

Friday, February 16th, 2024

Following directions on the mark-sense form, write your **name, and student number** in the blanks and fill in the bubbles. In addition, write your **name** on this exam.

When finished with the test, turn in both the mark-sense form and the exam at the front of the room.

PLACE ALL ANSWERS ON THE MARK-SENSE FORM

MULTIPLE CHOICE: Always choose the BEST, most complete answer. (2 points each)

1. ALL the following increase the surface area of the small intestine EXCEPT
 - a. plicae circulares
 - b. microvilli
 - c. villi
 - d. crypts
 - e. **muscularis externa**

2. Which of the following is an *exocrine secretion* of the *pancreas*?
 - a. pepsinogen
 - b. glucagon
 - c. insulin
 - d. **bicarbonate (HCO_3^-)**
 - e. H^+

3. Which of the following is most important in determining the rate of segmentation contractions in the duodenum during the digestive phase (when processing a meal)?
 - a. migrating motor complex
 - b. enteric neurons in the myenteric plexus
 - c. parasympathetic preganglionic neurons with axons in the vagus nerve
 - d. **ICC cells (interstitial cells of Cajal) that generate slow waves**
 - e. cholecystokinin

4. Fill in the blank. An example of _____ is when increased H^+ ions stimulate secretion of the hormone secretin.
 - a. cephalic phase regulation
 - b. gastric phase regulation
 - c. **intestinal phase regulation**
 - d. feedforward regulation

5. Which of the following is a key protein that enables acid secretion in the stomach?
- intrinsic factor
 - endopeptidase
 - ferroportin
 - secretin
 - H⁺/K⁺-ATPase**
6. Pepsinogen is
- secreted by parietal cells.
 - inactivated at low pH.
 - activated by enteropeptidase.
 - secreted by acinar cells.
 - activated by H⁺ ions.**
7. Which of the following typically occurs as a consequence of *H. pylori* infection that causes gastritis in the antrum of the stomach?
- increased gastrin secretion leading to acid hypersecretion**
 - atrophy of gastric glands
 - decreased acid secretion
 - intestinal metaplasia
 - ALL of the above occur
8. What activates pancreatic zymogens?
- enteropeptidase**
 - cholecystokinin (CCK)
 - HCO₃⁻
 - pepsin
 - bile salts
9. Where would you find a cell that releases the hormone secretin?
- epithelium of a pancreatic duct
 - duodenal epithelium**
 - GALT (gut-associated lymphoid tissue) in the lamina propria
 - islet of Langerhans in the pancreas
 - myenteric plexus
10. Which of the following is stimulated by cholecystokinin (CCK)?
- contraction of smooth muscle in the sphincter of Oddi
 - release of zymogens into the small intestine from the pancreatic duct**
 - secretion of bicarbonate from pancreatic duct cells
 - peristalsis in the stomach
 - acid secretion by parietal cells

11. Why might RYGB gastric bypass surgery cause iron-deficiency anemia?
- After RYGB, food bypasses the duodenum which is the primary location for iron absorption.**
 - Gastric bypass increases hepcidin secretion.
 - Gastric bypass increases GLP-1 secretion, which has a negative effect on iron absorption.
 - Gastric bypass surgery increases acid secretion, which reduces iron absorption.
 - Weight loss reduces iron storage in adipocytes.
12. Which of the following is an amphipathic molecule that is secreted by hepatocytes into bile?
- bile pigment
 - surfactant
 - apolipoprotein
 - phospholipid**
 - triacylglycerol
13. Which of the following is NOT found in a chylomicron?
- cholesterol
 - triacylglycerol (TAG)
 - bile salt**
 - apolipoprotein
 - phospholipid
14. How do chylomicrons enter the circulation?
- via intestinal capillaries
 - via lymphatic vessels**
 - receptor-mediated endocytosis
 - coupled transport linked to Na⁺
 - gap junctions
15. Which of the following is a skeletal muscle that **contracts** during defecation?
- puborectalis muscle
 - external anal sphincter
 - internal anal sphincter
 - rectus abdominis (an abdominal muscle)**
 - pyloric sphincter
16. What is measured in direct calorimetry when it is used to determine resting metabolic rate?
- CO₂ production
 - O₂ consumption
 - both O₂ consumption and CO₂ production
 - energy expenditure due to muscle contraction
 - heat given off by the body**

