

- Use Assessment Checklist 7: Independent Research Skills.

## Section 6.3 Review Answers

### Student Textbook page 238

- (a) Ulcers are caused by the acid-resistant bacteria *Helicobacter pylori* or by smoking, caffeine, alcohol intake, or stress.

(b) A gastric ulcer occurs when the thick layer of mucus that protects the lining of the stomach is eroded and the stomach acid eats away at the stomach wall. Technology to treat ulcers includes medications to either decrease the amount of acid or to strengthen the mucus layer. Antibiotics may also be used to reduce the growth of bacteria. Surgery can be done to block nerve signals that stimulate acid release or to remove part of the stomach. X-rays, and endoscopes are technologies used to diagnose ulcers.
- Crohn's disease and colitis are characterized by similar symptoms. There is no cure for either, and treatment options are the same. They differ in that Crohn's affects any part of the digestive tract and the inflammation extends deep into the lining of the affected organ. Colitis occurs only in the colon and only the innermost lining is inflamed. Treatments include medications to reduce the pain, to reduce inflammation, or to reduce the immune response. Dietary modifications are useful in treating symptoms. As a last resort, surgery to remove the diseased parts of the digestive tract can be done.
- Liver diseases pose serious health risks because the liver performs so many vital functions. In addition to producing bile salts for emulsification, the liver produces blood proteins, some needed for blood clotting. It stores glycogen, iron, vitamins, and poisons that cannot be broken down or excreted. The liver destroys alcohol and drugs and deaminates amino acids. It also excretes bile pigments that are by-products of destruction of hemoglobin from old red blood cells.
- Since anorexia nervosa and obesity are connected to psychological problems, treatment involves psychotherapy as well as family therapy, and education in addition to physiological treatment. This increases the time and cost of treatment.
- A person with pancreatitis would have difficulty digesting proteins, starch, and lipids in the small intestine because:
  - lack of trypsin and chymotrypsin would reduce protein digestion
  - lack of pancreatic amylase would reduce starch digestion
  - lack of lipase would reduce fat digestion

## Chapter 6 Review Answers

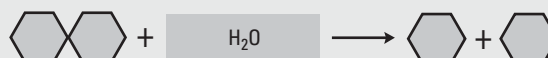
### Student Textbook pages 240-241

### Answers to Understanding Concepts Questions

- The following diagram can be used to represent the dehydration synthesis of maltose from two molecules of glucose.



The following diagram can be used to represent the hydrolysis of maltose to form two molecules of glucose.



A comparison of these processes shows that they represent a reversible chemical reaction. In one direction maltose is formed from 2 glucose molecules; in the opposite direction maltose is split into two glucose molecules.

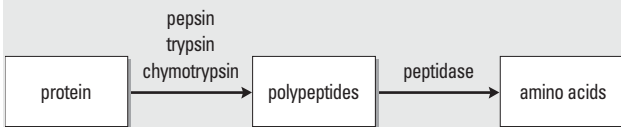
- A peptide bond is formed between two amino acids by removing a molecule of water. The following diagram represents the dehydration synthesis that forms a dipeptide molecule.
- 
- $$\text{Amino Acid} + \text{Amino Acid} \longrightarrow \text{Dipeptide} + \text{H}_2\text{O}$$
- Essential amino acids cannot be synthesized in the body so unless they are provided in the diet, one suffers from an amino acid deficiency.
  - Monosaccharides such as glucose and fructose are simple sugars with 3 – 7 carbon atoms and with a number of hydrogen and oxygen atoms. A disaccharide such as maltose and sucrose consist of two simple sugar units bonded together. Polysaccharides like starch and glycogen are long chains of simple sugar units (usually glucose) bonded together in various ways.
  - Some proteins function as building blocks for body tissues. Some are enzymes, antibodies, hormones, neurotransmitters or transport molecules such as hemoglobin, the oxygen carrying pigment in the blood.
  - We know that the stomach is an organ in which both physical digestion and chemical digestion because:
    - the folds of the stomach, called rugae, allow the stomach to expand as it fills with food. The muscular layers of the stomach churn the food, breaking it into smaller pieces (mechanical or physical digestion) and pushing it into the small intestine.
    - the gastric glands release pepsinogen and hydrochloric acid that activates pepsin for chemical digestion of protein

**7. Flow Charts Summarizing Chemical Digestion:**

**(a) The digestion of starch**



**(b) The digestion of protein**



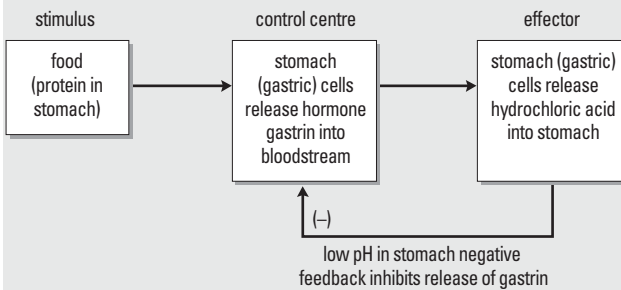
**(c) The digestion of fat**



**8.** The role of the liver in the physical digestion of fats is the production of bile that emulsifies fats in the small intestine (duodenum). Bile salts break large globules of fat into tiny droplets thereby increasing the surface area on which lipase chemically digests the fat.

