

## Chapter 03: Digestion, Absorption, and Metabolism

### Grodner and Escott-Stump: Nutritional Foundations and Clinical Application: A Nursing Approach, 6th Edition

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#### MULTIPLE CHOICE

1. Peristalsis is necessary to make it possible for people to \_\_\_\_\_ food.
  - a. chew
  - b. digest
  - c. swallow
  - d. smell and taste

ANS: C

Peristalsis makes swallowing possible as involuntary movements of circular and longitudinal muscles move food along the esophagus from the mouth to the stomach. Chewing is accomplished by jaw muscles and is not related to peristalsis. Peristalsis helps move food along the gastrointestinal tract to the places where digestion of each nutrient takes place, but it does not make digestion itself possible. Smell and taste are not related to peristalsis.

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MSC: Client Needs: Physiological integrity

2. Examples of mechanical digestion include
  - a. activity of salivary amylase in the mouth.
  - b. churning and mixing of food in the stomach.
  - c. action of bile breaking fats into smaller droplets.
  - d. effects of secretin in stimulating the pancreas to release bicarbonate.

ANS: B

Churning and mixing of food in the stomach is an example of mechanical digestion because it causes physical breakdown of the food. Salivary amylase is an enzyme that causes chemical breakdown of food; bile causes emulsification of fats. Secretin is a hormone that stimulates release of bicarbonate from the pancreas; this buffers stomach acid so that intestinal enzymes can work.

DIF: Cognitive Level: Understanding

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MSC: Client Needs: Physiological integrity

3. An example of a problem caused by a sphincter muscle not operating properly is
  - a. constipation.
  - b. gallbladder disease.
  - c. heartburn.
  - d. peptic ulcer.

ANS: C

Heartburn is caused by reflux of acidic stomach contents into the esophagus when the sphincter muscle between these two parts of the digestive tract does not operate properly. Constipation is usually caused by slow peristalsis, often in relation to inadequate intake of dietary fiber and fluid. Gallbladder disease is unrelated to gastrointestinal sphincters. Peptic ulcer is usually caused by *Helicobacter pylori* infection.

DIF: Cognitive Level: Applying  
TOP: Nursing Process: Assessment

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4. The best description of an enzyme is a(n)
- chemical messenger.
  - acid and alkali buffer.
  - emulsifier.
  - organic catalyst.

ANS: D

Enzymes are organic catalysts that work on specific classes of nutrients to change them from one form to a simpler form. The description “chemical messenger” applies to hormones. The emulsifier in the intestines is bile. The pancreas secretes alkaline bicarbonate to buffer stomach acid so that intestinal enzymes can work properly.

DIF: Cognitive Level: Remembering  
TOP: Nursing Process: Assessment

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5. Chemicals that act as messengers are called
- proteins.
  - hormones.
  - enzymes.
  - nerve impulses.

ANS: B

Hormones act as messengers between organs to cause release of needed secretions. Some, but not all, hormones are proteins. Enzymes work locally on specific classes of nutrients to change them from one form to a simpler form. Nerve impulses send messages in the body but via electrical impulses rather than via chemicals.

DIF: Cognitive Level: Remembering  
TOP: Nursing Process: Assessment

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6. The action of salivary amylase in the mouth is an example of
- chemical digestion.
  - chewing.
  - mechanical digestion.
  - peristalsis and segmentation.

ANS: A

Salivary amylase is an enzyme that chemically digests starch in the mouth. It does not contribute to mechanical digestion. Chewing is an example of mechanical digestion. Peristalsis and segmentation help propel food along the gastrointestinal tract and mix food with intestinal secretions.

DIF: Cognitive Level: Understanding  
TOP: Nursing Process: Assessment

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7. Most mechanical breakdown of food occurs in the
- large intestine.
  - liver and pancreas.

- c. mouth and stomach.
- d. esophagus and mouth.

ANS: C

Mechanical breakdown of food occurs in the mouth during chewing and in the stomach as the food is mixed by muscular action. By the time food reaches the large intestine, it is already broken down, and most of the nutrients have been absorbed. The liver and pancreas produce secretions that help with chemical but not mechanical breakdown of food. Food passes through the esophagus largely unchanged, and so the esophagus is not involved in breakdown.

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TOP: Nursing Process: Assessment      MSC: Client Needs: Physiological integrity

8. The body process over which people have most conscious control is
- a. ingestion.
  - b. digestion.
  - c. metabolism.
  - d. excretion.

ANS: A

People can choose the foods and fluids they ingest. Digestion, metabolism, and excretion are largely automatic processes. A person's actions may affect those processes indirectly (e.g., exercise affects metabolism, stress may affect digestion), but people have less control over them than over ingestion.

