

CHAPTER 14 The Digestive System

Think of the last meal you ate. Imagine the different shapes, sizes, tastes, and textures that you so recently enjoyed. Think of those items circulating in your bloodstream in those same original shapes and sizes. Impossible? Of course. And because of this impossibility, you will begin to understand and marvel at the close relationship of the digestive system to the circulatory system. It is the digestive system that changes our food, both mechanically and chemically, into a form that is acceptable to both the blood and the body.

This change begins the moment you take the very first bite. Digestion starts in the mouth, where food is chewed and mixed with saliva. The food then moves down the pharynx and esophagus by peristalsis and enters the stomach. In the stomach it is churned and mixed with gastric juices to become chyme. The chyme goes from the stomach to the duodenum where it is further broken down chemically by intestinal fluids, bile, and pancreatic juice. Those secretions prepare the food for absorption all along the course of the small intestine.

Products that are not absorbed pass on through the entire length of the small intestine (duodenum, jejunum, ileum). From there they enter into the cecum of the large intestine, then the ascending colon, transverse colon, descending colon, sigmoid colon, into the rectum and out the anus.

Products that are used in the cells undergo absorption. Absorption allows newly processed nutrients to pass through the walls of the digestive tract and into the bloodstream to be distributed to the cells.

Your review of this system will help you understand the mechanical and chemical processes necessary to convert food into energy sources and compounds necessary for survival.

TOPICS FOR REVIEW

Before progressing to Chapter 15, you should review the structure and function of all the organs of digestion. You should have an understanding of the process of digestion, both chemical and mechanical, and of the processes of absorption and metabolism.

WALL OF THE DIGESTIVE SYSTEM

Fill in the blanks.

1. The organs of the digestive system form an irregularly shaped tube called the alimentary canal or the _____.
2. The churning of food in the stomach is an example of the _____ breakdown of food.
3. _____ breakdown occurs when digestive enzymes act on food as it passes through the digestive tract.
4. Waste material resulting from the digestive process is known as _____.
5. Foods undergo three kinds of processing in the body: _____, _____, and _____.
6. The serosa of the digestive tube is composed of the _____ in the abdominal cavity.
7. The digestive tract extends from the _____ to the _____.
8. The inside or hollow space within the alimentary canal is called the _____.
9. The inside layer of the digestive tract is the _____.
10. The connective tissue layer that lies beneath the lining of the digestive tract is the _____.
11. The muscularis contracts and moves food through the gastrointestinal tract by a process known as _____.
12. The outermost covering of the digestive tube is the _____.
13. The loops of the digestive tract are anchored to the posterior wall of the abdominal cavity by the _____.

Select the correct term from the choices given and write the letter in the answer blank.

A. Main organ

B. Accessory organ

- _____ 14. Mouth
- _____ 15. Parotids
- _____ 16. Liver
- _____ 17. Stomach
- _____ 18. Cecum
- _____ 19. Esophagus
- _____ 20. Rectum
- _____ 21. Pharynx
- _____ 22. Appendix
- _____ 23. Teeth
- _____ 24. Gallbladder
- _____ 25. Pancreas



If you have had difficulty with this section, review pages 361-363.

MOUTH TEETH SALIVARY GLANDS

Circle the best answer.

26. Which one of the following is *not* a part of the roof of the mouth?
- A. Uvula
 - B. Palatine bones
 - C. Maxillary bones
 - D. Soft palate
 - E. All of the above are part of the roof of the mouth
27. The largest of the papillae on the surface of the tongue are the:
- A. Filiform
 - B. Fungiform
 - C. Vallate
 - D. Taste buds
28. The first baby tooth, on an average, appears at age:
- A. 2 months
 - B. 1 year
 - C. 3 months
 - D. 1 month
 - E. 6 months
29. The portion of the tooth that is covered with enamel is the:
- A. Pulp cavity
 - B. Neck
 - C. Root
 - D. Crown
 - E. None of the above
30. The wall of the pulp cavity is surrounded by:
- A. Enamel
 - B. Dentin
 - C. Cementum
 - D. Connective tissue
 - E. Blood and lymphatic vessels
31. Which of the following teeth is missing from the deciduous arch?
- A. Central incisor
 - B. Canine
 - C. Second premolar
 - D. First molar
 - E. Second molar
32. The permanent central incisor erupts between the ages of:
- A. 9-13
 - B. 5-6
 - C. 7-10
 - D. 7-8
 - E. None of the above

33. The third molar appears between the ages of:
A. 10-14
B. 5-8
C. 11-16
D. 17-24
E. None of the above
34. Which one of the following will *not* significantly reduce caries?
A. Reduction of plaque accumulation on teeth
B. Fluoride in the water supply
C. Regular and thorough brushing
D. Eating a carrot or stick of celery instead of brushing
35. The ducts of the _____ glands open into the floor of the mouth.
A. Sublingual
B. Submandibular
C. Parotid
D. Carotid
36. The volume of saliva secreted per day is about:
A. One half pint
B. One pint
C. One liter
D. One gallon
37. Mumps are an infection of the:
A. Parotid gland
B. Sublingual gland
C. Submandibular gland
D. Tonsils
38. Incisors are used during mastication to:
A. Cut
B. Piece
C. Tear
D. Grind
39. Another name for the third molar is:
A. Central incisor
B. Wisdom tooth
C. Canine
D. Lateral incisor
40. After food has been chewed, it is formed into a small rounded mass called a:
A. Moat
B. Chyme
C. Bolus
D. Protease



If you have had difficulty with this section, review pages 364-368.

