NCERT Exemplar Solutions of Class 11 Biology – Chapter 22: Chemical Coordination and Integration

MULTIPLE CHOICE QUESTIONS

1. Select the right match of the endocrine gland and their hormone among the options given below

Endocrine Glands	Hormones
A. Pineal	i. Epinephrine
B. Thyroid	ii. Melatonin
C. Ovary	iii. Estrogen
D. Adrenal medulla	iv. Tetraiodothyronine

Options:

a. A-iv, B-ii, C-iii, D-i
b. A-ii, B-iv, C-i, D-iii
c. A-iv, B-ii, C-i, D-iii
d. A-ii, B-iv, C-iii, D-i

Solution: (d) A-ii, B-iv, C-iii, D-i

Enhanced Explanation:

Pineal gland (A) secretes **Melatonin (ii)** - regulates sleep-wake cycle
Thyroid gland (B) secretes **Tetraiodothyronine/T_4 (iv)** - regulates metabolism
Ovary (C) secretes **Estrogen (iii)** - female sex hormone
Adrenal medulla (D) secretes **Epinephrine (i)** - fight-or-flight hormone

2. Which of the following hormones is not secreted by the anterior pituitary?

a. Growth hormone
b. Follicle-stimulating hormone
c. Oxytocin
d. Adrenocorticotrophic hormone

Solution: (c) Oxytocin

Enhanced Explanation: Oxytocin is secreted by the **posterior pituitary** (neurohypophysis), not the anterior pituitary. The anterior pituitary secretes:
Growth hormone (GH)
Follicle-stimulating hormone (FSH)
Adrenocorticotrophic hormone (ACTH)
Luteinizing hormone (LH)
Thyroid-stimulating hormone (TSH)
Prolactin

3. Mary is about to face an interview. But during the first five minutes before the interview, she experiences sweating, increased rate of heartbeat, respiration etc. Which of the following hormones are responsible for her restlessness?

a. Estrogen and progesterone

b. Oxytocin and vasopressin
c. Adrenaline and noradrenaline
d. Insulin and glucagon
Solution: (c) Adrenaline and noradrenaline
Enhanced Explanation: These symptoms represent the **"fight-or-flight" response** mediated by:
Adrenaline (Epinephrine) and **Noradrenaline (Norepinephrine)**
Both are catecholamine hormones secreted by adrenal medulla
They prepare the body for emergency situations by increasing heart rate, blood pressure, and metabolic rate
4. The steroid responsible for the balance of water and electrolytes in our body is:
a. Insulin
b. Melatonin
c. Testosterone
d. Aldosterone
Solution: (d) Aldosterone
Enhanced Explanation: Aldosterone is a mineralocorticoid hormone secreted by the zona glomerulosa of adrenal cortex. It:
Regulates sodium and potassium balance
Controls water retention in kidneys
Maintains blood pressure and blood volume
Acts on distal convoluted tubules and collecting ducts
5. Thymosin is responsible for:
a. Raising the blood sugar level
b. Raising the blood calcium level
c. Differentiation of T lymphocytes
d. The decrease in blood RBC
Solution: (c) Differentiation of T lymphocytes
Enhanced Explanation: Thymosin is secreted by the thymus gland and plays crucial roles in:
Maturation and differentiation of T-lymphocytes (T-cells)
Development of cell-mediated immunity
Immune system regulation
The thymus gradually atrophies with age, leading to decreased immune function
6. In the mechanism of action of a protein hormone, one of the second messengers is:
a. Cyclic AMP
b. Insulin
c. T_3
d. Gastrin

Solution: (a) Cyclic AMP

Enhanced Explanation: Cyclic AMP (cAMP) is a classic second messenger in protein hormone signaling:

Protein hormones bind to membrane receptors

This activates adenylyl cyclase enzyme

ATP is converted to cAMP

cAMP activates protein kinase A

This leads to phosphorylation of target proteins

7. Leydig cells produce a group of hormones called:

a. Androgens

b. Estrogens

c. Aldosterone

d. Gonadotropins

Solution: (a) Androgens

Enhanced Explanation: Leydig cells (interstitial cells) in testes produce:

