بسم الله الرحمن الرحيم

Al-Quds University **Endocrinology 0202313**
College of Health Professions **Second-hour exam. July 23, 2008**
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I. Multiple Choice: choose the single best answer (40 points, 2 points each)

1. The effects of TSH on thyroid gland include
    a. Increased cellular proliferation.
    b. Accelerates thyroglobulin resorption.
    c. Stimulate both cAMP and IP_3 production.
    d. Both (a) and (c) above are correct.
    e. All of the above are correct.

2. Oxytocin
    a. Is a peptide with considerable structural homology to vasopressin.
    b. Is released only in association with the release of vasopressin.
    c. Is secreted in response to suckling.
    d. Both (a) and (c) above are correct.
    e. All of the above are correct.

3. The action of vasopressin on the kidney involves
    a. Stimulation of cAMP formation in tubular cells.
    b. Decreased permeability of the distal tubules and collecting ducts to water.
    c. Increases the movement of aquaporin-2 water channels from plasma membrane to intracellular vesicles.
    d. Both (a) and (c) above are correct.
    e. All of the above are correct.

4. Follicular cells of the thyroid gland
    a. Are the major source of circulating thyroxine (T_4).
    b. Secrete calcitonin.
    c. Concentrate inorganic iodine by active transport.
    d. Both (a) and (c) above are correct.
    e. All of the above are correct.

5. Physiological effects of the thyroid hormones include all of the following **except**:
    a. Increased oxygen consumption by skeletal and cardiac muscle in the adult.
    b. Increased oxygen consumption by the brain in the adult.
    c. Maturation of the skeleton in the fetus and infant.
    d. Development of the CNS in the fetus and infant.
    e. Increased blood flow, sweating and cardiac output.

6. Polythiouracil
    a. Inhibits thyroid peroxidase.
    b. Stimulates the conversion of T_4 to T_3.
    c. Is used to treat hyperthyroidism.
    d. Both (a) and (c) above are correct.
    e. All of the above are correct.

7. Hormones released from the hypothalamus and regulate the anterior pituitary
    a. Are secreted into the portal hypophysial blood vessels.
    b. Are all stimulatory hormones.
    c. Are all peptides.
    d. Affect both the anterior and posterior pituitary.
    e. All of the above are correct.

8. Luteinizing hormone (LH) and follicle stimulating hormone (FSH)
    a. Are secreted by the same pituitary cells.
    b. Have the same α subunit but different β subunits.
    c. Affect both the testes and ovaries.
    d. Both (b) and (c) above are correct.
    e. All of the above are correct.

9. Gonadotropin releasing hormone (GnRH) from the hypothalamus
    a. Has secreted in a pulsatile and circadian rhythm.
    b. Is a short peptide.
    c. Increases the secretion of LH but not FSH.
    d. Both (a) and (b) above are correct.
    e. All of the above are correct.

10. Hormones of the posterior pituitary
    a. Are synthesized in the hypothalamus.
    b. Are both nanopeptides.
    c. Are released in the portal hypophysial circulation by the hypothalamus.
    d. Both (a) and (b) above are correct.
    e. All of the above are correct.

11. Proopiomelanocortin (POMC)
    a. Is the precursor of ACTH.
    b. Is synthesized by the corticotrophs under the influence of CRH.
    c. Is the precursor of β-endorphin.
    d. Both (a) and (b) above are correct.
    e. All of the above are correct.

12. Growth hormone (GH)
    a. Is under the influence of both GHRH and somatostatin.
    b. Enhances glucose uptake into cells.
    c. Increases amino acid uptake and protein synthesis.
    d. Both (a) and (c) above are correct.
    e. All of the above are correct.

13. Hyperprolactinemia causes all of the following **except**:
    a. Causes gonadal dysfunction.
    b. Decreases the levels of LH and FSH.
    c. Decreases the pulsatile secretion of LH and FSH.
    d. Decreases LH surge in women.
    e. Decreases spermatogenesis.

14. Factors affecting the onset of puberty include
    a. GnRH.
    b. LH and FSH.
    c. Leptin.
    d. Melatonin.
    e. All of the above are correct.

15. Thyroid stimulating hormone (TSH) is transported in blood by
    a. Thyroxine-binding globulin (TBG).
    b. Thyroxine-binding prealbumin (TBPA).
    c. Albumin.
    d. All of the above are correct.
    e. None of the above is correct.

16. TSH receptor autoantibodies
    a. Bind to TSH receptors and stimulate the thyroid.
    b. Bind to TSH receptors and inhibit the thyroid gland.
    c. Bind to TSH receptors but have no effects on thyroid gland.
    d. Both (a) and (b) above are correct.
    e. All of the above are correct.

17. The "Wolff-Chaikoff effect" is
    a. The ability of the thyroid gland to "escape" the effect of low iodine intake.
    b. The ability of the thyroid gland to "escape" the effect of high iodine intake
    c. The ability of the thyroid gland to increase thyroid hormone synthesis under high iodine intake.
    d. Both (a) and (b) above are correct.
    e. All of the above are correct.

