بسم الله الرحمن الرحيم

Endocrinology First Exam

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Al-Quds University
College of Health Professions
Department of Medical Laboratory Sciences

Name: _____
Student No. ____Key_____
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Section: S/M N/T

I. Multiple-choice questions. Choose the single best answer (50 points, 2 points each)

1. Hormone receptors:
   a. have a high affinity for their natural ligand.
   b. are always linked to G proteins.
   c. are lipids.
   d. are always located in the plasma membrane of their target cells.
   e. All of the above are correct.

2. G protein activation:
   a. leads to changes in gene expression.
   b. always causes an increase in cyclic AMP.
   c. leads to the generation of second messengers.
   d. always results in a decrease in cyclic AMP.
   e. Occurs with all peptide hormones.

3. G proteins
   a. are plasma-membrane bound proteins.
   b. have seven transmembrane domain.
   c. are activated when GTP replaces GDP on the α subunit.
   d. Both (a) and (c) above are correct.
   e. All of the above are correct.

4. Receptors coupled to tyrosine kinase include
   a. G protein-couple receptors.
   b. Cytokine receptors.
   c. Growth factor receptors.
   d. Both (b) and (c) above are correct.
   e. All of the above are correct.

5. The second messenger nitric oxide (NO)
   a. causes vasodilation of blood vessels.
   b. activates guanylyl cyclase (GC) which causes smooth muscle relaxation.
   c. activates adenylate cyclase which causes an increase in cAMP.
   d. Both (a) and (b) above are correct.
   e. All of the above are correct.

6. The lignad-binding domain of a steroid hormone receptor is responsible for all of the following **except**:
    a. lignad binding
    b. DNA binding.
    c. dimerization of the receptor.
    d. nuclear translocation of the receptor.
    e. association with heat shock proteins.

7. Adrenocorticotropic hormone (ACTH)
    a. Stimulates the secretion of glucocorticoids and adrenal androgens from the adrenal cortex.
    b. Is processed from a large precursor proopiomelanocortin (POMC).
    c. Is secreted by corticotrophs of the anterior pituitary gland.
    d. Both (a) and (c) above are correct.
    e. All of the above are correct.

8. The diabetogenic action of excess growth hormone secretion is due to:
    a. Enhancing amino acid uptake.
    b. Inhibition of protein catabolism.
    c. Inhibition of glucose uptake.
    d. Stimulating lipolysis.
    e. All of the above contribute to the diabetogenic effect of excess growth hormone.

9. Hyperprolactinermia causes gonadal dysfunction in women through
    a. decreasing pulsatile secretion of gonadotropins.
    b. decreasing the basal levels of LH and FSH.
    c. suppressing the midcycle LH surge
    d. Both (a) and (c) above are correct.
    e. All of the above are correct.

10. Luteinizing hormone (LH)
    a. Stimulates testosterone production for the Leydig cells of the testes.
    b. Has a similar α subunit to FSH and hCG (human chorionic gonadotropin)
    c. Enhance testicular growth and production of an androgen-binding protein from sertolic cells of the testes.
    d. Stimulates spermatogenesis with FSH.
    e. All of the above are correct.

11. Which of the following does NOT directly promote the secretion of a hormone from another gland?
    a. Prolactin
    b. Leutenizing hormone
    c. Thyroid stimulating hormone
    d. Adrenocorticotropic hormone
    e. Dopamine.

12. The hormone responsible for ejection of milk is
    a. Prolactin.
    b. Oxytocin.
    c. ADH.
    d. Cortisol.
    e. Growth hormone.

13. Gonadotropin Releasing Hormone (GnRH) is secreted by:
    a. Testes
    b. Ovaries
    c. Adenohypophysis
    d. Neurohypophysis
    e. Hypothalamus

14. Which of the following would bind a receptor on the cell membrane rather than enter the cell to have its effect?
    a. Calcitriol
    b. Glucagon
    c. Triiodothyronine
    d. Aldosterone
    e. Testosterone

15. Which of the following causes hepatocytes (liver cells) to ultimately increase blood glucose levels; and does so by entering the hepatocyte via passive diffusion and binding receptors within the cell?
    a. Epinephrine
    b. Glucagon
    c. Insulin
    d. Cortisol
    e. All of the above are correct.

16. High levels of the thyroid hormones will
    a. actively stimulate the hypothalamus to release more TRH.
    b. eventually inhibit the release of TSH.
    c. inhibit the anterior pituitary, thereby increasing TSH levels.
    d. stimulate the thyroid gland to release more thyroid hormone in a positive feedback loop.
    e. cause no change in hormone levels as thyroid hormone is the end product of the feedback loop.

17. The hormone that triggers the release of TSH from the anterior pituitary is
    a. thyrotropin-releasing hormone.
    b. corticotropin-releasing hormone.
    c. thyroxine-releasing hormone.
    d. thyroid-stimulating releasing hormone.
    e. somatostatin.

18. Serum TSH is high in:
    a. Primary hypothyroidism.
    b. Secondary/tertiary hypothyroidism.
    c. Thyroid hormone resistance syndrome.
    d. Primary hyperthyroidism.
    e. Thyrotoxicosis.

19. Thyroidal peroxidase catalyzes the following reactions in the thyroid gland:
    a. Oxidation of iodide ions.
    b. Iodoniation of tyrosine residues in thyroglobulin.
    c. Coupling of iodinated tyrosine residues.
    d. Both (a) and (b) above are correct.
    e. All of the above are correct.

20. Type 1 5'-deiodinase
    a. is the most abundant iodinase and found mainly in liver and kidney.
    b. provides T_3 to the plasma.
    c. increases in hyperthyroidism.
    d. Both (a) and (b) above are correct.
    e. All of the above are correct.

