

Chapter 2 – The Digestive System: Mechanism for Nourishing the Body

Multiple-Choice

<u>Key</u>	<u>Page(s)</u>	
b	34	1. Within the lamina propria, lying just below the epithelium, is the mucosa-associated lymphoid tissue which a. controls secretions from the mucosal glands. b. contains white blood cells and protects against ingested microorganisms. c. initiates peristalsis. d. secretes mucus, hormones and digestive juices into the lumen.
d	37-38	2. The volume of a normal stomach ranges from 50 mL (~2 oz) when empty to _____ when full. a. 100 mL (~4 oz) b. 250 mL (~1 cup) c. 750 mL (~3 cups) d. 1.5 L (~ 6 cups)
c	47	3. The pancreas is a digestive system accessory organ with two types of active tissue, the ductless endocrine tissue that secretes insulin and glucagon and the a. liver-like tissue that produces bile. b. ductless absorptive tissue that controls bicarbonate. c. ducted exocrine tissue that produces digestive enzymes. d. ducted erythropoietic tissue that produces red blood cells.
b	47	4. Pancreatic juice that enters the duodenum through the sphincter of Oddi contains all of the following EXCEPT _____. a. digestive enzymes b. intrinsic factor c. anions such as bicarbonate and chloride d. cations such as sodium, potassium and calcium
c	45	5. Most of the digestive enzymes produced by the intestinal mucosal cells function a. in the stomach. b. in the intestinal lumen. c. at the brush border. d. within the cytoplasm of the enterocytes.

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| a | 56 | 6. Among the regulatory peptide molecules, some are recognized as true hormones. Which of the following is a paracrine rather than a hormone? |
| | | <ul style="list-style-type: none"> a. somatostatin b. secretin c. cholecystokinin d. gastrin |
| b | 57 | 7. The major role of gastrin in the GI tract is that of ____. |
| | | <ul style="list-style-type: none"> a. inhibition b. stimulation c. transport d. no effect |
| d | 57 | 8. Which regulatory peptide synthesized in the pancreatic and intestinal cells appears to inhibit release of gastrin, secretin, and motilin? |
| | | <ul style="list-style-type: none"> a. neurotensin b. GRP c. insulin d. somatostatin |
| c | 34, 56 | 9. Which structural component of the gastrointestinal tract is within the muscularis externa and controls the contractions that cause motility? |
| | | <ul style="list-style-type: none"> a. muscularis mucosae b. submucosal plexus c. myenteric plexus d. lumen |
| c | 35-36 | 10. What is the name of the digestive enzyme in saliva that digests starch? |
| | | <ul style="list-style-type: none"> a. lipase b. synthetase c. amylase d. lactase |
| d | 38 | 11. What product produced by neck cells in the oxyntic gland of the stomach protects the epithelium from mechanical and chemical damage? |
| | | <ul style="list-style-type: none"> a. amylase b. pepsin c. gastrin d. mucus |
| b | 38 | 12. What cells, found both in oxyntic glands and pyloric glands of the stomach, secrete hydrochloric acid and intrinsic factor? |
| | | <ul style="list-style-type: none"> a. neck cells b. parietal cells c. chief cells d. enteroendocrine cells |

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| c | 38 | 13. What cells, found in oxyntic glands in the body of the stomach secrete pepsinogens?
a. neck cells
b. parietal cells
c. chief cells
d. enteroendocrine cells |
| d | 40 | 14. A function of hydrochloric acid in the gastric juice is to
a. digest protein, functioning as an endopeptidase.
b. protect the stomach lining from damage.
c. inhibit secretion of gastrin and CCK.
d. act as a bactericide agent. |
| a | 41, 49 | 15. Which of the following digestive fluids is the most alkaline?
a. bile
b. pancreatic juice
c. saliva
d. gastric juice |
| b | 43 | 16. Approximately how much chyme per minute is allowed to enter the duodenum from the stomach?
a. 1 - 5 mL
b. 6 - 10 mL
c. 11 - 15 mL
d. 16 - 20 mL |
| d | 34, 47 | 17. Which of the following is NOT considered an accessory organ?
a. pancreas
b. liver
c. gallbladder
d. spleen |
| c | 47 | 18. In what organ are enzymes produced which are responsible for digestion of 50% of carbohydrate and protein and 90% of fat?
a. liver
b. esophagus
c. pancreas
d. gallbladder |
| b | 47, 57 | 19. The hormone whose major action is to alkalize intestinal contents by stimulating secretion of bicarbonate from the pancreas and by inhibiting gastric acid secretion and gastric emptying is _____.
a. gastrin
b. secretin
c. cholecystokinin
d. GRP |

