بسم الله الرحمن الرحيم

Al-Quds University **Endocrinology 0202313**
College of Health Professions **Third-hour exam. August 6, 2008**
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Name: _____ **Student No. _____**

I. Multiple Choice: choose the single best answer (50 points, 2.5 points each)

1. Elevated Free T4 and slightly elevated TSH indicate
   a. Hypothyroidism due to thyroid tumor.
   b. TSH secreted pituitary tumor.
   c. Hypothyroidism due to hypothalamic tumor.
   d. Euthyroid.
   e. Both (a) and (c) above are correct.

2. The mechanism(s) that may contribute to anemia is(are)
   a. Impaired hemoglobin synthesis.
   b. Impaired intestinal absorption of iron.
   c. Impaired intestinal absorption of folic acid.
   d. Deficiency of vitamin B_{12}.
   e. All of the above are correct.

3. Features of Graves' disease include
   a. Thyrotoxicosis.
   b. Goiter.
   c. Exophthalmos.
   d. Peritibial myxedema.
   e. All of the above are correct.

4. PTH is important in maintaining
   a. ECF ionized calcium.
   b. ICF ionized calcium.
   c. Total serum calcium.
   d. Both (a) and (c) above are correct.
   e. All of the above are correct.

5. Hormones important in calcium homeostasis include
   a. PTH.
   b. 1,25 $(OH)_2$ D_3.
   c. Calcitonin.
   d. Both (a) and (b) above are correct.
   e. All of the above are correct.

6. Stimulation of PTH secretion from stored vesicles (exocytosis) is mediated by
    a. Increase in intracellular calcium levels.
    b. Increase in intracellular magnesium levels.
    c. Calcium receptors on the cell surface of the parathyroid cell.
    d. Both (b) and (c) above are correct.
    e. All of the above are correct.

7. The effects of PTH concerning calcium homeostasis include
    a. Increased bone resorption.
    b. Increased gastrointestinal absorption of calcium.
    c. Decreased renal excretion of calcium.
    d. Both (b) and (c) above are correct.
    e. All of the above are correct.

8. Causes of hypocalcemia include
    a. Hyperparathyroidism.
    b. Vitamin D deficiency.
    c. Decrease in target-organ responsiveness to PTH.
    d. Both (b) and (c) above are correct.
    e. All of the above are correct.

9. Primary osteoporosis
    a. Is due to increase in IL-6 secretion as a result of estrogen deficiecy.
    b. is due to proliferation of osteoblasts.
    c. Occurs mainly in postmenopausal women.
    d. Both (a) and (c) above are correct.
    e. All of the above are correct.

10. The rate-limiting step in steroidogenesis is
    a. Hydrolysis of cholesterol esters.
    b. The conversion of cholesterol to pregnenolone.
    c. 11 β hydroxylase.
    d. 21 α hydroxylase.
    e. 17 α hydroxylase.

11. The **major** source of cholesterol for steroidogenesis is
    a. Free cholesterol.
    b. Cholesterol esters.
    c. LDL.
    d. HDL.
    e. De novo synthesis from acetate.

12. The mitochondrial step(s) in steroidogenesis is(are)
    a. Cholesterol side chain cleavage enzyme.
    b. 11 β hydroxylase.
    c. 21 α hydroxylase.
    d. Both (a) and (b) above are correct.
    e. All of the above are correct.

13. The major adrenal androgens include all of the following **except**
    a. Testosterone.
    b. DHEA
    c. DHEA – sulfate.
    d. Androstenedione.
    e. Both (a) and (d) above are correct.

14. Glucocorticoid excess has the following effects on intermediary metabolism:
    a. Inhibit protein synthesis except in liver.
    b. Inhibit glucose uptake by muscle and adipose tissue.
    c. Decrease hepatic gluconeogenesis.
    d. Increase lipolysis.
    e. Both (a) and (b) above are correct.

15. The effects of glucocorticoid excess on bone include all of the following **except**
    a. Inhibition of bone formation.
    b. Stimulation of bone resorption.
    c. Stimulation of osteoblast activity.
    d. Stimulation of PTH.
    e. Decreasing collagen formation.