21. Goiter could be found in
    a. primary hypothyroidism,
    b. secondary hypothyroidism.
    c. Graves' disease.
    d. Both (a) and (c) above are correct.
    e. All of the above are correct.

22. Parathyroid hormone is responsible for the regulation of
    a. intracellular ionized calcium.
    b. extracellular total calcium.
    c. extracellular ionized calcium.
    d. bone calcium.
    e. All of the above are correct.

23. Vitamin D
    a. plays an important role in bone resorption.
    b. plays an important role in bone formation.
    c. plays an important role in intestinal calcium absorption.
    d. Both (a) and (c) above are correct.
    e. All of the above are correct.

24. In bone resorption
    a. Osteoclasts are activated and secrete acids and proteases.
    b. Parathyroid hormone and vitamin D binds to their receptors on osteoclasts causing their activation.
    c. High glucocorticoids, ethanol, and estrogen deficiency enhance osteoclast resorptive capacity.
    d. Both (a) and (c) above are correct.
    e. All of the above are correct.

25. Treatment of osteoporosis may include the injection of:
    a. Tamoxifen and Raloxifen in post menopausal women.
    b. Calcitonin.
    c. High concentration of parathyroid hormone.
    d. Both (a) and (b) above are correct.
    e. All of the above are correct.

I. Complete the following sentences (you may use abbreviations): (10 points. 1 point each)

1. Growth hormone hypersecretion in childhood causes gigantism and in adults causes acromegaly.
2. In Cushing's disease, hypercorisolism is due to pituitary ACTH hypersecretion.
3. Polythiouracil is a potent inhibitor of thyroperoxidase in the thyroid gland.
4. The major transport protein for thyroid hormone in plasma is TBG.
5. The enzyme that protects the fetus and CNS from excess T_4 is type 3 5-deiodinase.
6. Enzymes responsible for Vitamin D3 activation are 25 hydroxylase in liver and 1 α-hydroxylase in kidney.
7. Gonadotrophs of the anterior pituitary are responsible for the secretion of LH and FSH.
8. Prolactin is regulated mainly by the hypothalamic inhibitory hormone dopamine.

II. Match the following hormone with its action: (10 points. 1 point each)

__d_ 1. prolactin	(a) stimulates the adrenal cortex
__e_ 2. growth hormone (GH)	(b) stimulates the thyroid gland
__f_ 3. oxytocin	(c) stimulates sperm production
__a_ 4. adrenocorticotropic hormone (ACTH)	(d) initiates milk production
__b_ 5. thyroid-stimulating hormone (TSH)	(e) promotes growth in all body organs
__g_ 6. luteinizing hormone (LH)	(f) assists uterine contractions during labor
__h_ 7. antidiuretic hormone (ADH)	(g) stimulates ovulation
__c_ 8. follicle-stimulating hormone (FSH)	(h) causes retention of water
_j__ 9. melanocyte-stimulating hormone (MSH)	(i) stimulates bone resorption.
_i__ 10. Parathyroid hormone	(j) stimulates pigmentation.

III. Short answers. Answer the following questions briefly:

1. **Describe the mechanisms by which iodide is transported through the basement membrane and apical membrane of the thyroid follicular cells. (4 points)**

   Ans: iodide is transported by a symport mechanism (Na^+/I^- symporter, NIS) which is driven by Na^+/K^+ ATPase in the basement membrane. In the apical membrane, iodide is transported by a specific transport protein, pendrin.

2. **Describe the major cause of the following diseases (or complications): (8 points)**

   a. **Cretinism: ___neonatal hypothyroidism_____.**
   b. **Graves' disease: __hyperthroidism TSH antibodies__.**
   c. **Galactorrhea: __hyperprolacinemia_____.**
   d. **Myxedema coma: ___end-stage hypothyroidism_____.**
   e. **Rickets type II: ___vitamin D resistance_____.**
   f. **Primary osteoporosis: ____menopause bone resorption_ .**
   g. **Paget's disease: __bone viral infection, bone resorption__.**
   h. **Osteomalacia: ____vitamin D deficiency in adults____ .**

3. **Name the major symptoms of diffuse toxic goiter (Graves' disease): (4 points)**

   Ans: : (1) thyrotoxicosis, (2) goiter, (3) opthalmopathy (exophthalmos), and (4) dermopathy (peritibial myxedema), (5) obesity.

4. **Explain briefly how parathyroid hormone maintains calcium homeostasis. What is the mechanism by which calcium increases the release of parathyroid hormone? (6 points)**

   Ans: when calcium level decreases, PTH increases bone resorption, increases calcium reabsorption in the kidney. PTH also increased the production of 1,25 $(OH)_2$ D_3 which increase calcium absorption in the intestine.
   The mechanism by which calcium increases PTH secretion is that by binding of calcium to receptors on the parathyroid gland, this cause increase in intracellular Mg^{++} which causes the release of PTH.

5. **In G protein signal transduction: (8 points)**
   a. **What is the role of GTP?**

      Ans: when bound to G protein alpha subunit instead of GDP, it causes activation of the alpha subunit.

   b. **What is the role the alpha subunit of the G protein?**

      Ans: when activated, alpha subunit activates adenylate cyclase or phospholipase C.

   c. **What is the role of GTPase?**

      Ans: GTPase cause the conversion of GTP to GDP which causes inactivation of the alpha subunit and binding of alpha subunit of beta/gamma subunits.

   d. **What is the mechanism by which arrestin causes desensitization.**

      Ans: arrestin binds to phosphorylated receptor of epinephrine, this causes internalization of the receptor and desensitization.