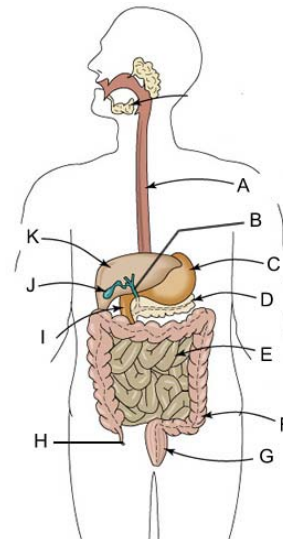
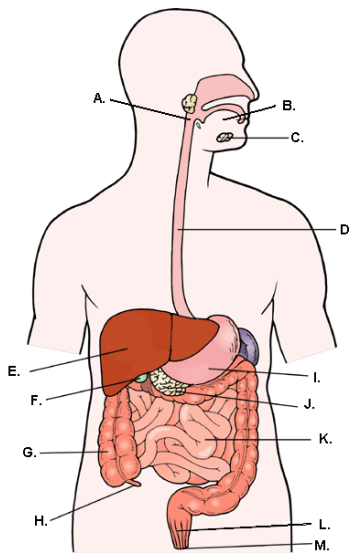


## Study Guide – Answer Key

### Digestive System

1. State the function of the digestive system (4 components).
  - **Ingest:** bring food into the body
  - **Digest:** break down food into monomers
  - **Absorb:** nutrients for use by the body
  - **Eliminate:** unusable remnants of food
2. Define the following terms and give two examples of each:
  - a. mechanical digestion: **PHYSICAL** breakdown of food into smaller pieces
    - i. **Teeth chewing**
    - ii. **Stomach churning**
  - b. chemical digestion: **ENZYMATIC** breakdown of food into monomers
    - i. **Salivary amylase** breaks down starches in mouth
    - ii. **Pepsin** breaks down protein in the stomach
3. Label a diagram of the digestive system. **Try these out (KEY at the end)**

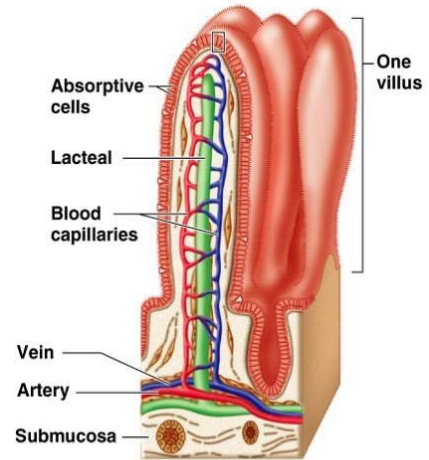
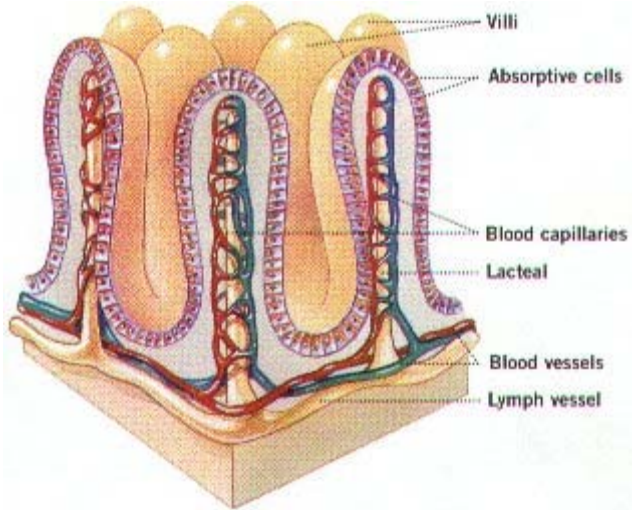


4. Trace the path of food during digestion.  
**Mouth → pharynx → esophagus → stomach → small intestine → large intestine → rectum → anus**
5. Give functions of the digestive structures.  
**See question 5 from Chapter 9 booklet**
6. Explain why if you chewed a cracker long enough, it will begin to taste sweet.  
**Salivary amylase in the mouth breaks down the starch of the cracker into maltose, a disaccharide sugar molecule.**
7. Which structures of the digestive system do not secrete enzymes?  
**Pharynx, esophagus, large intestine**
8. Explain the function of the (a) cardiac sphincter and (b) pyloric sphincter.
  - a. **Cardiac sphincter:** prevents gastric juices from coming into contact with the esophagus (failure to do so results in acid reflux, irritation of the esophagus)
  - b. **Pyloric sphincter:** regulates the passage of chyme leaving the stomach, allowing only a small amount to pass through each time it opens so the stomach acid can be neutralized

9. Where does the digestion of proteins take place?

Stomach begins the process of breaking proteins down into peptides using pepsin and it continues in the small intestine, breaking peptides down into amino acids using trypsin

10. Label a diagram of the villi in the small intestine. Samples (absorptive cells = epithelial cells)



(b) Villi

11. State the end product of digestion of each organic compound, where they are absorbed in the villus and where each goes from there.

