Exam Copy 287

**NROSCI/BIOSC 1070 and MSNBIO 2070**
**FINAL EXAM**
**December 11, 2017**

**Total POINTS: 100 20% of grade in class**

**1.** Emily, who is 45 years old, asked her physician when she should expect to enter menopause. The physician asked her if she had ever taken oral contraceptives on a regular basis. When Emily told him she had taken combination birth control pills for 10 consecutive years beginning at age 30, her physician told her that she should not expect to undergo menopause until her late 50s because she didn't recruit any follicles while she was on oral contraceptives.

Did the physician provide accurate information to Emily (yes or no)? Provide a brief justification for your answer. ***(5 points).***

**2.** You are a scientist at a pharmaceutical company, and hypothesize that a drug that blocks the actions of the P450 aromatase enzyme would serve as an effective contraceptive for women.

**a)** Would a blocker of the aromatase enzyme prevent pregnancy in women (yes or no)? Provide a brief rationale for your answer. ***(5 points).***

**b)** Would levels of FSH be altered by the aromatase enzyme blocker? If so, would they increase or decrease? Provide a brief explanation of your answer. ***(3 points).***

**3.** Activating mutations in the luteinizing hormone receptor (LHR) gene are one of the most common mutations found in the gonadotropin receptor genes. The LH receptor is active from birth in individuals with this condition, as though high levels of LH were always present. The following questions relate to individuals with this condition.

**a)** What physiological differences (if any) would be noted in an 8 year-old boy with an activating mutation of the LH receptor, relative to a boy without such mutations? ***(5 points).***

**b)** This individual matures to adulthood, and wants to become a father. Is it likely this is possible (yes or no)? Discuss the rationale for your answer. ***(5 points)***.

**c)** What physiological changes (if any) would be noted in an 8 year-old girl with an activating mutation of the LH receptor, relative to a girl without such mutations? ***(5 points).***

**4.** A 40 year-old patient with Graves' disease develops exophthalamos, or protrusion of the eyeballs. How would the levels of the following hormones likely differ in this patient from those in a normal individual? ***(2 points each; 4 points total).***

**T3 and T4**

Normal High Low

**Thyroid-stimulating hormone (TSH)**

Normal High Low

**5.** Pregnancy tests detect the presence of the hormone human chorionic gonadotropin (hCG) in the blood or urine.

***a)*** List two tissues (or structures) that produce hCG in pregnant women. ***(4 points).***

***b)*** Which receptor type does hCG bind to in pregnant women? ***(2 points).***

**6.** A patient has a parathyroid tumor, such that their levels of parathyroid hormone are drastically elevated. How do the following parameters differ in this patient from a normal individual? ***(2 points each; 10 points total*).**

**Q-T interval of ECG**

Normal Shortened Lengthened

**Blood volume**

Normal Increased Decreased

**$Na^+$ entry into excitable tissues**

Normal Enhanced Reduced

**Stomach acid secretion**

Normal Increased Decreased

**Plasma phosphate levels**

Normal Increased Decreased

**7.** Another patient is diagnosed with low plasma albumin (hypoalbuminemia) due to liver damage. How do the following parameters differ in this patient from a normal individual? ***(2 points each; 4 points total*).**

**Heart rate**

Normal Low High

**Excitability of peripheral nerves**

Normal Low High

**8.** Circle the best answer to each question below. ***(2 points each; 10 points total).***

**The migrating motor complex (migrating action potential complex) in the gastrointestinal system:**

a) Is regulated by the parasympathetic nervous system

b) Occurs at 15-minute intervals after a meal to aid in peristalsis

c) Is abolished by injection of the ganglionic blocker hexamethonium

d) Is facilitated by a calcium channel blocker

e) Occurs during fasting

**In the intestine the layer of nerve cells known as the submucosal plexus (Meissner's plexus) is located:**

a) Between the circular muscle layer and the muscularis mucosae

b) Between the longitudinal and circular muscle layers

c) Directly below the serosa

d) In the circular muscle itself

e) Under the mesentery

**Which phase of gastric acid secretion is abolished by vagotomy?**

a) Cephalic

b) Gastric

c) Interdigestive

d) Intestinal

e) All of the above

**Secretin is released in response to which of the following stimuli?**

a) Acid in the duodenum

b) Hypertonic chyme in the duodenum

c) Hypotonic chyme in the duodenum

d) Lipid in the duodenum

e) Amino acids in the duodenum

**Which of the following digestive enzymes is <u>not</u> activated by trypsin?**

a) Colipase

b) Chymotrypsin

c) Lactase

d) Phospholipase

**9.** The process of gluconeogenesis plays a major role in maintaining adequate blood glucose levels. Answer the following questions regarding gluconeogenesis.

***a)*** List two nutrients that provide a substrate for gluconeogenesis ***(4 points).***

***b)*** List two hormones that **stimulate** gluconeogenesis ***(4 points).***

***c)*** List the major hormone that **inhibits** gluconeogenesis ***(2 points).***

**10.** An unfortunate patient with stomach cancer undergoes a total gastrectomy, or complete removal of the stomach. As a consequence of the surgery, the esophagus is joined directly to the small intestine.

Would it be necessary to inject any nutrients into the patient following a total gastrectomy because they can no longer be absorbed? If so, indicate the nutrient(s) and briefly explain why absorption is now impossible. ***(5 points).***

**11.** Circle the best answer to the question below. ***(2 points).***

**A potential side effect of long-term treatment with cortisol analogs is:**

a) Stronger bones
b) Enhanced ability to develop muscle mass
c) Weight loss
d) Darkening of the skin through increased deposition of melatonin
e) High blood glucose levels

**12.** Indicate how the levels of the following hormones differ from the fasting state at 30 minutes following the consumption of a large, traditional Thanksgiving meal. ***(2 points each; 6 points total).***

***Ghrelin***

Same Lower Higher

***Insulin***

Same Lower Higher

***Glucagon***

Same Lower Higher

**13.** A patient with Vitamin D deficiency develops secondary changes in parathyroid hormone levels. Indicate whether parathyroid hormone levels are low or high during Vitamin D deficiency; provide a brief justification for your answer. **(5 points*).***

**14.** It is not uncommon for newborn infants to develop yellow discoloration of the skin. Briefly describe the physiological reason for this skin discoloration. Your answer should include a discussion of the particular substance that causes the skin discoloration, and why this substance can be in high concentration in the blood of a newborn. ***(10 points).***

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