

MULTIPLE CHOICE

1. Absorption occurs in the stomach for which of the following nutrients?
 - a. Vitamins
 - b. Carbohydrates
 - c. Minerals
 - d. Alcohol

ANS: D

The stomach is the site of digestion of small amounts of lipid and protein. Large proteins are broken down into peptides. Otherwise, the stomach breaks down food into smaller particles and passes it into the small intestine, where absorption of all nutrients EXCEPT alcohol takes place. Alcohol is absorbed through the stomach.

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2. Pepsinogen is converted to pepsin when it comes in contact with
 - a. enterokinase.
 - b. trypsinogen.
 - c. hydrochloric acid.
 - d. peptidases.

ANS: C

Pepsinogen is secreted in the stomach and converted to its active form by the acid environment of the stomach. Enterokinase is secreted by the brush border of the small intestine in response to the presence of chyme. Trypsinogen is secreted by the pancreas and activated by enterokinase. Various peptidases are secreted by the either brush border or the pancreas.

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3. Which of the following is formed by bacterial synthesis in the colon?
 - a. Vitamin K
 - b. Vitamin D
 - c. Vitamin B₆
 - d. Niacin

ANS: A

Colonic bacteria produce vitamin K, vitamin B₁₂, thiamin, and riboflavin. Vitamin D may be metabolized by exposure of precursor vitamin D in the skin to ultraviolet light. The human body can synthesize niacin from the amino acid tryptophan. Vitamin B₆ must be obtained from dietary sources such as meats, whole grains, vegetables, and nuts.

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4. After surgical removal of a large portion of the small intestine, what functional complication is most likely to develop?
 - a. Changes in dietary habits
 - b. Impaired digestion
 - c. Loss of absorptive tissue
 - d. Elimination of dietary residue

ANS: C

The small intestine is the primary site of nutrient absorption because of its large absorption surface area. Secretions from the liver, gallbladder, and pancreas can still contribute to digestion of intestinal contents. However, decreased absorption of nutrients and food components may result in more intestinal remains and residue. A patient may change dietary habits as a result of gastrointestinal discomfort experienced after intestinal resection, but this is not a functional complication.

REF: p. 8

5. The sight or smell of food produces vagal stimulation of the parietal cells of the gastric mucosa, resulting in the increased production of what?
 - a. Motilin
 - b. Hydrochloric acid
 - c. Cholecystokinin
 - d. Secretin

ANS: B

Parasympathetic innervation that causes release of hydrochloric acid helps prepare the stomach for the potential of receiving food. After food chyme is passed into the small intestine from the stomach, secretin and cholecystokinin are secreted to stimulate pancreatic secretion of water and bicarbonate. They also signal gallbladder contractions and colonic motility, all resulting in reductions in stomach emptying and duodenal motility. Motilin is secreted from the duodenal mucosa during fasting to stimulate gastric emptying and intestinal motility.

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6. If a patient experiences malabsorption of fat resulting from an impaired ability to produce adequate bile salts for micelle formation, how may fat absorption be improved?
- By increasing short-chain fatty acids in the diet
 - By increasing medium-chain fatty acids in the diet
 - By increasing long-chain fatty acids in the diet
 - By restricting dietary intake of cholesterol

ANS: B

Medium-chain fatty acids of 8 to 12 carbons can be absorbed directly by mucosal cells without the presence of bile. The long-chain fatty acids require micelle formation for absorption. Short-chain fatty acids result from bacterial fermentation of malabsorbed carbohydrates and fibers. As bile is produced from cholesterol, dietary restriction of cholesterol is negligible in regard to improvements in fat absorption.

REF: p. 7

7. What is the function of secretin?
- Stimulation of gastric secretions and increased motility
 - Stimulation of gallbladder contraction and the release of bile
 - Stimulation of the pancreas to secrete water and bicarbonate
 - Stimulation of the parietal cells to secrete gastrin

ANS: C

Secretin is the hormone that works in opposition to gastrin. Whereas gastrin stimulates stomach digestion activities, secretin decreases gastric output and promotes pancreatic secretions to neutralize the acidity of chyme. Cholecystokinin is also secreted when chyme enters the duodenum, and it is responsible for stimulating the gallbladder.

REF: p. 6

8. Which of the following is a list of enzymes released from the pancreas?
- Insulin, trypsin, and secretin
 - Lactase, isomaltase, and dextrinase
 - Protease, pepsin, and gastrin
 - Trypsin, chymotrypsin, and carboxypeptidase

ANS: D

Trypsin, chymotrypsin, and carboxypeptidase are three protein digestive enzymes secreted by the pancreas. Insulin is an endogenous hormone secreted by the pancreas. Secretin is a hormone secreted by the small intestine. Lactase and isomaltase (also known as dextrinase) are brush-border enzymes. Pepsin, which is a protease, and gastrin are hormones secreted by the stomach.