**9.** The stomach has a pH of approximately 2 (very acidic). Pepsin in the stomach is inactive until mixed with hydrochloric acid. This activation is essential for chemical digestion of proteins in the stomach

**10.**



**11.**

Label	Structure	Digestive Processes that occur in the Structure
A	mouth	physical and chemical digestion
B	liver	none; an accessory organ that produces bile for physical digestion of fats
C	gall bladder	none; accessory organ that stores bile for physical digestion of fats
D	large intestine	absorption
E	rectum	none; elimination of feces

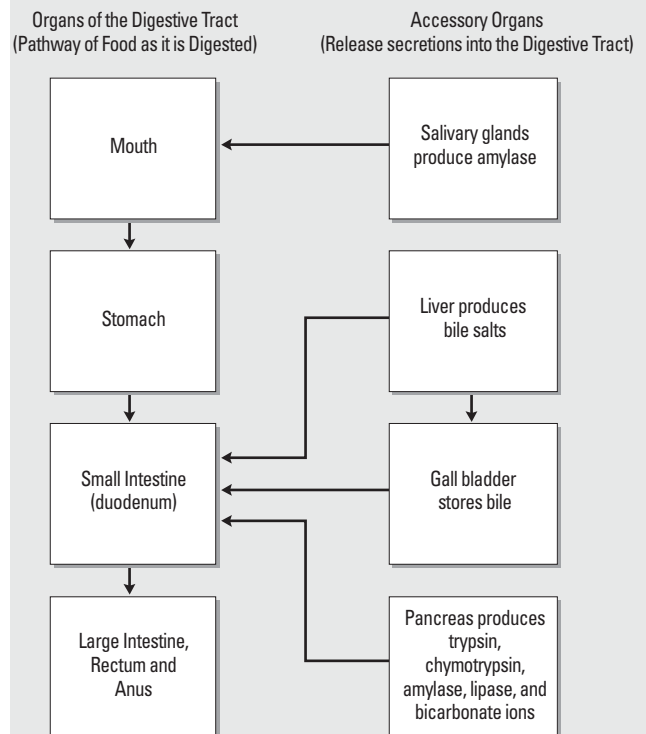
Label	Structure	Digestive Processes that occur in the Structure
F	esophagus	none; carries food from the mouth to the stomach
G	stomach	physical and chemical digestion
H	pancreas	none; accessory organ that produces digestive enzymes
I	small intestine	chemical and physical digestion absorption

- 12. (a)** inflammatory bowel disease—is the general name for diseases that cause inflammation in the intestines
- (b)** cirrhosis—is a chronic disease of the liver that occurs when scar tissue replaces healthy liver tissue and prevents the liver from functioning properly
- (c)** ulcer—forms when the thick layer of mucus that protects the lining of the stomach from the acids in the digestive juices is eroded (acid eats away at the stomach wall after acid-resistant bacteria—*H. pylori*—attaches itself to the lining).

**Answers to Applying Concepts Questions**

**13.** The very acidic pH in the stomach kills many bacteria that are ingested. The immune system protects the child from potentially toxic bacteria that are not killed in the stomach.

**14.**



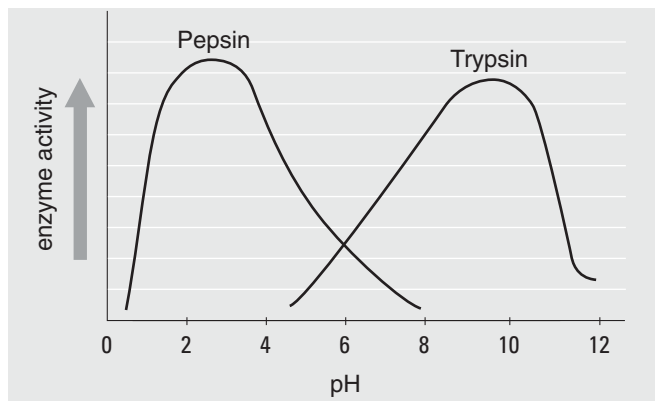
15.