Androgens - primarily testosterone

Testosterone regulates male secondary sexual characteristics

Stimulates spermatogenesis

Maintains male reproductive tract

8. Corpus luteum secretes a hormone called:

a. Prolactin

b. Progesterone

c. Aldosterone

d. Testosterone

Solution: (b) Progesterone

Enhanced Explanation: Corpus luteum forms from the ruptured Graafian follicle and secretes:

Progesterone - maintains pregnancy

Small amounts of estrogen

Essential for endometrial maintenance

If pregnancy doesn't occur, corpus luteum degenerates

9. Cortisol is secreted by:

a. Pancreas

b. Thyroid

c. Adrenal

d. Thymus

Solution: (c) Adrenal

Enhanced Explanation: Cortisol is secreted by the **zona fasciculata** of adrenal cortex:

Glucocorticoid hormone

Regulates carbohydrate, protein, and fat metabolism

Anti-inflammatory effects
Stress response hormone
Follows circadian rhythm

10. A hormone responsible for the normal sleep-wake cycle is:

a. Epinephrine
b. Gastrin
c. Melatonin
d. Insulin

Solution: (c) Melatonin

Enhanced Explanation: Melatonin is secreted by the pineal gland:
Regulates circadian rhythm (sleep-wake cycle)
Production increases in darkness
Levels peak during night hours
Light exposure suppresses its secretion
Important for seasonal biological rhythms

11. Hormones are called chemical signals that stimulate specific target tissues. Their action depends on the presence of receptors on the respective target tissues. Which of the following is the correct location of the receptors in the case of protein hormones?

a. Extracellular matrix
b. Blood
c. Plasma membrane
d. Nucleus

Solution: (c) Plasma membrane

Enhanced Explanation: Protein hormones have receptors on the **plasma membrane** because:
They are water-soluble and cannot cross lipid bilayer
Bind to membrane-bound receptors
Activate second messenger systems
Examples: insulin, glucagon, growth hormone

12. Choose the correct option among the following options

Column I	**Column II**
A. Epinephrine	i. Stimulates muscle growth
B. Testosterone	ii. A decrease in blood pressure
C. Glucagon	iii. Breakdown of liver glycogen
D. Atrial natriuretic factor	iv. Increases heartbeat

Options:

a. A-ii, B-i, C-iii, D-i
b. A-iv, B-i, C-iii, D-ii

c. A-i, B-ii, C-iii, D-iv
d. A-i, B-iv, C-ii, D-iii
Solution: (b) A-iv, B-i, C-iii, D-ii
Enhanced Explanation:
Epinephrine (A) → **Increases heartbeat (iv)** - sympathetic response
Testosterone (B) → **Stimulates muscle growth (i)** - anabolic effects
Glucagon (C) → **Breakdown of liver glycogen (iii)** - glycogenolysis
Atrial natriuretic factor (D) → **Decrease in blood pressure (ii)** - vasodilation and diuresis

13. Which of the following organs in mammals does not consist of a central calcium balance in the human body?
a. Vitamin D
b. Parathyroid hormone
c. Thyrocalcitonin
d. Thymosin
Solution: (d) Thymosin
Enhanced Explanation: Thymosin is not involved in calcium homeostasis. Calcium balance is maintained by:
Vitamin D - enhances calcium absorption
Parathyroid hormone (PTH) - increases blood calcium
Thyrocalcitonin (Calcitonin) - decreases blood calcium

14. Which of the following organs in mammals does not consist of a central medullary region surrounded by a cortical region?
a. Ovary
b. Adrenal
c. Liver
d. Kidney
Solution: (c) Liver
Enhanced Explanation: Liver does not have cortex-medulla organization. Organs with this structure:
Ovary - cortex (follicles) and medulla (blood vessels, nerves)
Adrenal - cortex (three zones) and medulla (chromaffin cells)
Kidney - cortex (nephrons) and medulla (loops of Henle, collecting ducts)

15. Which of the following conditions is not linked to a deficiency of thyroid hormones?
a. Cretinism
b. Goitre
c. Myxedema
d. Exophthalmia
Solution: (d) Exophthalmia

Enhanced Explanation: Exophthalmia (protruding eyes) is associated with **hyperthyroidism** (Graves' disease), not hypothyroidism.
Thyroid hormone deficiency causes:
Cretinism - congenital hypothyroidism in children
Goitre - enlarged thyroid gland (can be due to iodine deficiency)
Myxedema - severe hypothyroidism in adults