- c 50, 57 20. The hormone primarily responsible for contraction of the gallbladder and release of bile into the duodenum is _____.
a. gastrin
b. secretin
c. cholecystokinin
d. GRP
- c 49 21. Bile salts are synthesized from cholesterol in the _____.
a. canaliculi
b. common bile duct
c. hepatocytes
d. gallbladder
- a 49 22. Conjugation of bile acids with glycine and taurine improves their ability to
a. ionize and form micelles.
b. undergo enterohepatic recirculation.
c. be excreted in the feces, thus keeping serum cholesterol normal.
d. promote the formation of bile salts.
- d 50 23. The total bile acid pool in the human body is 2.5 to 5 g. What percent of bile is reabsorbed in the ileum?
a. 10%
b. 30%
c. 65%
d. 90%
- c 50 24. Bile is most important for the digestion and absorption of _____.
a. carbohydrates
b. proteins
c. fats
d. vitamins
- d 50 25. What percentage of cholesterol in bile is used to form chylomicrons?
a. none of it
b. 10%
c. 25%
d. 50%
- c 51 26. In general, in which portion of the gastrointestinal tract does most absorption occur?
a. esophagus
b. stomach
c. small intestine
d. colon

- b 51 27. How long does it take for most of the carbohydrate, protein and fat to be absorbed from chyme after it enters the small intestine?
- a. 10 minutes
 - b. 30 minutes
 - c. 1 hour
 - d. 2 hours
- c 53 28. Which of the mechanisms responsible for absorption of nutrients into the epithelial cell of the villus requires energy?
- a. diffusion
 - b. facilitated diffusion
 - c. active transport
 - d. pinocytosis
- c 54 29. Which hormone is responsible for decreasing sodium absorption in the colon?
- a. glucocorticoids
 - b. mineralcorticoids
 - c. antidiuretic
 - d. glucagon
- a 54 30. Of the 3 short-chain fatty acids created by gut bacteria, which one is the preferred source for colonic epithelial cells?
- a. butyrate
 - b. acetate
 - c. propionate
 - d. oleate
- b 55 31. What % urea produced in the body is converted to ammonia and reabsorbed by bacteria in the colon?
- a. 10%
 - b. 25%
 - c. 50%
 - d. 100%
- d 54 32. One of the major molecules absorbed from the colon is water and one liter of chyme entering the large intestine is normally reduced to ____.
- a. 500 g
 - b. 400 g
 - c. 300 g
 - d. 200 g

- c 54 33. Anaerobic bacteria populate the gut in ____ greater quantities than aerobic bacteria.
a. 2 fold
b. 5 fold
c. 10 fold
d. 100 fold
- b 55 34. When diagnosing lactose intolerance, ____ is measured in the breath following oral consumption of 50 g lactose.
a. methane
b. hydrogen
c. carbon dioxide
d. sulfur
- a 55 35. Lactose intolerance is common in all of the following EXCEPT ____.
a. European Americans
b. African Americans
c. American Indians
d. Asian Americans
- c 55 36. Prebiotics act as substrates for the growth of beneficial bacteria in the colon and are ____.
a. certain types of bifidobacteria
b. live cultures of mixed lactobacilli
c. selected fibers
d. antibiotics
- a 37, 41, 56 37. Acetylcholine affects gastrointestinal motility by
a. stimulating peristalsis.
b. constricting sphincters.
c. decreasing muscle contractions.
d. inhibiting peptide production.
- d 56 38. The neuronal network system located in the submucosa (plexus of Meissner) controls:
a. peristalsis and local blood flow.
b. ileal secretions and gastric motility.
c. frequency and strength of gastric muscle contractions.
d. gastrointestinal secretions and local blood flow.
- b 58 39. Which of the following peptides stimulates appetite?
a. bombesin
b. ghrelin
c. leptin
d. cholecystokinin

- c 57-58 40. All of the following are involved in satiety and suppression of food intake EXCEPT ____.
- bombesin
 - corticotropin-releasing factor
 - neuropeptide Y
 - leptin

Matching

Digestive Substances: Match the substance important for digestion with its site of production.

<u>Key</u>	<u>Page(s)</u>	<u>Molecule</u>	<u>Site of production</u>
b	38, 40	1. pepsin	a. hepatocytes
c	47	2. trypsinogen	b. gastric chief cells
d	35-36	3. ptyalin	c. pancreatic exocrine tissue
e	45	4. digestive glycoproteins	d. salivary glands
a	49	5. cholate	e. small intestine

Digestion: From the following list shown in the box, you need to pick the best answer and place the corresponding letter on the blank for each statement. You can only use a letter once – some letters you won't use at all.

a. amylose	g. bile	m. liver
b. saliva	h. amylase	n. gastrin
c. HCl	i. pancreas	o. stomach
d. α -1,4-bonds	j. lipase	p. amylopectin
e. cholecystokinin	k. trypsin	q. secretin
f. α -1,6-bonds	l. zymogen	r. pepsinogen

1. ____ is the regulatory peptide that is responsible for acid release from the 2. ____, whereas 3. ____ stimulates the gallbladder to release 4. ____.