PHARYNX ESOPHAGUS STOMACH

Fill in the blanks.

The (41) _____ is a tubelike structure that functions as part of both respiratory and digestive systems. It connects the mouth with the (42) _____. The esophagus serves as a passageway for movement of food from the pharynx to the (43) _____. Food enters the stomach by passing through the muscular (44) _____ at the end of the esophagus. Contraction of the stomach mixes the food thoroughly with the gastric juices and breaks it down into a semisolid mixture called (45) _____.

The three divisions of the stomach are the (46) _____, the (47) _____, and the (48) _____.

Food is held in the stomach by the (49) _____ muscle long enough for partial digestion to occur. After food has been in the stomach for approximately 3 hours, the chyme will enter the (50) _____.

Match the term with the correct definition.

- | | |
|-------------------|----------------------|
| A. Esophagus | F. Greater curvature |
| B. Chyme | G. Hiatal hernia |
| C. Peristalsis | H. Tagamet |
| D. Rugae | I. Acid indigestion |
| E. Triple therapy | J. Lesser curvature |

- _____ 51. Stomach folds
- _____ 52. Upper right border of stomach
- _____ 53. Condition that may result in backward movement or reflux of stomach contents into the lower portion of the esophagus
- _____ 54. 10-inch passageway
- _____ 55. Drug used to treat GERD
- _____ 56. Semisolid mixture of stomach contents
- _____ 57. Muscle contractions of the digestive system
- _____ 58. Used to heal ulcers and prevent recurrences
- _____ 59. Heartburn
- _____ 60. Lower left border of stomach



If you have had difficulty with this section, review pages 368-373.

SMALL INTESTINE LIVER AND GALLBLADDER PANCREAS

Circle the best answer.

61. Which one is *not* part of the small intestine?
A. Jejunum
B. Ileum
C. Cecum
D. Duodenum
62. Which one of the following structures does *not* increase the surface area of the intestine for absorption?
A. Plicae
B. Rugae
C. Villi
D. Brush border
63. The union of the cystic duct and hepatic duct form the:
A. Common bile duct
B. Major duodenal papilla
C. Minor duodenal papilla
D. Pancreatic duct
64. Obstruction of the _____ will lead to jaundice.
A. Hepatic duct
B. Pancreatic duct
C. Cystic duct
D. None of the above
65. Each villus in the intestine contains a lymphatic vessel or _____ that serves to absorb lipid or fat materials from the chyme.
A. Plica
B. Lacteal
C. Villa
D. Microvilli
66. The middle third of the duodenum contains the:
A. Islets
B. Fundus
C. Body
D. Rugae
E. Major duodenal papilla
67. Most gastric and duodenal ulcers result from infection with the bacterium:
A. Biaxin
B. Metronidazole
C. Prilosec
D. *Helicobacter pylori*

68. The liver is an:
 A. Enzyme
 B. Endocrine organ
 C. Endocrine gland
 D. Exocrine gland
69. Fats in chyme stimulate the secretion of the hormone:
 A. Lipase
 B. Cholecystokinin
 C. Protease
 D. Amylase
70. The largest gland in the body is the:
 A. Pituitary
 B. Thyroid
 C. Liver
 D. Thymus



If you have had difficulty with this section, review pages 370-374.

LARGE INTESTINE APPENDIX PERITONEUM

If the statement is true, write "T" in the answer blank. If the statement is false, correct the statement by circling the incorrect term and writing the correct term in the answer blank.

- _____ 71. Bacteria in the large intestine are responsible for the synthesis of vitamin E needed for normal blood clotting.
- _____ 72. Villi in the large intestine absorb salts and water.
- _____ 73. If waste products pass rapidly through the large intestine, constipation results.
- _____ 74. The ileocecal valve opens into the sigmoid colon.
- _____ 75. The splenic flexure is the bend between the ascending colon and the transverse colon.
- _____ 76. The splenic colon is the S-shaped segment that terminates in the rectum.
- _____ 77. The appendix serves no important digestive function in humans.
- _____ 78. For patients with suspected appendicitis, a physician will often evaluate the appendix by a digital rectal examination.
- _____ 79. The visceral layer of the peritoneum lines the abdominal cavity.
- _____ 80. The greater omentum is shaped like a fan and serves to anchor the small intestine to the posterior abdominal wall.



If you have had difficulty with this section, review pages 376-379.

DIGESTION ABSORPTION METABOLISM

Circle the best answer.

81. Which one of the following substances does *not* contain any enzymes?
- A. Saliva
 - B. Bile
 - C. Gastric juice
 - D. Pancreatic juice
 - E. Intestinal juice
82. Which one of the following is a simple sugar?
- A. Maltose
 - B. Sucrose
 - C. Lactose
 - D. Glucose
 - E. Starch
83. Cane sugar is the same as:
- A. Maltose
 - B. Lactose
 - C. Sucrose
 - D. Glucose
 - E. None of the above
84. Most of the digestion of carbohydrates takes place in the:
- A. Mouth
 - B. Stomach
 - C. Small intestine
 - D. Large intestine
85. Fats are broken down into:
- A. Amino acids
 - B. Simple sugars
 - C. Fatty acids
 - D. Disaccharides



If you have had difficulty with this section, review page 380.