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9. When someone walks by a bakery and smells the fresh bread, his or her mouth starts to water. As the person thinks about eating the fresh bread, another digestive function that starts to occur is
- a. peristalsis in the small intestine.
  - b. stimulation of pancreatic secretions.
  - c. increased blood flow to the gut and liver.
  - d. release of the hormone gastrin in the stomach.

ANS: D

Release of the hormone gastrin from the stomach may be caused by the cephalic phase of gastric secretions when someone thinks about eating food. Thinking about food does not stimulate peristalsis, pancreatic secretions, or blood flow to the gut and liver.

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TOP: Nursing Process: Assessment      MSC: Client Needs: Physiological integrity

10. The most important functions of the small intestine are
- a. digestion and denaturation.
  - b. segmentation and excretion.
  - c. digestion and absorption.
  - d. peristalsis and mechanical digestion.

ANS: C

Most digestion and absorption occurs in the small intestine. Denaturation is not part of the digestive process. Segmentation occurs in the small intestine, but excretion does not. Peristalsis occurs throughout the digestive tract, and mechanical digestion occurs in the mouth and stomach.

DIF: Cognitive Level: Applying  
TOP: Nursing Process: Assessment

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11. The most important function of the villi of the small intestine is to
- increase the secretion of enzymes for digestion.
  - increase the surface area for absorption of nutrients.
  - excrete waste into the intestines.
  - secrete hormones in response to nutrients in the gut.

ANS: B

Villi increase the surface area of the small intestine, which makes it possible for it to absorb more nutrients. Digestion occurs in the small intestine but is not a function of the villi. Excretion does not occur in the small intestine. The villi do not secrete hormones.

DIF: Cognitive Level: Remembering  
TOP: Nursing Process: Assessment

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12. The layer of the gastrointestinal tract that contributes most to mechanical digestion of food is the
- mucosa.
  - submucosa.
  - muscularis.
  - serosa.

ANS: C

The muscularis is a layer of muscle tissue that causes churning, peristalsis, and segmentation of food, which contribute to mechanical digestion. The mucosa is the inside layer that releases enzymes and digestive juices. The submucosa is a layer of connective tissue that contains blood vessels and nerves that regulate digestion. The serosa is the outermost layer of the gastrointestinal wall and connects to the peritoneum lining.

DIF: Cognitive Level: Understanding  
TOP: Nursing Process: Assessment

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13. If pancreatic secretions were absent,
- there would be no bicarbonate to buffer the acid in chyme entering the duodenum.
  - mechanical digestion in the stomach would be inhibited.
  - the hormone secretin would not be secreted by the small intestine.
  - the gallbladder would not contract to release bile into the small intestine.

ANS: A

Pancreatic secretions contain bicarbonate, which is important in buffering the acidity of chyme from the stomach. Pancreatic secretions enter the small intestine, below the stomach, and so have no effect on the stomach's mechanical digestion. The hormone secretin causes release of pancreatic secretions; pancreatic secretions do not affect its release. Bile release is initiated by the hormone cholecystikinin (CCK), not by pancreatic secretions.

DIF: Cognitive Level: Applying  
TOP: Nursing Process: Assessment

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MSC: Client Needs: Physiological integrity

14. Release of digestive secretions into the small intestine is caused by \_\_\_\_\_ that are released when \_\_\_\_\_.
- enzymes; food enters the stomach
  - enzymes; food enters the small intestine
  - hormones; food enters the stomach
  - hormones; enters the small intestine

ANS: D

Hormones that are released when chyme enters the small intestine cause the release of digestive secretions into the small intestine. The causative agents are hormones, not enzymes. The digestive secretions contain enzymes; enzymes do not trigger their release. If hormones were released when food entered the stomach, digestive secretions would be released into the small intestine too early and could cause damage.

DIF: Cognitive Level: Understanding  
TOP: Nursing Process: Assessment

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MSC: Client Needs: Physiological integrity

15. If the large intestine did not carry out its main function, feces would be
- alkaline.
  - acidic.
  - liquid.
  - very dry.

ANS: C

A major function of the large intestine is absorption of water, and so if the large intestine were dysfunctional, feces would be liquid. Feces would not be dry if the large intestine did not remove water. The large intestine does not have a significant effect on the acidity or alkalinity of feces.

DIF: Cognitive Level: Applying  
TOP: Nursing Process: Assessment

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16. If the speed of peristalsis were to increase, the result would be
- heartburn.
  - vomiting.
  - diarrhea.
  - constipation.

ANS: C

If peristalsis were to speed up, food would move quickly through the gastrointestinal tract, and time for absorption of nutrients and water would be insufficient, which would result in diarrhea. Constipation can be related to decreased peristalsis. Heartburn is caused by reflux of stomach contents in the esophagus and is not related to peristalsis. Vomiting is caused by a reverse in the direction of peristalsis.