18. Deficiency of thyroid hormone during fetal development causes
    a. Dwarfism.
    b. Mental retardation.
    c. Cretinism.
    d. Both (a) and (c) above are correct.
    e. All of the above are correct.

19. Adrenocorticotropic hormone (ACTH)
    a. Is important in stress adaptation.
    b. Increases cortisol levels from adrenal cortex.
    c. Is inhibited by its own secretion.
    d. Both (a) and (b) above are correct.
    e. All of the above are correct.

20. Thyroid hormone receptor β (TRβ)
    a. Is a nuclear receptor.
    b. Binds T_4.
    c. Bind T_3.
    d. Both (a) and (c) above are correct.
    e. All of the above are correct.

II. Matching: match the information on the right column to the left column (you may use the same answer more than once). (10 points)

__c__	Corticotrophs	a.	LH
__d__	Lactotrophs	b.	GH
__b__	Somatotrophs	c.	ACTH
__a__	Gonadotrophs	d.	Prolactin
__e__	Thyrotrophs	e.	TSH

__d__ Is mainly under inhibitory effect.

__c__ Peak before awakening.

__b__ causes acromegaly in adults in hypersecretion.

__c__ Increases in Graves' Disease.

__b__ Peak during deep sleep.

III. True (T) or False (F) (12 points)

__F__ 1. Chemicals secreted by the hypothalamus act only through paracrine effect.

__T__ 2. Dopamine is a neurotransmitter, a neurohormone and a classic hormone secreted by endocrine cells.

__T__ 3. Amenorrhea means the absence of menstrual cycle.

__T__ 4. The neurohypophysis secretes ADH and oxytocin.

__T__ 5. Tryptophan is the precursor of the hormone melatonin.

__F__ 6. Melanocyte stimulating hormone (MSH) is one of the hormones in humans that is responsible for hyperpigmentation in Cushing's syndrome.

__F__ 7. One of the major modulator of thyroid hormones in adult humans is the change in temperature.

__T__ 8. FSH stimulates testicular growth by enhancing the production of an androgen-binding protein by the Sertoli cells.

__F___ 9. Biosynthesis of thyroid hormones occurs by iodination of free tyrosines, then coupling of these tyrosines to T_4 and T_3.

__T___ 10. Biosynthesis of thyroid hormones occur at the cell-colloid interface.

__T___ 11. Thyroperoxidase catalyzes iodination of tyrosines and the coupling reactions.

__T___ 12. Thyroid hormone increases heat production by increasing the activity of Na^+-K^+-ATPase.

IV. Short-assay questions

1. **What is the difference between primary and secondary hypopituitarism? (6 pts)**
   Answer: Primary means a pituitary defect or destruction. Secondary means deficiency of hypothalamic hormones that stimulate the pituitary.

2. **Testing GH deficiency may not be accurate if basal levels of GH are measured only. Explain why? Explain briefly two tests for evaluating GH deficiency and the scientific basis of these tests. (9 points)**
   Answer: Because of the diurnal rhythm, the basal levels of growth hormone is not constant and low normal levels could be detected. Evaluating GH deficiency could be evaluated by provocative tests like injecting GHRH which stimulates GH release or stress-induced hypoglycemia since stress increases GH. Amino acids also stimulate GH secretion and are used to evaluate GH deficiency.

3. **What is meant by direct and indirect effects of growth hormone? Name one indirect effect and three direct effects. (6 points)**
   Answer: Direct effect of GH is due to binding of GH to target cells and causing an effect however indirect effect is due to induction of IGF-1 from liver.
   Indirect effect: promotion of linear growth
   Direct effect: promotion of protein synthesis, mobilization of fat, decrease carbohydrate utilization (inhibits glucose uptake).

4. **Explain the difference(s) in iodine transport in the basement membrane and apical membrane of the follicular cells of thyroid gland. (8 points)**
5. **Answer: Iodine is transported across the basement membrane by Na^+/I^- symporter (secondary active transport that derives energy from Na^+-K^+-ATPase that creates a Na^+ gradient which is used for transport).**
   Iodine transport in the apical membrane is carried out by a specific protein – pendrin (facilitated transport). It is inhibited by PTU.

6. **Name the different types of deiodinases. What are their tissue distribution and function? (9 points)**
   Answer: There are three types of deiodinase, type 1 5'-deiodinase, type 2 5'-deiodinase, and type 3 5-deiodinase. Type 1 is present in liver, kidney, skeletal muscle and thyroid gland and it produces the active hormone T_3 from T_4. Type 2 is present in brain and pituitary, it maintains intracellular T_3 in the CNS. Type 3 is present in placenta and glial cells of the CNS, it inactivates T_4 and T_3 and may play a role in protection of the fetus and the brain from excess thyroid hormones.