CHEMICAL DIGESTION

86. Fill in the blank areas on the chart below.

Digestive Juices and Enzymes

Substance Digested (or Hydrolyzed)

Resulting Product

SALIVA

1. Amylase

1. _____

1. Maltose

GASTRIC JUICE

2. Protease (pepsin)
plus hydrochloric acid

2. Proteins

2. _____

PANCREATIC JUICE

3. Protease (trypsin)

3. Proteins (intact or
partially digested)

3. _____

4. Lipase

4. _____

4. Fatty acids,
monoglycerides,
and glycerol

5. Amylase

5. _____

5. Maltose

INTESTINAL JUICE

6. Peptidases

6. _____

6. Amino acids

7. _____

7. Sucrose

7. Glucose and fructose

8. Lactase

8. _____

8. Glucose and galactose
(simple sugars)

9. Maltase

9. Maltose

9. _____



If you have had difficulty with this section, review page 381.

UNSCRAMBLE THE WORDS

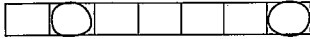
87. SLBOU



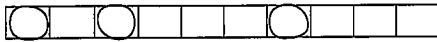
88. EYCHM



89. LLAAPPI



90. PMERTEUION



Take the circled letters, unscramble them, and fill in the statement.

What the groom gave his bride after the wedding.



91.



APPLYING WHAT YOU KNOW

92. Mr. Amato was a successful businessman, but he worked too hard and was always under great stress. His doctor cautioned him that if he did not alter his style of living he would be subject to hyperacidity. What could be the resulting condition of hyperacidity?

93. Baby Shearer has been regurgitating his bottle feeding at every meal. The milk is curdled, but it does not appear to be digested. He has become dehydrated, and so his mother is taking him to the pediatrician. What is a possible diagnosis from your textbook reading?

94. Mr. Attanas has gained a great deal of weight suddenly. He also has been noticing that he is sluggish and always tired. What test might his physician order for him and for what reason?

95. WORD FIND

Can you find 22 terms from the chapter? Words may be spelled top to bottom, bottom to top, right to left, left to right, or diagonally.

X M E T A B O L I S M X X W
R S D P E R I S T A L S I S
E V A M N O I T S E G I D R
E D E E U O Q T W Q O H N Q
Q Z H S R N I N T F E C E S
D H R E C C I T K C J A P E
Q W R N A T N V P Y R M P C
O C A T N R B A P R H O A I
U Y I E O W T A P A O T W D
B O D R L N P B F Q J S V N
N T S Y F I S L U M E E B U
W G J A L U V U N R N W O A
Q S N L X D U O D E N U M J
H C A V I T Y M U C O S A D
Y E A A P H V W S V C Q J C

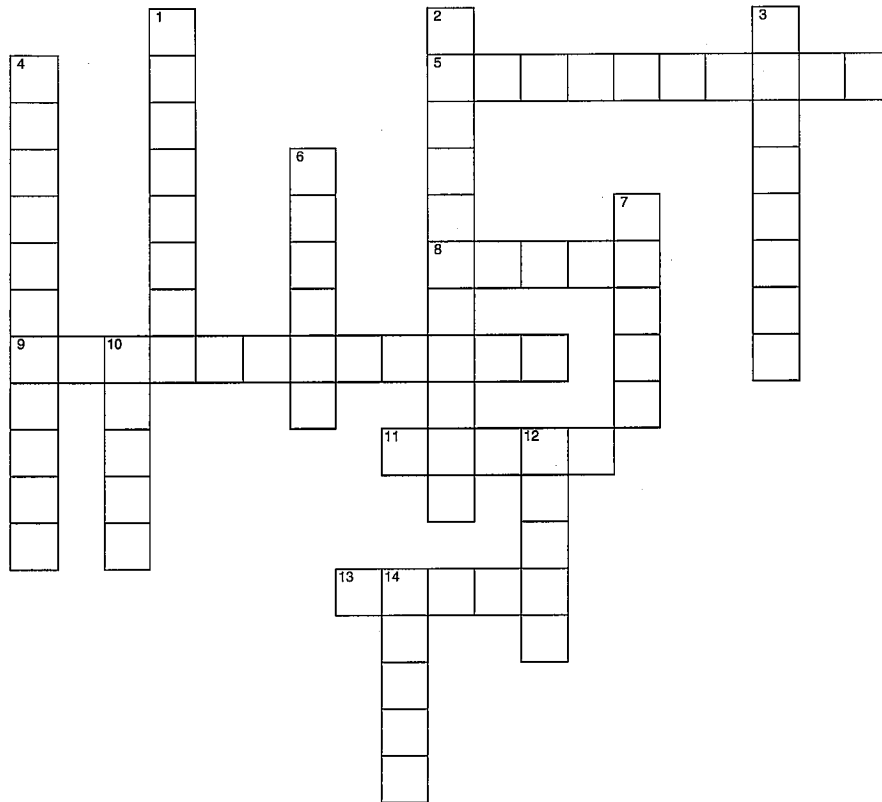
Absorption	Emulsify	Mucosa
Appendix	Feces	Pancreas
Cavity	Fundus	Papillae
Crown	Heartburn	Peristalsis
Dentin	Jaundice	Stomach
Diarrhea	Mastication	Uvula
Digestion	Mesentery	
Duodenum	Metabolism	

DID YOU KNOW?

