Chemical Coordination and Integration

Standard difficulty · 20 questions · 40 marks · Time: 36 minutes

Name: _____ Date: _____ Score: ____ / 40

Show your working for Sections B and C. Answers are on the last page — try every question first!

Section A — Choose the correct answer — 8 × 1 = 8 marks

1. The gland called the "master gland" is the:
(a) adrenal **(b)** pancreas **(c)** thyroid **(d)** pituitary

2. Oxytocin is secreted by the:
(a) atrial wall of the heart **(b)** stomach wall
(c) posterior pituitary **(d)** corpus luteum

3. The main function of testosterone is that it:
(a) prepares the body for "fight or flight"
(b) regulates the 24-hour (diurnal) rhythm of the body
(c) stimulates the adrenal cortex to make glucocorticoids
(d) controls male secondary sexual characters and spermatogenesis

4. Exophthalmic goitre (Graves' disease) is caused by:
(a) hypothyroidism during pregnancy or infancy
(b) hyperthyroidism
(c) too little growth hormone in childhood
(d) too little ADH, giving large volumes of dilute urine

5. Chemically, triiodothyronine (T_3) is an:
(a) amino-acid derivative **(b)** peptide/protein
(c) iodothyronine **(d)** steroid

6. Vasopressin binds to receptors:
(a) in the blood plasma only
(b) inside the cell (intracellular receptors)
(c) on the cell membrane
(d) on the cell wall

7. Which hormone is made by the anterior pituitary?
(a) Secretin **(b)** Insulin **(c)** FSH **(d)** Oestrogen

8. Assertion (A): Progesterone binds to receptors on the membrane of its target cells.
Reason (R): Steroid hormones and iodothyronines enter the cell and bind intracellular receptors, while peptide and amino-acid-derived hormones bind receptors on the cell membrane.
(a) Both A and R are true, and R is the correct explanation of A.
(b) Both A and R are true, but R is not the correct explanation of A.
(c) A is true, but R is false.
(d) A is false, but R is true.

Section B — Short answer — 8 × 2 = 16 marks

9. What are hormones?

10. Which gland secretes ACTH, and what does it do?

11. Name the hormone of the thymus that help T-lymphocytes to differentiate.

12. Name the disorder caused by underproduction of hormones by the adrenal cortex.

13. What is the chemical nature of noradrenaline, and where are its receptors?

14. Which gland is involved in Addison’s disease, and is the hormone in excess or deficient?

15. Name two hormones secreted by the adrenal cortex.

16. Which part of the pituitary releases MSH? Which part of the brain controls its release?

Section C — Word problems — 4 × 4 = 16 marks

17. Describe the hormones of the anterior pituitary and their functions.

18. For each hormone give the gland that secretes it and its main function: cortisol, aldosterone, secretin, growth hormone.

19. Explain the cause of each disorder and name the gland involved: goitre, dwarfism, diabetes mellitus.

20. Classify these hormones by chemical nature and say where their receptors are: insulin, triiodothyronine (T_3), oestradiol, thyroxine (T_4). How does each kind act on the cell?

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Answer key

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Q	Answer	Working
1	**(d) pituitary**	it controls many other glands; it is itself regulated by the hypothalamus
2	**(c) posterior pituitary**	—
3	**(d) controls male secondary sexual characters and spermatogenesis**	—
4	**(b) hyperthyroidism**	—
5	**(c) iodothyronine**	—
6	**(c) on the cell membrane**	vasopressin is a peptide/protein hormone
7	**(c) FSH**	—
8	**(d) A is false, but R is true.**	A is false: it is a steroid. R is true.
9	**Non-nutrient chemicals that act as intercellular messengers and are produced in trace amounts by endocrine glands or cells, travelling in the blood to act on target cells.**	—
10	**The anterior pituitary; it stimulates the adrenal cortex to make glucocorticoids**	—
11	**Thymosins**	—
12	**Addison's disease**	—
13	**Amino-acid derivative; on the cell membrane, acting through second messengers**	—
14	**Adrenal cortex (deficiency)**	—
15	**Cortisol and Aldosterone**	—
16	**The pars intermedia of the pituitary; the hypothalamus (through releasing and inhibiting hormones carried by the portal system)**	—
17	**Growth hormone: growth (excess causes gigantism in children and acromegaly in adults; deficiency causes dwarfism). Prolactin: growth of mammary glands and milk formation. TSH: stimulates the thyroid. ACTH: stimulates the adrenal cortex to secrete glucocorticoids. LH and FSH (gonadotrophins): stimulate the gonads; in males LH stimulates androgen secretion and FSH with**	—

Q	Answer	Working
	androgens regulates spermatogenesis; in females LH induces ovulation and maintains the corpus luteum, and FSH stimulates the growth of ovarian follicles. MSH (from the pars intermedia): pigmentation of the skin.	
18	cortisol: adrenal cortex; controls carbohydrate metabolism and suppresses inflammation and immunity; aldosterone: adrenal cortex; increases reabsorption of Na^+ and water and excretion of K^+; secretin: small intestine wall; makes the pancreas release water and bicarbonate; growth hormone: anterior pituitary; stimulates growth	—
19	goitre: iodine deficiency, which enlarges the thyroid; gland: thyroid (iodine deficiency); dwarfism: too little growth hormone in childhood; gland: pituitary (deficiency); diabetes mellitus: lack of insulin or reduced response to it; gland: pancreas: β-cells (insulin deficiency or resistance)	—
20	insulin: peptide/protein, membrane; triiodothyronine (T_3): iodothyronine, intracellular; oestradiol: steroid, intracellular; thyroxine (T_4): iodothyronine, intracellular. Membrane-bound receptors work through second messengers (cAMP, Ca^{2+}) to change metabolism; intracellular receptors regulate gene expression.	—

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