DIF: Cognitive Level: Applying  
TOP: Nursing Process: Assessment

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17. The part of the digestive system that is easiest to live without is the
- taste buds.
  - gallbladder.
  - large intestine.
  - appendix.

ANS: D

The least vital part of the intestine is the appendix; it does not have any known function in humans. The taste buds are important for the enjoyment of food and to stimulate food intake. The gall bladder is not essential, but it allows for storage of bile to be released as needed for optimal digestion. The large intestine is important for absorption of water and a few other nutrients; it is possible to live without it, but intake must be adapted to compensate for unabsorbed fluid, electrolytes, and other substances.

DIF: Cognitive Level: Applying  
TOP: Nursing Process: Assessment

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18. What is the main difference between passive diffusion and active transport?
- In active transport, the villi membrane surrounds the substance.
  - Active transport requires energy; passive diffusion does not.
  - Passive diffusion is involuntary; active transport is voluntary.
  - Active transport requires enzymes; passive diffusion does not.

ANS: B

Active transport requires energy to absorb nutrients against a concentration gradient; passive diffusion does not require energy because nutrients travel with the concentration gradient. The absorptive process by which the villi membrane surrounds the substance is pinocytosis. Neither passive diffusion nor active transport is under voluntary control, and neither process involves enzymes.

DIF: Cognitive Level: Applying  
TOP: Nursing Process: Assessment

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19. Nutrients are considered to have become part of the body only once they have
- been placed inside the mouth.
  - been swallowed.
  - passed through the microvilli cells.
  - been stored throughout the body.

ANS: C

Nutrients are considered to be truly inside the body once they have been absorbed from the intestines through the microvilli cells. When food is in the mouth or swallowed, it is still “outside” the body in that the nutrients are not available for metabolism and storage. Stored nutrients are inside the body, but that is not the point at which they are first considered to be inside.

DIF: Cognitive Level: Remembering  
TOP: Nursing Process: Assessment

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MSC: Client Needs: Physiological integrity

20. People tend to feel full for longer after eating a high-fat meal rather than a low-fat meal because
- ingestion of fat causes release of hormones that signal a feeling of fullness to the

- brain.
- b. food stays in the stomach for longer to allow emulsification by bile and digestion by gastric enzymes.
  - c. fat in the duodenum causes release of gastric inhibitory polypeptide, which decreases peristalsis of the stomach.
  - d. metabolism of the products of fat metabolism by the liver takes longer than metabolism of other nutrients.

ANS: C

As fat enters the duodenum after a high-fat meal, it causes release of gastric inhibitory polypeptide, which decreases peristalsis in the stomach. Food stays in the stomach longer, and so the person feels full longer. People feel full after a high-fat meal is because the stomach is full for longer, not because the brain is told by hormone messengers that it is full. Emulsification of fat by bile and digestion of fat by enzymes occurs in the small intestine, not in the stomach. Metabolism of nutrients is not related to a feeling of fullness.

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21. The bloodstream carries nutrients to the liver soon after absorption because the liver
  - a. produces hormones that regulate blood glucose level.
  - b. is an important site of metabolism and production of vital substances.
  - c. is able to determine which substances should be stored and eliminated.
  - d. has functions similar to those of the stomach in relation to the digestive process.

ANS: B

After absorption, the bloodstream carries nutrients to the liver because it has so many important metabolic functions in the body, and so its nutrient needs take priority. Hormones that regulate blood glucose level are produced by the islets of Langerhans in the pancreas. The liver stores some substances and eliminates others, but this is not the primary reason that blood travels there directly from the intestines. The functions of the liver are very different from those of the stomach.

DIF: Cognitive Level: Remembering

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TOP: Nursing Process: Assessment

MSC: Client Needs: Physiological integrity

22. An example of catabolism is the
  - a. building of new muscle tissue during growth.
  - b. breakdown of glucose to provide energy.
  - c. synthesis of protein from amino acids.
  - d. use of enzymes to digest protein and release amino acids.

ANS: B

Catabolism is the breakdown of absorbed and stored nutrients into small particles, which causes the release of energy as heat and chemical energy. An example of this is the breakdown of glucose to provide energy. Building new muscle tissue during growth and synthesis of protein from amino acids are examples of anabolism. Use of enzymes to digest protein is a function of digestion, not related to anabolism and catabolism, which are metabolic functions.

DIF: Cognitive Level: Understanding

REF: Page 47

23. Healing of a broken bone is an example of
- anabolism.
  - catabolism.
  - absorption.
  - metabolism.

ANS: A

Healing of a broken bone is an anabolic process because it involves use of nutrients and substrates to form new body tissue. Catabolism is the breakdown of body tissues to release energy or release nutrients for other body processes. Metabolism comprises both anabolism and catabolism. Absorption is the process by which nutrients are taken into the body from the gut.

