PBIO 376 Second Midterm **Wednesday, Feb 24th, 2021**

Correct answers are in red.

1. Which of the following best describes the M cells?
   a. secrete the hormone gastrin
   b. transfer antigens across the intestinal epithelium
   c. absorb nutrients in the small intestine
   d. secrete pepsinogen in the stomach
   e. spontaneously active pacemaker cells electrically coupled to smooth muscle

2. Which of the following is the term used to describe the folds of the apical plasma membrane of enterocytes (also called the "brush border")?
   a. plicae circulares
   b. villi
   c. crypts
   d. microvilli

3. What is the source of the slow waves in gastrointestinal smooth muscle?
   a. rhythmic activation by the vagus nerve
   b. rhythmic activation by neurons in the myenteric plexus
   c. rhythmic activation by somatic motor neurons
   d. spontaneous rhythmic activity in pacemaker cells called the interstitial cells of Cajal (ICCs)
   e. action potentials in electrically coupled smooth muscle cells

4. ALL of the following are secreted by enteroendocrine cells, EXCEPT
   a. pepsin
   b. gastrin
   c. somatostatin
   d. CCK (cholecystokinin)
   e. secretin

5. Increased H^+ ions in the lumen of the stomach directly stimulate
   a. the proton pump
   b. gastrin secretion
   c. histamine secretion
   d. somatostatin secretion
   e. pancreatic zymogens

6. Zollinger-Ellison syndrome is a disorder in which there is a tumor that secretes excessive amounts of the hormone gastrin. Based on what you know about the effects of gastrin, which of the following is most likely to happen in Zollinger-Ellison syndrome?
    a. reduced stomach motility
    b. reduced secretion of histamine by ECL cells
    c. excessive acid secretion and duodenal ulcer
    d. atrophy of gastric glands
    e. reduced secretion of acid by parietal cells

7. Which of the following can cause peptic ulcer disease?
    a. too much use of proton pump inhibitor drugs
    b. excessive mucus secretion
    c. infection with *Salmonella* bacteria
    d. too much somatostatin secretion by endocrine cells in the antrum
    e. too much use of nonsteroidal anti-inflammatory drugs such as aspirin and ibuprofen

8. Which of the following is involved in the activation of pancreatic zymogens?
    a. a brush border enzyme
    b. bicarbonate (HCO3-)
    c. secretin
    d. gastrin
    e. pepsin

9. Which of the following is most likely to cause pancreatic insufficiency (lack of digestive enzyme production and secretion)?
    a. secretory diarrhea
    b. defect in CFTR protein
    c. celiac disease
    d. atrophic gastritis
    e. non-alcoholic fatty liver disease

10. Which of the following is the signal from the liver that decreases iron absorption?
    a. ferroportin
    b. glucagon
    c. insulin
    d. glycogen
    e. hepcidin

11. Which of the following stimulates bile release during the digestive period?
    a. contraction of smooth muscle in the Sphincter of Oddi
    b. cholecystokinin
    c. relaxation of the pyloric sphincter
    d. somatostatin
    e. increased [H+] in the stomach

12. Which of the following is NOT likely to be found in a micelle?
    a. fatty acid
    b. bile salt
    c. phospholipid
    d. cholesterol
    e. lipoprotein lipase

13. ALL of the following occur during fat digestion and absorption EXCEPT
    a. absorbed fats get packaged into lipoproteins in enterocytes
    b. enterocytes secrete chylomicrons, which enter lacteals
    c. absorbed fats travel to the liver via the hepatic portal vein
    d. triglycerides associate with bile salts to form emulsion droplets
    e. triglycerides get digested by lipase into fatty acids and monoglycerides

14. Which of the following is true about the puborectalis muscle?
    a. contraction causes a more acute anorectal angle
    b. contraction occurs during defecation
    c. innervated by enteric neurons located in the myenteric plexus
    d. contraction causes a mass movement
    e. ALL of the above are true about the puborectalis muscle.