16. Cushing's disease
    a. Is due to excessive ACTH secretion from pituitary tumors.
    b. Results in increase in cortisol and adrenal androgens.
    c. Results in increase in mineralocorticoids (aldosterone).
    d. Both (a) and (b) above are correct.
    e. All of the above are correct.

17. The best laboratory test to differentiate between Cushing's disease and ectopic ACTH tumor is
    a. Measuring the basal level of cortisol.
    b. Two-day dexamethasone suppression test.
    c. Measuring the basal level of ACTH.
    d. Measuring ACTH after CRH injection.
    e. Measuring CRH levels.

18. High ACTH, high cortisol levels could indicate
    a. Cushing's disease.
    b. Ectopic ACTH tumor.
    c. Adrenal tumor.
    d. Both (a) and (b) above are correct.
    e. All of the above are correct.

19. Symptoms of Cushing's syndrome include
    a. Obesity.
    b. Moon faces.
    c. Hypertension.
    d. Gonadal dysfunction.
    e. All of the above are correct.

20. ACTH causes hypertrophy and hyperplasia of
    a. Zona glomerulosa.
    b. Zona fasiculata.
    c. Zone reticularis.
    d. Both (b) and (c) above are correct.
    e. All of the above are correct.

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

__F__ 1. TSH will be elevated after TRH injection in hypothyroidism due to pituitary tumors.

__T__ 2. Goiter may result from hypothyroidism and hyperthyroidism.

__F__ 3. Myxedema in hypothyroidism is due to increase synthesis of glycosaminoglycans.

__T__ 4. Graves' disease is primarily an autoimmune disease.

__T__ 5. Calcitonin is secreted from parafollicular cells and inhibits bone resorption.

__T__ 6. PTH increases the synthesis of 1,25 (OH)2 D3 thus influencing Ca absorption indirectly.

__T__ 7. Mineralization of bone requires the enzyme alkaline phosphatase.

__T__ 8. Renal osteodystorphy results in hyperparathyroidism.

__T__ 9. The steroidogenic acute regulatory protein (StAR) is responsible for cholesterol transport from the outer to inner mitochondrial membrane.

__T__ 10. Zona glomerulosa lacks the enzyme 17α hydroxylase.

__T__ 11. Circadian rhythm is abolished during stress.

__T__ 12. Glucocorticoids reduce the number of circulating lymphocytes.

III. Short-assay questions

1. **What is the biological importance of PTH inhibition of phosphate reabsorption of in the kidney? (9 points)**
   Answer: When calcium levels are low, PTH increases and causes bone resorption which causes an increase in calcium and phosphate levels in the blood. This is important in correcting the low calcium levels but causes unwanted increase in phosphate levels in blood. The effect of PTH on the kidney concerning phosphate increases the loss of phosphate in urine and the return of phosphate in blood to normal levels.

2. **The major effect of vitamin D is increasing calcium absorption in the intestine. Explain briefly the mechanisms by which vitamin D carry out this effect. (10 points)**
   Answer: Vitamin D affects calmodulin-myosin I complex that removes calcium from the brush border membrane; vitamin D induces calcium channel (CaT1) which is responsible for calcium absorption; vitamin D induces calcium transport by inducing the binding protein, calbindin; vitamin D induces the calcium pump (Ca-ATPase) that removes calcium from the cells.

3. **What is the importance of having PTH and vitamin D receptors on osteoblasts and not osteoclasts? (9 points)**
   Answer: The major function of PTH and vitamin D is to maintain calcium by increasing the activity of osteoclasts. Having the receptors on the osteoblasts means that osteoblasts will be activated at the same time a signal is sent from osteoblasts to osteoclasts so that bone formation will follow bone resorption (bone remodeling).

4. **Explain briefly how kidneys escape the mineralocorticoid effects of cortisol. Why do you think cortisone creams are effective anti inflammatory agents even though cortisone is not an active glucocorticoid. (10 points)**
   Answer: the kidney has the enzyme 11 β-hydroxysteroid dehydrogenase 2 which converts cortisol to cortisone which does not bind to mineralocorticoid receptors. Cortisone creams are converted in the skin by the enzyme 11 β-hydroxysteroid dehydrogenase 1 to cortisol which is a highly active anti inflammatory glucocorticoid.