DIF: Cognitive Level: Applying

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TOP: Nursing Process: Assessment

MSC: Client Needs: Physiological integrity

24. A busy and stressed person who eats very few fruits and vegetables and does not take time to exercise is likely to experience
- vomiting.
  - diarrhea.
  - constipation.
  - lactose intolerance.

ANS: C

Busy lifestyles, stress that causes muscle tension, lack of exercise to maintain tone in gastrointestinal muscles, and lack of dietary fiber (from fruits, vegetables, and whole grains) are likely to result in constipation. Diarrhea may be caused by stress, not by lack of fruits and vegetables or lack of exercise. Vomiting is caused by motion sickness or by ingestion of a virus or toxin. Lactose intolerance is caused by an inability to digest lactose, the sugar in milk.

DIF: Cognitive Level: Applying

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TOP: Nursing Process: Assessment

MSC: Client Needs: Physiological integrity

25. Dehydration may occur after
- vomiting and diarrhea.
  - constipation and heartburn.
  - esophagitis and anemia.
  - gastroesophageal reflux and hiatal hernia.

ANS: A

Both vomiting and diarrhea cause abnormal loss of fluid, which can lead to dehydration. Constipation, heartburn, esophagitis, anemia, gastroesophageal reflux, and hiatal hernia do not affect hydration status.

DIF: Cognitive Level: Applying

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TOP: Nursing Process: Assessment

MSC: Client Needs: Physiological integrity

26. A person who complains of problems with gas, bloating, and diarrhea if he or she eats breakfast cereal with milk, but not if he or she eats pancakes or waffles, may have
- milk allergy.



- b. gluten intolerance.
- c. irritable bowel syndrome.
- d. lactose intolerance.

ANS: D

These symptoms are likely to be caused by lactose intolerance. Patients with lactose intolerance cannot digest lactose, the sugar in milk, and so it ferments in the intestines, causing gas, bloating, and diarrhea. Milk allergy may also cause diarrhea, but it would probably also cause skin rash, asthma, or both. Gluten intolerance would not be affected by milk intake. Symptoms of irritable bowel syndrome would probably not be related to eating foods with milk.

DIF: Cognitive Level: Applying

REF: Page 46

TOP: Nursing Process: Diagnosis

MSC: Client Needs: Physiological integrity

27. The adjectives *mechanical* and *chemical* describe two
- a. actions needed to cook food.
  - b. ways to move substances in the body.
  - c. types of action that result in digestion.
  - d. ways in which molecules are transported into and out of cells.

ANS: C

*Mechanical* and *chemical* describe two types of action that take place in digestion. These adjectives describe processes that may be used to cook food, but they are not needed for this description. Substances are moved in the body and into and out of cells by mechanical and chemical means, but these adjectives are not generally used for these processes.

DIF: Cognitive Level: Applying

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MSC: Client Needs: Physiological integrity

28. If a meal is eaten at noon, by 8 PM that evening, the food would probably be in the
- a. stomach.
  - b. small intestine.
  - c. large intestine.
  - d. colon.

ANS: B

Food stays in the stomach for 2 to 6 hours. It then takes about 5 hours to pass through the small intestine and another 9 to 16 hours to pass through the large intestine, which includes the colon. Therefore, 8 hours after a meal, the food would be in the small intestine.

DIF: Cognitive Level: Applying

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MSC: Client Needs: Physiological integrity

29. If the small intestine did not release secretin, the result would be that
- a. the stomach would not release gastric juices to moisten and begin digestion of swallowed food.
  - b. the gallbladder would not release bile to help the process of fat breakdown.
  - c. peristalsis would slow down, and food would move very slowly through the intestines.
  - d. the chyme entering the small intestine would be too acidic for digestive enzymes to work.

ANS: D

Secretin causes the pancreas to release bicarbonate into the small intestine to reduce the acidity of the chyme being released by the stomach; this ensures the correct pH for the digestive enzymes in the small intestine to digest the food. Release of bile by the gallbladder and peristalsis are affected by the hormone cholecystokinin (CCK), rather than by secretin. Secretion of gastric juices is controlled by gastrin.

DIF: Cognitive Level: Applying  
TOP: Nursing Process: Assessment

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30. If peristalsis were to reverse direction, the result would be
- vomiting.
  - diarrhea.
  - constipation.
  - intestinal failure.

ANS: A

Reverse peristalsis causes vomiting; instead of food moving from the mouth to the stomach and then the small intestine, it flows backwards and is regurgitated out of the mouth. Diarrhea may be caused by increased peristalsis, so that waste is eliminated before the water can be reabsorbed. Constipation may be caused by slow peristalsis, so that food moves to the rectum very slowly. Reverse peristalsis does not cause intestinal failure, although ongoing vomiting prevents ingestion, digestion, and absorption of food.

DIF: Cognitive Level: Applying  
TOP: Nursing Process: Assessment

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