The liver performs over 500 functions and produces over 1000 enzymes to handle the chemical conversions necessary for survival.

DIGESTIVE SYSTEM

Fill in the crossword puzzle.



Across

5. Movement of digested food from intestine to blood
8. Semisolid mixture
9. Inflammation of the appendix
11. Rounded mass of food
13. Stomach folds

Down

1. Yellowish skin discoloration
2. Process of chewing
3. Fluid stools
4. Movement of food through the digestive tract
6. Vomitus
7. Waste product of digestion
10. Intestinal folds
12. Open wound in digestive area acted on by acid juices
14. Prevents food from entering nasal cavities

CHECK YOUR KNOWLEDGE

Multiple Choice

Circle the correct answer.

1. During the process of digestion, *stored* bile is poured into the duodenum by which of the following?
 - A. Gallbladder
 - B. Liver
 - C. Pancreas
 - D. Spleen
2. The _____ is the portion of the alimentary canal that mixes food with gastric juice and breaks it down into a mixture called chyme.
 - A. Gallbladder
 - B. Small intestine
 - C. Stomach
 - D. Large intestine
3. What is the middle portion of the small intestine called?
 - A. Jejunum
 - B. Ileum
 - C. Duodenum
 - D. Cecum
4. The crown of the tooth is covered externally with which of the following?
 - A. Cementum
 - B. Enamel
 - C. Dentin
 - D. Pulp
5. What is the layer of tissue that forms the outermost covering of organs found in the digestive tract called?
 - A. Mucosa
 - B. Serosa
 - C. Submucosa
 - D. Muscularis
6. Duodenal ulcers appear in which of the following?
 - A. Stomach
 - B. Small intestine
 - C. Large intestine
 - D. Esophagus
7. What is an extension of the peritoneum that is shaped like a giant, pleated fan?
 - A. Omentum
 - B. Mesentery
 - C. Peritoneal cavity
 - D. Ligament
8. Protein digestion begins in the:
 - A. Esophagus
 - B. Small intestine
 - C. Stomach
 - D. Large Intestine

9. The enzyme pepsin is concerned primarily with the digestion of which of the following?
 - A. Sugars
 - B. Starches
 - C. Proteins
 - D. Fats
10. The enzyme amylase converts which of the following?
 - A. Starches to sugars
 - B. Sugars to starches
 - C. Proteins to amino acids
 - D. Fatty acids and glycerols to fats

Completion

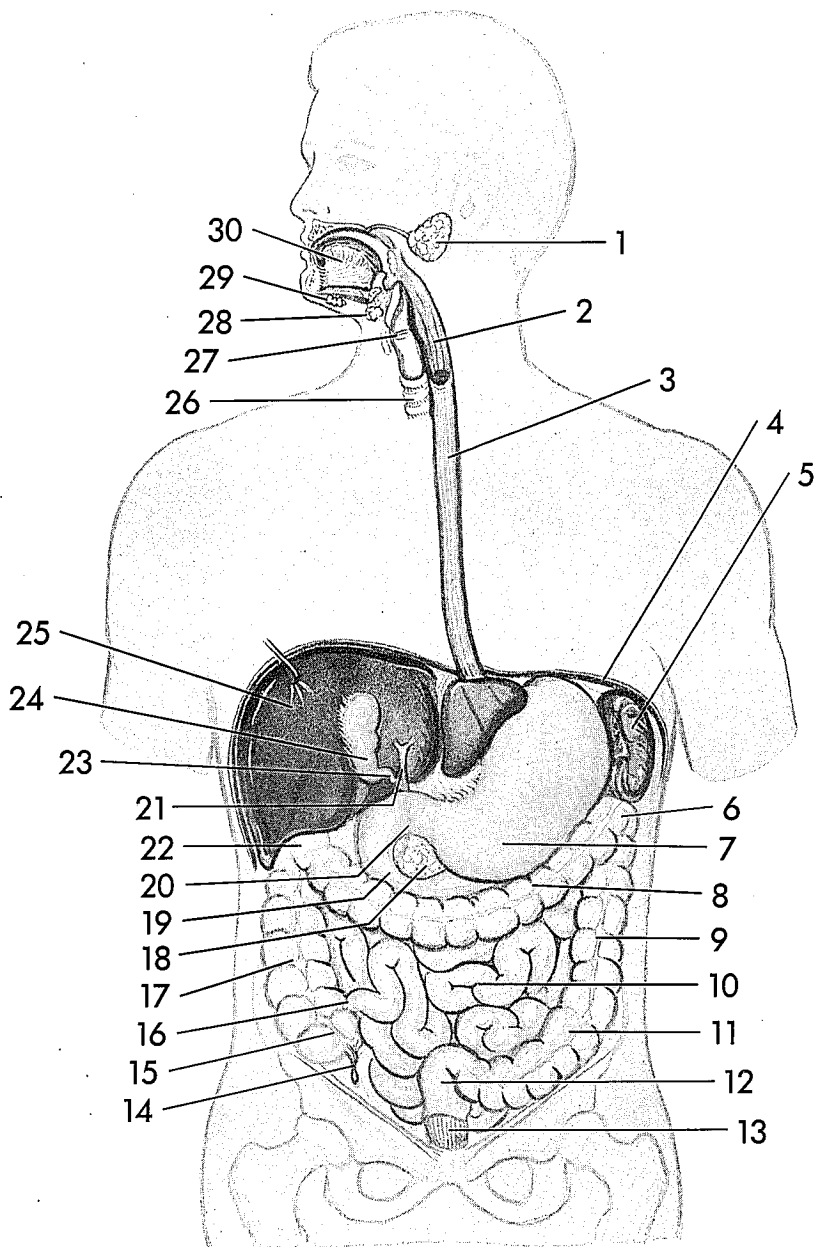
Complete the following statements using the terms listed below:

