Name _____ **Period** _____

Chapter 21: Nutrition and Digestion

Guided Reading Activities

Big idea: Obtaining and processing food

Answer the following questions as you read modules 21.1–21.3:

1. True or false: The defining characteristic of animals is that they produce their own sugars through photosynthesis. If false, make it a correct statement.
   False, plants produce their own sugars through photosynthesis. Animals, like ourselves, consume food.
2. Based on their diet, animals are grouped into three categories. List the three categories and provide an example of an organism found within each group.
   Herbivores (mice), carnivores (lions), or omnivores (humans)

3. Complete the following table, which compares the different types of feeding mechanisms.

	Filter	Substrate	Fluid	Bulk
Description	Organisms that sift food from water	Organisms that live on or in their food source and eat their way through it	Organisms that suck fluid from another organism	Organisms that ingest large pieces of food
Example	Blue whale	Maggots	Mosquitoes	Humans

4. Which step ensures that animals can use the molecules (like proteins) in the food that we eat?

   a. Elimination
   b. Ingestion
   c. Absorption
   d. Digestion

5. Describe the role of the circulatory system in food processing.
   The circulatory system is necessary for the transportation of digested nutrients throughout the body.
6. Each type of food macromolecule/polymer requires a specific ___enzyme___ to aid in breaking it down.

7. Complete the following table, which compares a gastrovascular cavity to an alimentary canal.

	Gastrovascular cavity	Alimentary canal
Description	A system of digestion that has a single opening used as an entrance and an exit	A digestive system that consists of a tube with openings at either end; this allows for specialization of compartments.

8. What basic organizational plan do the three examples of alimentary canals all have in common? Refer to Figure 21.3B on page 432 of your textbook.
They all have an opening at either end and have specialized regions for digestion and absorption.

Big idea: The human digestive system

Answer the following questions as you read modules 21.4–21.13:

1. A common misunderstanding is that gravity propels food down our throats into our stomachs. Briefly explain why this is not so; your answer should include what the driving force is.
If this were true, we would not be able to swallow upside down. Contractions of smooth muscle that lines the esophagus are responsible for moving food into the stomach.
2. The regulation of food into and out of the stomach is controlled by sphincters.
3. Do you control peristalsis? Briefly explain your answer either way.
No, once the food hits the back of your throat and triggers swallowing, you are no longer in control. Contraction of smooth muscle is involuntary.
4. List two functions served by the tongue during ingestion.
It is important in tasting our food and pushing food into the back of our mouths.
5. You are enjoying some peanut brittle. Which teeth are you primarily using to digest the peanut brittle mechanically?
Molars
6. Saliva is very important in the processing of food. List four substances found in saliva and describe the function of each.
It contains a slippery glycoprotein to help coat food and protect from abrasion, buffers to neutralize acids, antibacterial compounds, and amylase to begin starch digestion.
7. This structure closes off the trachea during the swallowing of a bolus of food.
   a. Esophagus
   b. Epiglottis
   c. Esophageal sphincter
   d. Larnyx

8. What are three features of the esophagus that aid it in its function?
   It has elastic connective tissue that allows it to stretch, smooth muscle for peristalsis, and a lining of stratified epithelial cells that replenishes itself through repeated cell division.
9. True or false: You can perform the Heimlich maneuver only on another person and not on yourself. If false, make it a correct statement.
   False, it is possible to perform the Heimlich maneuver on yourself.

10. Food is churned and liquefied in the stomach. This mixture of food and gastric juice is known as ___chyme___.

11. Complete the following table, which describes the functions of the different components of gastric juice.

	Mucus	Pepsinogen	HCl
Role in digestion	Keeps the stomach safe from the acid within the stomach	Is converted to pepsin	Converts pepsinogen to pepsin

12. Briefly explain why the term *heartburn* is inaccurate.
    It's not a problem with your heart. The problem is with the acid in your stomach.

