

## CHAPTER TWENTY-SIX

### Answers to WHAT DID YOU LEARN?

1. The GI tract includes the oral cavity, pharynx, esophagus, stomach, small intestine, and large intestine.
2. Mechanical digestion breaks down ingested materials into physically smaller pieces through chewing in the oral cavity, muscular churning and mixing in the stomach, and further mixing within the small intestine.
3. Segmentation churns and mixes the material being digested, breaking it down into smaller pieces and blending it with intestinal secretions.
4. Secretion is the process of producing and releasing fluid products, such as acid, bile, digestive enzymes, and mucus, in order to facilitate chemical digestion or the passage of material through the GI tract. Absorption involves either the passive or active transport of electrolytes, products of digestion, vitamins, and water, through the GI tract epithelium and into the lymph vessels and blood vessels.
5. The components of saliva are water, electrolytes (excess salts such as sodium, potassium, chloride, and bicarbonate), immunoglobulin A (a class of secreted antibodies that inhibit bacterial growth), lingual lipase (a fat-digesting enzyme), lysozyme (an antibacterial enzyme), mucus, and salivary amylase (initiates chemical digestion of carbohydrates in the mouth).
6. Permanent teeth include the incisors, canines, premolars, and molars. The incisors are designed for slicing or cutting into food. Canines have pointed tips for puncturing and tearing food. Premolars have flat crowns with cusps that can crush and grind ingested materials. Molars have large, broad, flat crowns with distinctive cusps, and are also used for grinding and crushing.
7. Sequential contraction of the pharyngeal constrictors functions to decrease the diameter of the pharynx beginning at its superior end and moving toward its inferior end, thus forcing swallowed material toward the esophagus.
8. Intraperitoneal organs are completely surrounded by visceral peritoneum. They include the stomach, part of the duodenum of the small intestine, the jejunum and the ileum of the small intestine, the cecum, the appendix, and the transverse and sigmoid colon of the large intestine. Retroperitoneal organs typically lie directly against the posterior abdominal wall, so only their anterolateral portions are covered with peritoneum. Retroperitoneal organs include most of the duodenum, the pancreas, and the ascending and descending colon of the large intestine.
9. The four main tunics and their default patterns are mucosa (typically lined with simple columnar epithelium), submucosa, muscularis (typically formed from two layers of smooth muscle), and an adventitia or serosa.
10. The esophageal tunics differ from the default tunic pattern in that the mucosa has a stratified squamous epithelium and the muscularis is composed of a mixture of skeletal and smooth muscle.

11. The three phases of swallowing are the voluntary phase, the pharyngeal phase, and the esophageal phase. The voluntary phase occurs after the ingestion of food. Food mixed with saliva forms a bolus that is pushed into the archway leading into the oropharynx. The appearance of the food bolus at the oropharynx initiates the pharyngeal phase. The bolus passes quickly and involuntarily through the pharynx to the esophagus. The esophageal phase (involuntary stage) moves the bolus through the esophagus and into the stomach.
12. The four regions of the stomach are the cardia, fundus, body, and pylorus. The cardia is a small, narrow, superior entryway into the stomach lumen from the esophagus. The fundus is the dome-shaped region lateral and superior to the esophageal connection with the stomach. The body is the largest region of the stomach; it is inferior to the cardiac orifice and the fundus. The pylorus is a narrower, medially directed, funnel-shaped pouch that forms the terminal region of the stomach.
13. The third layer of smooth muscle in the stomach wall assists in the mechanical digestion of the swallowed bolus.
14. The five types of epithelial cells in the stomach are surface mucous cells, mucous neck cells, parietal cells, chief cells, and enteroendocrine cells.
15. The duodenum forms the first region of the small intestine. It is mostly retroperitoneal and is approximately 10 inches long. It is arched into a C-shape around the head of the pancreas. The duodenum begins at the pyloric sphincter and ends at the duodenojejunal flexure. The proximal duodenum is characterized by submucosal (Brunner) glands. The jejunum is the middle region of the small intestine and forms approximately two-fifths of the length of the small intestine. It extends approximately 7.5 feet (2.5 meters) and is intraperitoneal. The jejunum has a thicker, redder wall than the ileum. Circular folds (plicae circulares) are mucosal and submucosal folds in all three regions of the small intestine, but are best-developed in the duodenum and jejunum. Additionally, villi are larger and more numerous in the jejunum. The ileum is the last region of the small intestine and forms approximately three-fifths of the length of the small intestine. It extends about 10.8 feet (3.6 meters) from its origin at the end of the jejunum, and its distal end terminates at the ileocecal valve. It is intraperitoneal and suspended in the abdomen by a mesentery. Peyer patches are much more numerous in the ileum than in the jejunum. The number of goblet cells in the mucosa of the small intestine increases from the duodenum to the ileum.
16. The ascending colon, descending colon, rectum, and anal canal are retroperitoneal. The cecum, vermiform appendix, transverse colon, and sigmoid colon are intraperitoneal.
17. The movements and reflexes that propel material through the large intestine are peristaltic movements, haustral churning, and mass movement.
18. Portal triads are composed of branches of the hepatic portal vein, the hepatic artery, and the hepatic duct.

19. The gallbladder stores and concentrates the bile produced by the liver.
20. Pancreatic acini are organized into large clusters termed lobules. They secrete digestive enzymes, collectively called pancreatic juice. Endocrine functions are performed by the pancreatic islets.
21. The simple cuboidal epithelial cells lining the pancreatic ducts secrete an alkaline fluid (pancreatic juice) to help neutralize the acidic chyme arriving in the duodenum from the stomach.
22. A decrease in mucin secretion results in a decrease in the thickness and volume of the mucus that coats and protects the luminal lining of GI tract organs. Without this protection, the organ lining is subject to abrasion by a moving bolus or chyme and to damage by acid or enzymes.
23. The liver parenchyma, gallbladder, pancreas, and biliary apparatus develop from buds or outgrowths from the endoderm of the duodenum.