- | | |
|----------------------|----------------------|
| A. Ileum | M. Pyloric sphincter |
| B. Amylase | N. Sigmoid colon |
| C. Muscularis | O. Canines |
| D. Metabolism | P. Amino acids |
| E. Cholecystokinin | Q. Duodenum |
| F. Molars | R. Jejunum |
| G. Cardiac sphincter | S. Premolars |
| H. Digestion | T. Mucosa |
| I. Incisors | U. Submucosa |
| J. Greater omentum | V. Cecum |
| K. Absorption | W. Bile |
| L. Adventitia | X. Serosa |

11. The S-shaped portion of the colon is called the _____.
12. The portion of the peritoneum that descends from the stomach and the transverse colon to form a lacy apron of fat over the intestines is called the _____.
13. The "building blocks" of protein molecules are _____.
14. The small intestine is made up of three sections called the _____, _____, and the _____.
15. Fats that enter into the digestive tract are emulsified when they are acted upon by a substance called _____.
16. Foods undergo three kinds of processing in the body: _____, _____, and _____.
17. Fats in the chyme stimulate the secretion of _____, which stimulates contraction of the gallbladder to release bile.
18. The four tissue layers that make up the wall of the digestive tract are _____, _____, _____, and _____.
19. Food enters the stomach by passing through a muscular structure at the end of the esophagus. This structure is called the _____.
20. The four major types of teeth found in the human mouth are _____, _____, _____, and _____.