a. Carbohydrates

- i. End product... glucose
- ii. Absorbed into the... blood capillaries in the villi
- iii. Goes to the... cells of the body

b. Proteins

- i. End product... amino acids
- ii. Absorbed into the... blood capillaries in the villi
- iii. Goes to the... cells of the body

c. Lipids

- i. End product... glycerol and fatty acids
- ii. Absorbed into the... lacteal in the villi
- iii. Goes to the... lymphatic vessels

12. What products of digestion enter the hepatic portal vein? What happens to these products when they enter the liver?

Glucose and amino acids. Excess glucose will be converted into glycogen and stored by the liver for future use. Amino acids will be used to create many plasma proteins.

13. Name the 3 accessory organs of digestion and describe their contribution to the digestive process.

- a. Pancreas: secretes sodium bicarbonate to neutralize stomach acid, secretes digestive enzymes into duodenum to complete digestion of macromolecules, produces insulin and glucagon to regulate uptake and release of glucose into the blood stream
- b. Liver: creates bile which physically breaks down lipids in to smaller droplets, stores excess glucose as glycogen, stores iron and various vitamins
- c. Gall Bladder: stores bile for future use

14. State the gland source for insulin. State the effects of insulin on target organs, cells, and tissues and its overall effect on the body.

Insulin is produced by the pancreas (beta cells specifically). Insulin stimulates the uptake of glucose by cells, especially liver cells, muscle cells and adipose tissue cells. This lowers the overall blood glucose levels to a normal range.

15. Name 4 of the 7 functions of the liver.

1. Detoxifies blood by removing and metabolizing poisonous substances
2. Stores iron and vitamins A, D, E, K, and B12
3. Makes many plasma proteins (e.g. fibrinogen) from amino acids
4. Stores glucose as glycogen and breaks down glycogen to glucose (maintains homeostatic blood sugar levels)
5. Produces urea after breaking down amino acids
6. Removes bilirubin, a breakdown product of hemoglobin, from the blood and excretes it in bile, a liver product
7. Helps regulate blood cholesterol level, converting some to bile salts

16. Where does the bile duct enter the digestive system?

Duodenum (first section of the small intestine)

17. Name the major digestive enzymes. Give the...

- production location
- preferred pH of each
- formula its involved in

Enzyme	Produced in the...	pH...	Formula
Salivary Amylase	Salivary glands (mouth)	Neutral	starch + H <sub>2</sub> O → maltose
Pepsin	Gastric glands (stomach)	Acidic	protein + H <sub>2</sub> O → peptides
Pancreatic Amylase	Pancreas	Basic	starch + H <sub>2</sub> O → maltose
Lipase	Pancreas	Basic	lipid + H <sub>2</sub> O → fatty acids + glycerol
Trypsin	Pancreas	Basic	protein + H <sub>2</sub> O → peptides
Nuclease	Pancreas	Basic	RNA/DNA + H <sub>2</sub> O → nucleotides
Peptidases	Small intestine	Basic	peptides + H <sub>2</sub> O → amino acids
Nucleosidases	Small intestine	Basic	nucleotides + H <sub>2</sub> O → base + sugar + phosphate
Maltase	Small intestine	Basic	maltose + H <sub>2</sub> O → 2 glucose

18. Decide whether the described condition for digestion will allow digestion to occur maximally or not. If not, describe why.

Examples (see enzyme assignment)

- gelatin, pepsinogen, HCl, 37 degrees
- butter, bile, sodium bicarbonate, warm gently
- salivary amylase, cracker, water, 37 degrees
- trypsin, HCl, body temperature, egg white

19. Explain what is meant by digestive enzymes being hydrolytic enzymes.

The term "hydrolytic" refers to the process of hydrolysis which is the conversion of polymers to monomers. All digestive enzymes break down biological molecules. This process requires the input of water to separate the monomers from each other.

20. Which compounds are digested in only one organ or region of the digestive system?

Lipids and nucleic acids are only digested in the small intestine.

21. What problem may result from an inflammation of the large intestine which hinders its function?

The intestine would lose the ability to absorb water efficiently and result in diarrhea.

22. Name and describe one disorder of the digestive system.

Stomach ulcers... open sore in the wall of the stomach caused by bacteria

Constipation... large intestine absorbs too much water resulting in excessively hard feces

Diarrhea... large intestine doesn't absorb enough water resulting in very loose, watery feces

Diabetes... inability to regulate blood glucose levels

Answers for the diagrams on question 3.

Diagram on LEFT	Diagram on RIGHT
A. pharynx	A. esophagus
B. tongue	B. bile duct
C. salivary gland	C. stomach
D. esophagus	D. pancreas
E. liver	E. small intestine
F. gall bladder	F. large intestine
G. large intestine	G. rectum
H. appendix	H. appendix
I. stomach	I. duodenum
J. pancreas	J. gall bladder
K. small intestine	K. liver
L. rectum	
M. anus	