REF: p. 8

9. In what form is dietary fat absorbed from the lumen of the intestine?
- Chylomicron
 - Micelle
 - Triglyceride
 - Lipoprotein

ANS: B

Fats must be emulsified into micelles so that they may cross the unstirred water layer that borders the brush-border membranes. These micelles leave monoglycerides and fatty acids at the brush border, where they are reabsorbed and reassembled as triglycerides. The triglycerides are packaged with cholesterol, fat-soluble vitamins, and phospholipids into chylomicrons, which pass into the lymphatic circulation. When these reach the liver, the chylomicron components are repackaged into low-density lipoproteins.

REF: p. 13

10. Which of the following is true of probiotics?
- Probiotics are live microorganisms found in food.
 - Probiotics are nondigestible carbohydrates.
 - Probiotics act primarily on bacteria in the proximal small intestine.
 - Probiotics cannot be given as supplements because they readily die.

ANS: A

Probiotics are live microorganisms, which when administered in adequate amounts confer a health benefit on the host. They are found in fermented foods like yogurt and sauerkraut or as a nutritional supplement. Bacterial action is most intense in the distal small intestine and large intestine.

REF: p. 10

11. By which transport mechanism are most vitamins absorbed from the small intestine into the blood?
- Passive diffusion
 - Active diffusion
 - Facilitative diffusion
 - Passive osmosis

ANS: A

Passive diffusion is limited by the number of channels available for nutrients to randomly pass through. Facilitated diffusion requires the presence of carrier proteins, which may be limited by the health and nutritional status of the person. Active transport requires energy, which also may be limited by the person's health and nutritional status. Osmosis occurs in regard to concentration gradient and only involves the movement of water, not vitamins.

REF: p. 13

12. What are primarily absorbed by the large intestine?

- a. Water and fats
- b. Carbohydrates
- c. Proteins
- d. Water and electrolytes

ANS: D

Water and electrolytes are usually the only absorbable remnants of dietary intake that reach the large intestine. Fats, carbohydrates, and proteins from the diet are absorbed throughout the small intestine.

REF: p. 11

13. What happens to cellulose and lignin as they go through the GI tract?

- a. They are converted into glucose before absorption.
- b. They are converted into glucose and absorbed by active transport.
- c. They are excreted in the feces unchanged.
- d. They are excreted in the feces as glucose.

ANS: C

In humans, the secreted amylases cannot split the β 1-2 and β 1-4 linkages between the saccharides within the cellulose molecule. As a result, no individual glucose molecules are broken off.

REF: p. 12

14. Which is the process by which minerals are absorbed when they are bound to an acid, organic acid, or amino acid?

- a. Cotransportation
- b. Carrier protein
- c. Competitive inhibition
- d. Chelation

ANS: D

Chelation refers to the binding of a cation mineral to a ligand, not a whole protein. Cotransporters carry two different minerals at a time, such as the case with sodium and phosphorus. An overlap of mineral transport mechanisms may lead to competitive absorption between minerals in the presence of other minerals, such as the case with iron or zinc supplementation, leading to a decrease in copper absorption.

REF: p. 15

15. How often do the cells lining the intestinal tract recycle?

- a. Every 2 to 3 days
- b. Every 3 to 5 days
- c. Every 5 to 7 days
- d. Every 10 to 14 days

ANS: B

Intestinal mucosal cells have a life span of 3 to 5 days before they are sloughed off and recycled. They are fully functional only for the last 2 to 3 days as they migrate to the distal third of the villi.

REF: p. 3

16. SGLT-1 is key to the small intestine's ability to absorb water because

- a. it is an active transporter of sodium and glucose.
- b. it blocks the transport of sodium.
- c. it stimulates the body's thirst mechanism.
- d. it changes the pH of the small intestine.

ANS: A

The SGLT-1 is an active transporter of sodium and glucose and is key to the small intestine's ability to absorb 7 L of fluid a day. In addition to transporting sodium and glucose, SGLT-1 functions as a molecular water pump. For each molecule of glucose absorbed by SGLT-1, 2 molecules of sodium and 210 molecules of water are also absorbed.

REF: p. 12

17. What effect may be achieved by eating a diet high in prebiotic carbohydrates?

- a. Decreased SCFA production in the bowel
- b. Increased growth of *Lactobacillus* spp.
- c. Decreased absorption of bile salts
- d. Increased absorption of cation minerals

ANS: C

The use of prebiotic carbohydrates favors the growth of friendly bacteria such as lactobacilli and bifidobacteria. These bacteria ferment the prebiotic carbohydrates, promoting increased short-chain fatty acid production. These types of carbohydrates have not been demonstrated to have a bile-sequestering effect. Impairments in absorption of cation minerals tend to be in relation to phytates and oxalates that are present in plant foods.

REF: p. 11

18. How long does it take for small intestine contents to reach the ileocecal valve?

- a. 18 to 72 hours
- b. 3 to 8 hours
- c. 1 to 2 hours
- d. 2 to 3 hours

ANS: B

Travel of contents through the small intestine takes 3 to 8 hours. A liquid meal empties from the stomach within 1 to 2 hours of eating. A solid meal takes 2 to 3 hours. Total transport from mouth to anus takes 18 to 72 hours on average.

REF: p. 8