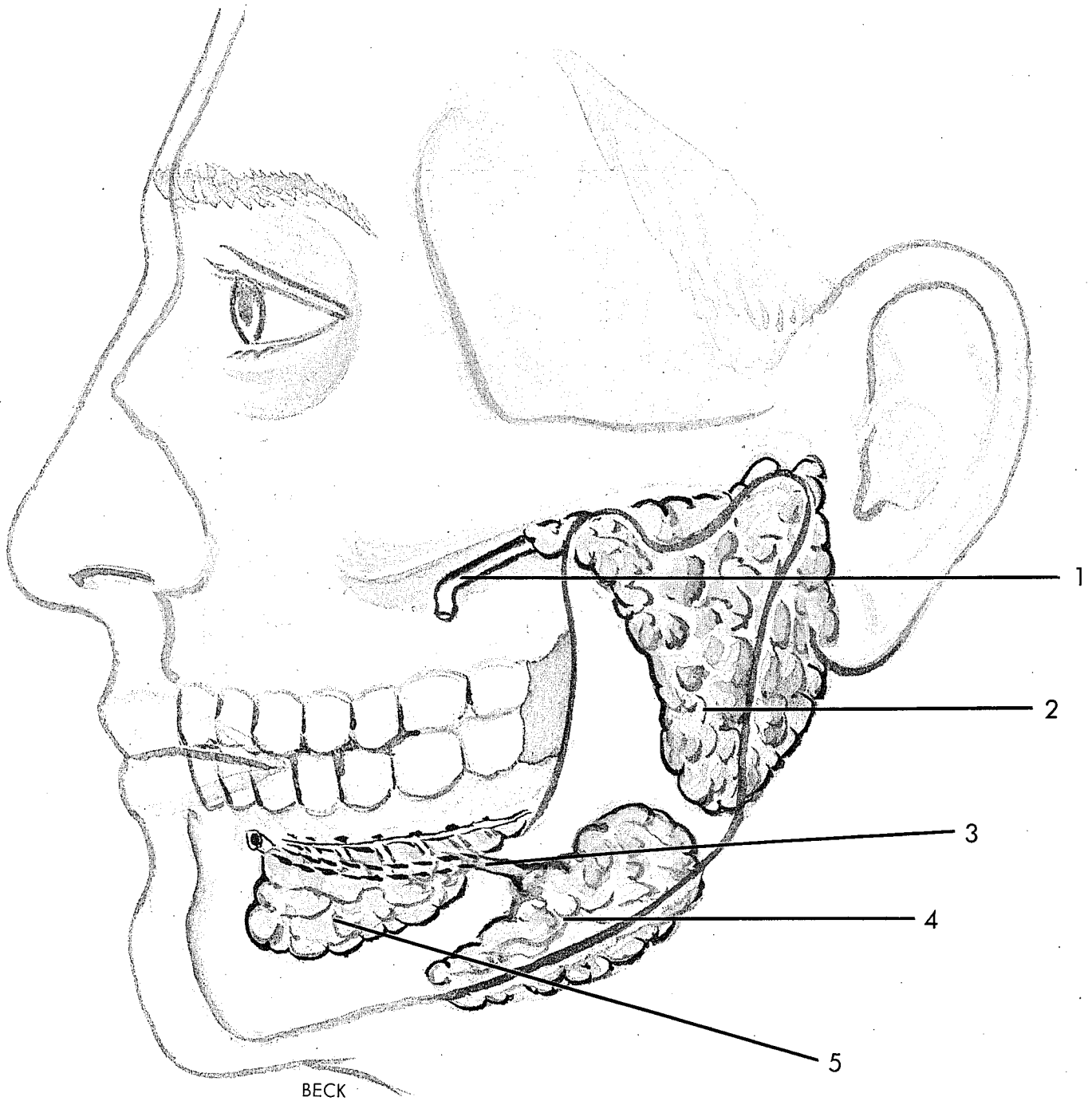
Digestive Organs

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____
13. _____
14. _____
15. _____
16. _____
17. _____
18. _____
19. _____
20. _____
21. _____
22. _____
23. _____
24. _____