17. Which of the following is true about the hormone leptin?
- a. Leptin injections are an effective weight loss treatment.
 - b. Common obesity is caused by leptin deficiency.
 - c. Weight loss decreases leptin secretion by decreasing adiposity.**
 - d. Increased leptin signaling in the hypothalamus stimulates decreased metabolic rate to promote weight gain.
 - e. Decreased leptin signaling in the hypothalamus stimulates decreased feeding to promote weight loss.
18. Which of the following is an anabolic reaction that occurs during the fed state?
- a. glycogenolysis
 - b. ketogenesis
 - c. lipogenesis**
 - d. gluconeogenesis
 - e. lipolysis
19. Which of the following is a hormone that is secreted by adipocytes?
- a. GLP-1
 - b. amylin
 - c. epinephrine
 - d. leptin**
 - e. cortisol
20. Which type of cell requires a minimum level of glucose in the circulation to function normally?
- a. neuron**
 - b. adipocyte
 - c. skeletal muscle cell
 - d. hepatocyte
 - e. pancreatic beta cell
21. What is a possible metabolic fate for glucose found in fat-free cookies?
- a. converted to triacylglycerol by adipocytes
 - b. converted to triacylglycerol by hepatocytes
 - c. converted to glycogen in skeletal muscle
 - d. metabolized by oxidative phosphorylation to generate ATP
 - e. ALL of the above are possible metabolic fates for glucose**

22. Which of the following is NOT an effect of insulin on hepatocytes during the fed state?
- a. **increases the number of glucose transporters on the cell membrane**
 - b. inhibits gluconeogenesis
 - c. stimulates glycogenesis
 - d. promotes glucose uptake
 - e. stimulates hexokinase activity
23. Which of the following is involved in glucose sensing by pancreatic beta cells?
- a. GPCR that binds to glucose
 - b. innervation by glucose-sensitive neurons
 - c. **potassium channel that is closed by ATP**
 - d. ligand-gated ion channel that binds glucose
 - e. Na⁺/glucose-cotransporter
24. Which of these hormones has increased secretion right after you consume a meal?
- a. **amylin**
 - b. cortisol
 - c. epinephrine
 - d. glucagon
 - e. growth hormone
25. Which of the following is an enzyme that is *inhibited by insulin*?
- a. lipoprotein lipase
 - b. **hormone-sensitive lipase**
 - c. hexokinase in hepatocytes (hexokinase converts glucose to glucose-6-phosphate)
 - d. pepsin
 - e. pancreatic lipase
26. Glucose-sensitive neurons in the central nervous system are most directly involved in stimulating
- a. lipogenesis during the fed state.
 - b. **secretion of epinephrine during the fasted state.**
 - c. secretion of insulin during the fed state.
 - d. glucose uptake by hepatocytes.
 - e. ketogenesis in the liver.

27. Why does polyuria occur in diabetes mellitus?
- a. Insulin is required to stimulate glucose reabsorption in the kidney.
 - b. Hyperglycemia damages the filtration membrane and makes it leaky to glucose.
 - c. Hyperglycemia causes a high filtered load of glucose that exceeds the capacity for glucose reabsorption in the kidney.**
 - d. Insulin is required to inhibit glucose filtration.
 - e. Hyperglycemia stimulates glucose secretion in the renal tubule.
28. All the following occur in acute, untreated type 1 diabetes mellitus EXCEPT
- a. high circulating fatty acids
 - b. increased osmolarity
 - c. metabolic acidosis
 - d. increased ketone production
 - e. hypoglycemia**
29. Which of the following is characteristic for BOTH excess adiposity and lipodystrophy?
- a. increased number of adipocytes
 - b. can be treated effectively with leptin injections
 - c. ectopic lipid deposits and insulin resistance**
 - d. increased glycogenesis in hepatocytes during the fed state
 - e. higher than normal body weight
30. Which effect of exercise **reduces** hyperglycemia in a type 2 diabetic?
- a. Exercise stimulates lipolysis in adipocytes.
 - b. Exercise stimulates secretion of epinephrine.
 - c. Exercise stimulates secretion of glucagon.
 - d. Exercise stimulates insertion of GLUT4 glucose transporters into the membrane of skeletal muscle cells.**
 - e. Exercise stimulates glycogenolysis in skeletal muscle cells.

END OF TEST

Please turn in your mark-sense form and your question sheets at the front of the room.