15. Which of the following is a key signaling molecule that positively stimulates food intake?
    a. leptin
    b. cholecystokinin (CCK)
    c. cocaine-and amphetamine-regulated transcript (CART)
    d. neuropeptide Y (NPY)
    e. α-melanocyte-stimulating hormone (α-MSH)

16. Direct calorimetry would measure which of the following type of metabolic energy output?
    a. oxygen
    b. mechanical work
    c. heat
    d. water
    e. carbon dioxide

17. The respiratory quotient (RQ) is NOT useful for which of the following measurements?
    a. **measuring plasma blood sugar**
    b. identifying pulmonary disease
    c. estimating the basal metabolic rate
    d. determining the extent to which you derive calories from carbohydrates
    e. determining if a patient is being underfed and preferentially burning fat

18. ALL of the following will increase plasma blood sugar EXCEPT
    a. glycogenolysis
    b. gluconeogenesis
    c. **glycogenesis**
    d. lipolysis
    e. decreased glucose uptake in adipose tissue

19. Which of the following hormones is highest in the FASTED state?
    a. insulin
    b. amylin
    c. CCK (cholecystokinin)
    d. leptin
    e. **glucagon**

20. Which of these is a primary target tissue for insulin?
    a. skeletal muscle
    b. adipose tissue
    c. liver
    d. BOTH adipose tissue and liver
    e. **skeletal muscle, adipose tissue, and liver are all primary target tissues for insulin**

21. Why does exercise assist in the reduction of plasma hyperglycemia (high blood sugar)?
    a. Exercise promotes phosphorylation of glucose to glucose-6-phosphate in the liver.
    b. **Exercise promotes the insertion of glucose transporters into the membrane of muscle fibers.**
    c. Exercise promotes the insertion of glucose transporters into the membrane of adipose cells.
    d. Exercise promotes the insertion of glucose transporters into the membrane of hepatocytes.
    e. Exercise promotes the secretion of glucagon.

22. Canaglifozin and dapagliflozin are SGLT2 inhibitors. Which of these could be a side effect of taking these drugs?
    a. **Your urine will be more likely than ever to attract ants.**
    b. You will increase the proportion of adipose tissue in your body.
    c. You will develop peripheral neuropathy due to chronic hyperglycemia.
    d. Your HbA1c (measure of glycated hemoglobin) will go up.
    e. Your volume of urine will most likely decrease.

23. Which of the following methods can be used to determine how much insulin is being secreted by a type 2 diabetic?
    a. fasting plasma glucose test
    b. determine the percent of glycated hemoglobin
    c. an MRI to look at accumulated fat in the liver
    d. oral glucose tolerance test
    e. measure the level of C-peptide in the blood

24. Which of these is generally NOT considered part of the endocrine system?
    a. testes
    b. thyroid gland
    c. pituitary gland
    d. spleen
    e. hypothalamus

25. Peptide hormones are water soluble and do not require a carrier protein to circulate in the bloodstream. What other characteristic is typical of peptide hormones?
    a. They exclusively activate gene transcription.
    b. They are synthesized on demand.
    c. They have a short half-life in plasma.
    d. They are tyrosine derivatives.
    e. They usually bind to receptors located in the cell nucleus.

26. Where are the cell bodies for the neurosecretory cells that secrete releasing hormones (RH) located?
    a. anterior pituitary
    b. hypothalamus
    c. adrenal cortex
    d. posterior pituitary
    e. pancreas

27. Which of the following hormones is secreted by the adrenal medulla?
    a. **epinephrine**
    b. androgens
    c. cortisol
    d. CRH (corticotropin releasing hormone)
    e. aldosterone

28. Which of the following is NOT a characteristic of cortisol?
    a. It is a steroid hormone.
    b. It is a biomarker for stress.
    c. It counteracts insulin.
    d. It can access cytoplasmic or nuclear receptors.
    e. **It positively stimulates the secretion of corticotropin releasing hormone (CRH).**

29. A patient with a pituitary tumor that causes excessive adrenocorticotropic hormone (ACTH) secretion would be expected to develop which of the following conditions?
    a. Addison's disease
    b. adrenal atrophy
    c. **Cushing's syndrome**
    d. weight loss

30. Epinephrine secretion gets activated when the sympathetic nervous system is activated. Thus, all of the following would be likely actions of epinephrine actions EXCEPT
    a. **increased glycogenesis in muscle tissue**
    b. inhibition of insulin secretion
    c. increased heart rate
    d. increased lipolysis
    e. increased blood pressure