (b) Thyrotrophin (TSH) – Thyroid gland

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- (c) Corticotrophin (ACTH) – adrenal cortex
- (d) Gonadotrophins (LH, FSH) - Testis and ovaries
- (e) Melanotrophin (MSH) – Pigment cells of the dermis of the skin

### 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

#### Solution:

- (a) Parathyroid hormone (PTH)
  - It is a peptide hormone secreted by the parathyroid gland
  - Its secretion is regulated by the circulating levels of calcium ions □ The PTH causes an increase in the levels of calcium ions in the blood.
  - It acts on the bones thereby triggering the bone resorption process
  - Also, it triggers the reabsorption of calcium ions by the renal tubules, increases calcium ions absorption from the food that is digested
  - Hence, PTH is a hypercalcemic hormone – increases the blood  $\text{Ca}^{2+}$  levels
  - Has a critical role to play in balancing calcium in the body along with TCT, i.e., in calcium homeostasis.
- (b) Thyroid hormones  
Thyroxine/tetraiodothyronine( $\text{T}_4$ )
  - It checks the basal metabolic rate(BMR) and body growth such as mental development and ossification of bones
  - Controls the weight of the body
  - Controls tissue differentiation and metamorphosis of the tadpole larva into an adult frog
  - Suppresses the formation of RBC
  - Tri-iodothyronine( $\text{T}_3$ ) – Increases energy consumption and body's oxygen . It also increases heart rate and force of contraction that increases the cardiac output
- (c) Thymosin
  - Triggers the differentiation of T-lymphocytes providing cell-mediated immunity
  - It facilitates antibody production to provide humoral immunity
  - Triggers the rate of division of cell in children thereby promotes growth
- (d) Androgens
  - The interstitial cells that are located in the intertubular space generate a collection of hormones known as androgens, testosterone mainly

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- Checks the maturation, development and functions of the male accessory sex organs such as vas deferens, epididymis, seminal vesicles, urethra, prostate gland etc
  - These trigger the growth of muscles, facial and axillary hair, low pitch of voice, aggressiveness etc
  - These play a critical stimulatory role in the phenomena of spermatogenesis
  - They act on the central neural system, influencing the male sexual behavior
  - They generate anabolic effects on carbohydrate metabolism and protein
- (e) Estrogen
- Triggers the development of ovarian follicles and the growth & development of the female reproductive organs namely the uterus, fallopian tube and vagina
  - Causes the FSH secretion to decrease and LH secretion to increase
  - Enhances the sensitivity of the uterus to the hormone – oxytocin
  - Facilitates the development of mammary gland
  - Regulation of female sexual behavior
- (f) Insulin and glucagon
- Insulin
- Regulates glucose homeostasis
  - Acts on adipocytes and hepatocytes
  - Triggers the transport of glucose to the muscles from blood
  - Facilitates the oxidation of glucose and brings about glycogenesis, i.e., conversion of glucose to glycogen causing hyperglycemia
- Glucagon
- Critical in maintaining normal blood glucose levels
  - Acts on hepatocytes, triggering conversion of glycogen to glucose
  - Triggers the gluconeogenesis phenomena i.e., the conversion of non-carbohydrate particles namely – proteins and fats to glucose

### 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**

### Solution:

- (a) Hyperglycemic hormone and hypoglycemic hormone – Glucagon and Insulin respectively
- (b) Hypercalcemic hormone – Parathormone hormone (PTH)
- (c) Gonadotrophic hormones – Follicle-stimulating hormone (FSH) and Luteinizing Hormone (LH)

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- (d) Progestational hormone – Progesterone
- (e) Blood pressure lowering hormone – Atrial natriuretic factor (ANF)
- (f) Androgens and estrogens – Androgen - Testosterone and androsterone  
Estrogen -  $\beta$ - oestradiol

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

- (a) Diabetes mellitus
- (b) Goitre
- (c) Cretinism

#### Solution:

The hormonal deficiency that is responsible for the following are:

- (a) Diabetes mellitus – Insulin (inadequate secretion) caused due to abnormally high glucose levels in the blood
- (b) Goitre – Thyroxin (inadequate secretion)
- (c) Cretinism – Thyroid (inadequate secretion)

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

#### Solution:

Follicle stimulating hormone or FSH is a glycoprotein polypeptide hormone which is not soluble in lipid and therefore cannot enter the target cell. The FSH binds to the surface of the cell thereby activating the cellular systems to carry out its functionalities.

#### Mechanism of FSH

- FSH molecule binds to the receptor protein located on the surface of the cell forming the hormone-receptor complex
- The formation of hormone causes the receptor complex to activate the adenyl cyclase enzyme
- This enzyme converts ATP to cyclic AMP as a second messenger which inturn activates the follicular cells of membrane of granulosa to produce estrogens.

### 9. Match the following:

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

**Solution:**

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