Label	Structure	Secretion(s)	Function of each Secretion
A	salivary glands	<ul style="list-style-type: none"> <li>■ salivary amylase</li> <li>■ saliva</li> </ul>	<ul style="list-style-type: none"> <li>■ enzyme that contributes to the digestion of starch</li> <li>■ lubricates the inside of the mouth to assist in swallowing</li> </ul>
B	esophagus	<ul style="list-style-type: none"> <li>■ mucus</li> </ul>	<ul style="list-style-type: none"> <li>■ lubricates the passage of food to the stomach</li> </ul>
C	stomach	<ul style="list-style-type: none"> <li>■ hydrochloric acid</li> <li>■ proteases (pepsin)</li> </ul>	<ul style="list-style-type: none"> <li>■ its low pH activates precursor of pepsin</li> <li>■ digests protein (large polypeptides) into smaller peptide chains</li> </ul>
D	liver	<ul style="list-style-type: none"> <li>■ bile</li> </ul>	<ul style="list-style-type: none"> <li>■ emulsifies fats</li> </ul>
F	pancreas	<ul style="list-style-type: none"> <li>■ trypsin and chymotrypsin</li> <li>■ amylase</li> <li>■ lipase</li> <li>■ bicarbonate ions</li> </ul>	<ul style="list-style-type: none"> <li>■ digestion of protein into smaller peptide chains</li> <li>■ digestion of starch</li> <li>■ digestion of fats</li> <li>■ neutralizes chyme to a pH of 8</li> </ul>
G	small intestine	<ul style="list-style-type: none"> <li>■ carbohydrases</li> <li>■ proteases</li> <li>■ peptidases</li> <li>■ lipases</li> <li>■ nucleases</li> </ul>	<ul style="list-style-type: none"> <li>■ digestion of carbohydrates</li> <li>■ digestion of polypeptides</li> <li>■ digestion of dipeptides</li> <li>■ digestion of fats</li> <li>■ digestion of nucleotides</li> </ul>

16. The following substances are identified by the following letters:

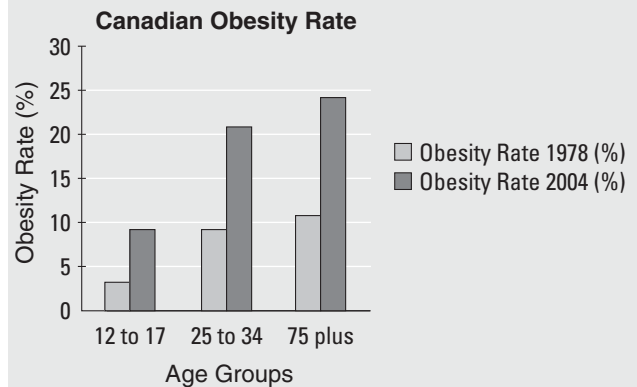
- (i) Represents monosaccharides (from carbohydrate digestion) and amino acids (from protein digestion); these are absorbed directly into the bloodstream
- (j) Represents protein-coated triglycerides (from fat digestion); these are absorbed into the lymphatic vessels
- (k) Represents water, minerals (salts), and vitamins produced by bacteria; these are absorbed from the large intestine into the bloodstream.

17. The following graph represents the optimal environmental pH for the digestive enzymes pepsin and trypsin.



You could infer that pepsin is active in the stomach where the pH is approximately 2. Trypsin is active in the small intestine where the pH is close to 8.

18. The following graph shows the data on Canadian Obesity Rate.



19. (a) The obesity rate is increasing for all three age groups.  
 (b) Possible inferences including eating more fast food (higher fat in diet) or getting less exercise. Accept any reasonable answer.

### Answers to Making Connections Questions

20. Ethical concerns include

- using scarce resources (liver for transplant) in a surgery that is likely to fail due to the presence of an underlying disease (alcoholism)
- “playing God” by asking healthcare professionals to decide who gets organs and who does not
- the “slippery slope” theory that once society begins refusing treatment because of lifestyle choices, the practice will expand to other areas (e.g., obesity treatment) because it is unethical to deny anyone in need of a new liver, even if underlying conditions jeopardize the chances of success.

21. The textbox points out that many people believe that alcoholics should be ineligible for a liver transplant. Some students will support that point of view while others will suggest that alcoholics should receive liver transplants. Others may suggest that the transplant be conditional on

receiving intensive therapy to combat alcoholism (e.g., Alcoholics Anonymous).

- 22.** The gall bladder stores bile produced by the liver. Chyme, which has a high fat content, is a strong stimulus for the secretion of the hormone CCK. CCK travels through the bloodstream to the gall bladder. The hormone stimulates contractions of the gall bladder that inject more bile into the duodenum. The extra bile enhances the emulsification and subsequent digestion of fats.
- 23.** After having a cholecystectomy, an individual might have to limit the amount of fat in their diet. This is necessary because the extra bile normally stored in the gall bladder is not available to emulsify fats.
- 24.** Meal X (simple carbohydrates) would cause a more rapid increase in blood glucose levels than Meal Y (complex carbohydrates). Simple carbohydrates are digested into absorbable glucose more rapidly than complex carbohydrates.
- 25. (a)** Given that the stomach acts as a reservoir for food during ingestion, restrictive surgery would limit the amount of food that a person could ingest during a meal. With less food entering the digestive tract, caloric intake would be reduced resulting in weight loss.  
**(b)** Malabsorptive surgery removes sections of the small intestine. This would reduce the surface area through which nutrients are absorbed. The reduction of length might also reduce the time available for chemical digestion as the food moves toward the absorptive region (ileum) of the intestine. With fewer nutrients absorbed into the blood and lymph, caloric intake would be reduced resulting in weight loss.