25. _____
26. _____
27. _____
28. _____
29. _____
30. _____

The Salivary Glands



1. _____

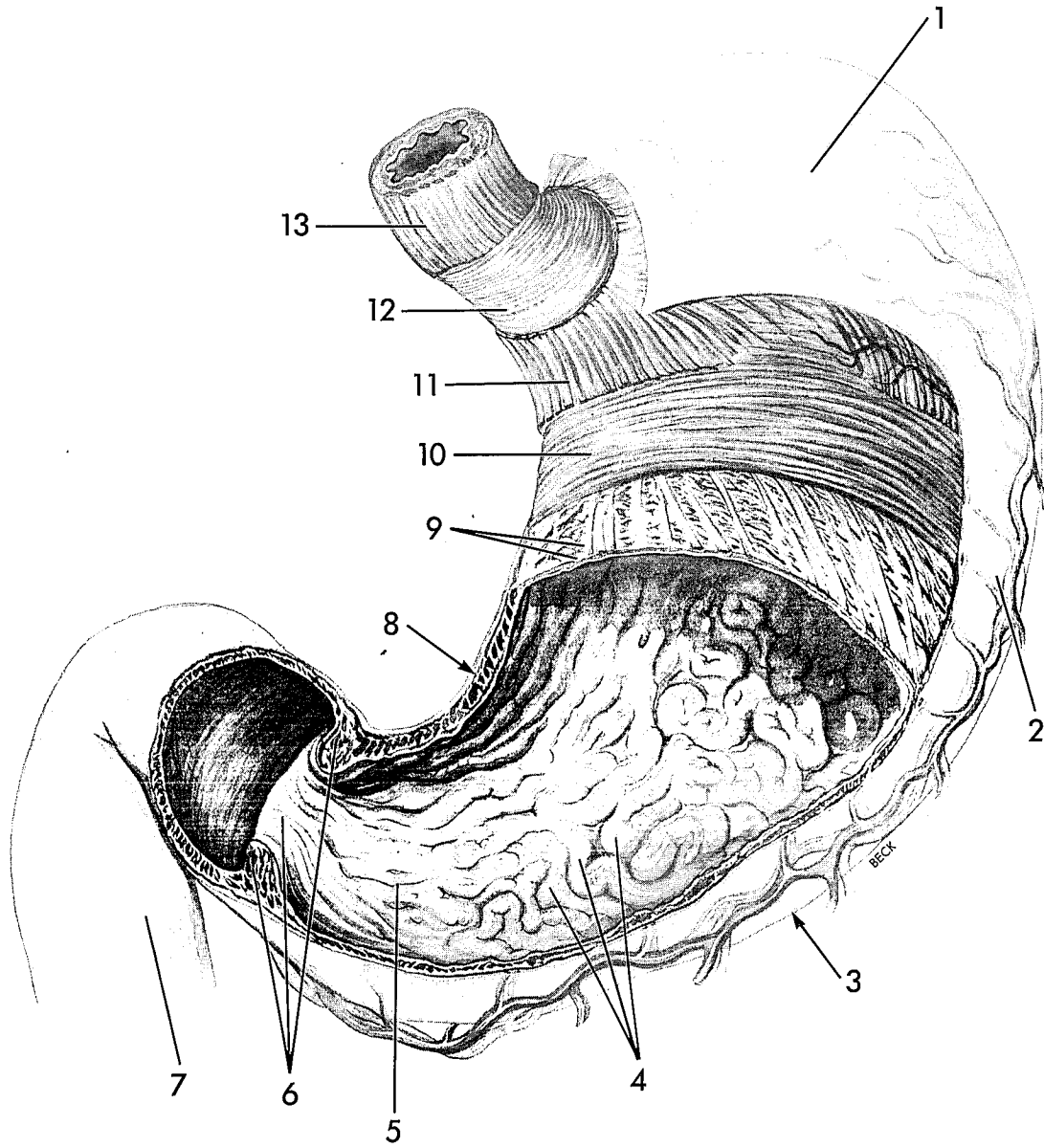
4. _____

2. _____

5. _____

3. _____

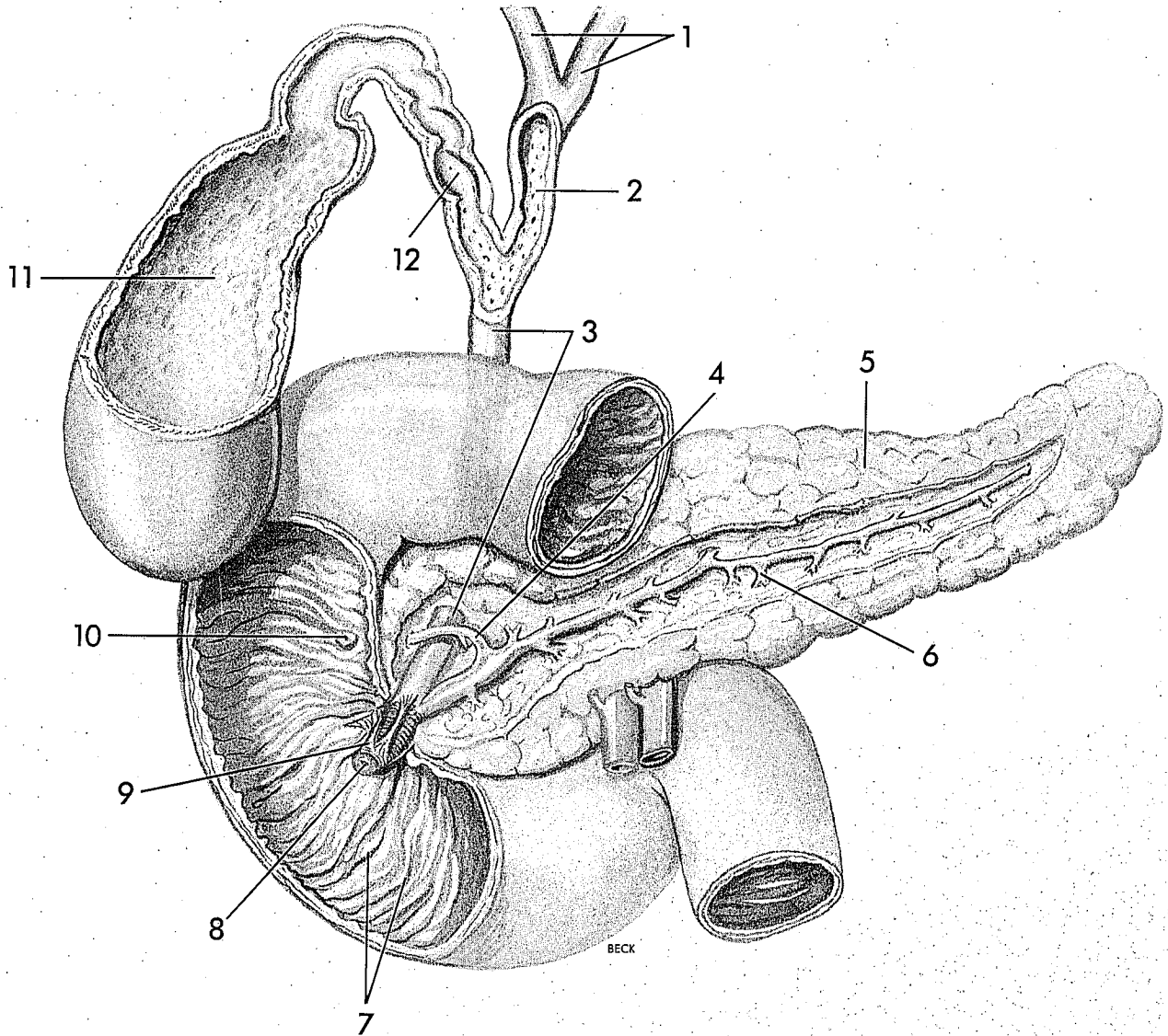
Stomach



1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____

8. _____
9. _____
10. _____
11. _____
12. _____
13. _____

Gallbladder and Bile Ducts

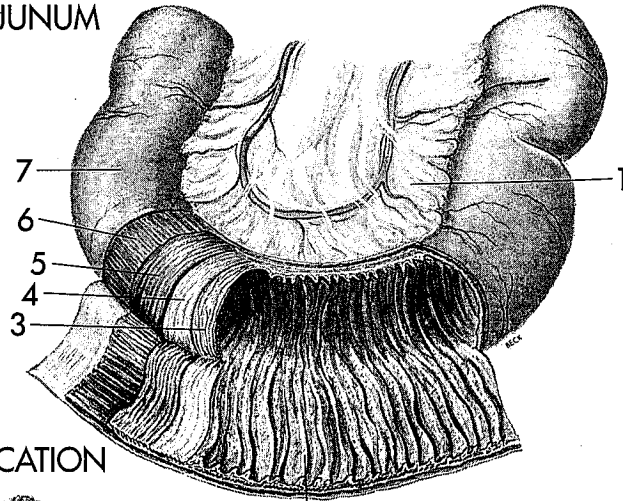


1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

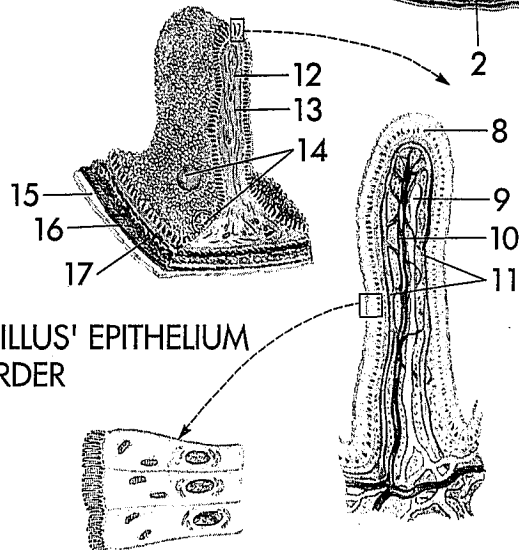
7. _____
8. _____
9. _____
10. _____
11. _____
12. _____