A protease secreted in the stomach is 5. ____, which is in its 6. ____ form that must be activated by the action of 7. ____ and gastrin.

The enzyme 8. ____ can be found in both 9. ____ (a little) and the 10. ____ (the majority), and is responsible for the digestion of triglycerides.

The enzyme 11. ____ is responsible for the digestion of polysaccharides, specifically the 12. ____ bonds of 13. ____ or 14. ____.

Key: 1. n (pp. 41, 56), 2. o (p. 41, 56), 3. e (p. 49), 4. g (p. 49), 5. r (p. 38, 40), 6. l (p. 38, 40), 7. c (p. 40), 8. j (p. 36, 48), 9. b (p. 36), 10. i (p. 48), 11. h (p. 36), 12. d (p. 36), 13. a (p. 36), 14. p (p. 36)

Enrichment¹—Absorption and Transport of Nutrients: You’ve just read an article about a newly discovered nutrient that is water soluble – what can you predict about how it is absorbed and transported in the body? If instead this new nutrient were lipid soluble, how would these processes be different? To answer this, match three terms with each type of nutrient solubility.

<u>Key</u>	<u>Page(s)</u>	<u>Term</u>	<u>Type of solubility</u>
b	52-53	1. passive diffusion	a. water-soluble
b	44	2. lymphatic system	b. lipid-soluble
a	48	3. portal vein	
b	50	4. chylomicron	
a	52-53	5. active/facilitated transport	
a	52-53	6. membrane transporter	

Fill-in-the-Blank

Page(s)

- 49 1. In the hepatocyte, cholesterol is _____ into the two primary bile acids, _____ and _____.
Key: oxidized, cholic, chenodeoxycholic
- 49 2. Bile acids are conjugated with amino acids, _____ and _____, to make them more useful in forming micelles.
Key: glycine, taurine
- 49 3. Owing to the alkaline pH of bile, the conjugated bile acids combine with _____, _____, or _____ to form bile salts.
Key: sodium, potassium, calcium
- 54 4. The proximal colonic epithelial cells absorb water and the major cation _____. In contrast, potassium and the anion _____ are secreted into the lumen of the colon.
Key: sodium, bicarbonate

Provide the appropriate information for four regulatory peptides in the following table. Information in each row must match.

Name of the peptide	Production site(s)	Major action(s)
5. somatostatin		
6. cholecystokinin		
7. secretin		
8. gastrin		

Key: See Table 2.2 (p. 57)

5. *Production site(s): Pancreas and small intestine. Major action(s): inhibits gastric motility and secretions of stomach, pancreas and gall bladder.*

¹ These matching items are related but go beyond the text chapter.

6. *Production site(s): small intestine. Major action(s): stimulates gall bladder contraction.*
7. *Production site(s): small intestine. Major action(s): stimulates pancreatic juice and enzyme secretion.*
8. *Production site(s): stomach and small intestine. Major action(s): stimulates motility and gastric acid secretion.*

Essay

Page(s)

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|-----------|---|
| 41-42 | 1. Discuss the role of drug therapies such as Tagamet, Zantac, and Pepcid in treatment of peptic ulcers. |
| 46-47 | 2. Describe the effect of starvation on immunological defense/barriers in the gastrointestinal tract and the possible consequences. |
| 50 | 3. What happens to reabsorbed bile acids after transport back to the liver? |
| 51 | 4. Describe the mechanisms by which resin-type drugs and functional foods containing phytosterols lower high blood cholesterol levels. |
| 54-55 | 5. Develop a hypothesis regarding the effects of a wide-spectrum antibiotic on the beneficial effects of gut flora. |
| 55 | 6. What are probiotics and prebiotics? Give examples of each. |
| 55 | 7. Discuss three of the five mechanisms by which probiotics may be helpful in diarrheal illnesses. |
| 56 | 8. If psychological stress increases the output of norepinephrine from the sympathetic nervous system and epinephrine from the adrenal gland, predict the ways in which digestion may be affected. |
| 58 | 9. Bariatric surgery involves removal or bypass of a large portion of the stomach. Speculate on how the production of ghrelin following bariatric surgery might affect appetite and explain your reasoning. |
| 44-45, 58 | 10. Discuss the functions and significance of the folds of Kerckring, the villi and the microvilli. |

Perspective – An Overview of Selected Digestive System Disorders with Implications for Nourishing the Body

Essay

Page(s)

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| 59-60 | 1. Discuss the role of high-fat foods, chocolates, peppermint, and smoking in gastroesophageal reflux disease. |
| 60 | 2. Why are water-miscible fat-soluble vitamins recommended for individuals with Crohn's disease? |
| 60 | 3. Name 4 grains that can cause severe discomfort in people with celiac disease. What are the proteins that are problematic in each grain? |
| 61 | 4. What causes the diarrhea associated with pancreatitis? |