The Small Intestine

SEGMENT OF JEJUNUM



THREE-DIMENSIONAL MAGNIFICATION OF JEJUNAL WALL

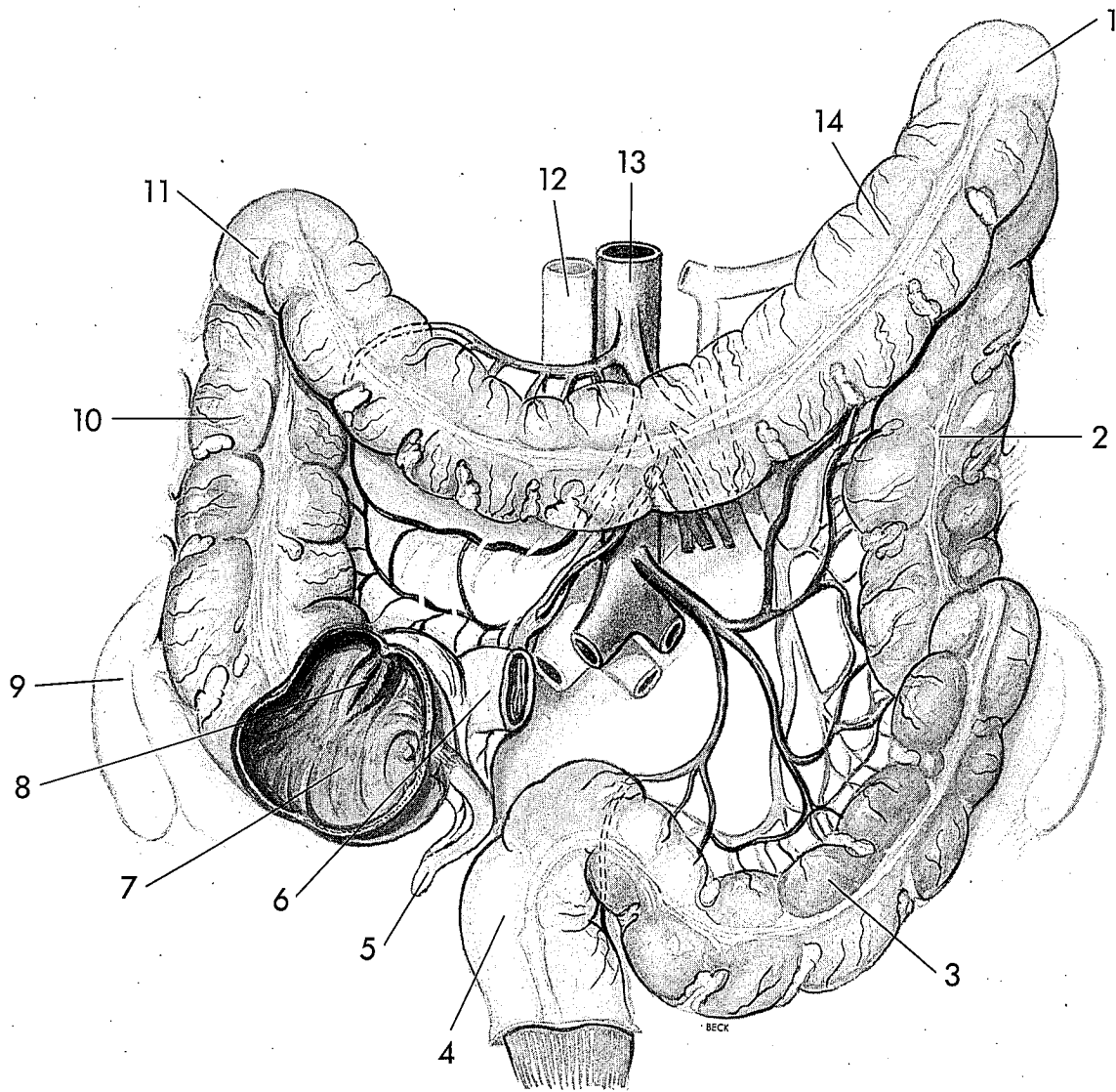


THREE CELLS OF THE VILLUS' EPITHELIUM SHOWING BRUSH BORDER (MICROVILLI)



- | | |
|----------|-----------|
| 1. _____ | 10. _____ |
| 2. _____ | 11. _____ |
| 3. _____ | 12. _____ |
| 4. _____ | 13. _____ |
| 5. _____ | 14. _____ |
| 6. _____ | 15. _____ |
| 7. _____ | 16. _____ |
| 8. _____ | 17. _____ |
| 9. _____ | |

The Large Intestine



- | | |
|----------|-----------|
| 1. _____ | 8. _____ |
| 2. _____ | 9. _____ |
| 3. _____ | 10. _____ |
| 4. _____ | 11. _____ |
| 5. _____ | 12. _____ |
| 6. _____ | 13. _____ |
| 7. _____ | 14. _____ |