13. A patient with a history of GERD presents in the ER with blood in his vomit. What has likely happened?
    The acid has worn away the stomach lining and has caused bleeding ulcers in the stomach.

14. The three regions of the small intestine are the ___duodenum___, ___jejunum___, and ___ileum___.

15. Digestion occurs in which region of the small intestine?

    a. Jejunum

    b. Duodenum

    c. Ileum

    d. Gall bladder

16. A gall stone forms in the gall bladder and blocks the bile duct. What aspect of digestion will likely be affected? Briefly explain your answer.
Bile will be blocked from entering the small intestine, and the digestion of fats will be affected.

17. A statin is a class of drug that helps to lower a person's cholesterol. Once you have begun taking the statin, your doctor will periodically check your liver enzymes for proper liver functioning. Briefly explain why doctors check the liver enzymes.
One of the liver's functions is to help remove toxins from the blood, and that includes medicines like statins.

18. You just ate a bowl of mashed potatoes. The starch began chemical digestion in your mouth and finished in your duodenum with hydrolysis into glucose molecules. The fate of the starch is conversion to glycogen in your liver. What did the glucose travel through in order to get to the liver?
It traveled through the hepatic portal vein.

19. True or false: Of the approximately 7L of digestive juice that enters the digestive system each day, approximately 90% of the water is reabsorbed by active transport. If false, make it a correct statement.
False, the water is reabsorbed by osmosis.

20. The small intestine primarily absorbs __nutrients__, while the large intestine primarily absorbs __water__.

21. When compared to the cecums of carnivores, the cecums of herbivores are much larger. What is the explanation of this evolutionary adaptation?
It allows for increased digestion of plant material.

Big idea: Nutrition

Answer the following questions as you read modules 21.14–21.21:

1. The milk you drank with breakfast contained protein that was chemically digested in your stomach and small intestine into amino acids. What are the three functions served by the molecules (like those amino acids) absorbed during digestion?
They provide the monomers from which biological polymers are constructed, provide chemical energy to power cellular activities, and provide the nutrients to maintain health.
2. Assume the average person consumes 1,500 food calories (kcal) per day. Use the following conversion facts to show that the average body produces almost as much energy as a 75-watt light bulb.

1 kcal = 4,184 joules (a unit of energy)

1 joule/second = 1 watt (a unit of power)

1,500 kilocalories/1day × 4,184 Joules/1 kilocalorie × 1 day/86,400 seconds = 73 Joules/second = 73 Watts (almost 75 Watts)

3. Use the information from question 2 to determine how many calories a person would need to consume in a day to power a 100-watt light bulb.
   100 Watts = 100 Joules/1 second × 1 kilocalorie/4,184 Joules × 86,400 seconds/1 day = 2,065 kilocalories/day
4. Vitamin C is an essential nutrient for humans. Briefly explain what this means.
   It means that the cells of your body cannot synthesize it.

5. What is meant by complete versus incomplete proteins? What are sources of these in your diet?
   A complete protein provides all of the essential amino acids, whereas an incomplete protein does not. You can get complete proteins by eating meat or animal products like cheese and milk.
6. The major difference between vitamins and minerals is that vitamins are ___organic___, whereas minerals are ___inorganic___.

7. A common misconception about vitamins is that you can never have too much of a good thing. Briefly explain why this is an incorrect way of thinking with respect to vitamins. Your answer should include at least one example of what happens when you get too much of a vitamin.
   You should not consume too much of a fat-soluble vitamin because it can lead to vitamin toxicity. Too much vitamin A can cause liver damage.
8. Salads are definitely good for you. If you ate a green leafy salad for lunch, which vitamins and minerals are you getting?
   Vitamins A, E, and K, and calcium, magnesium, and iron

9. How many slices of bread would you have to consume in order to meet your daily requirement of calories? Assume a 2,000-calorie diet. Refer to Figure 21.17 on page 446 of your textbook.
   You would need to eat 20 pieces of bread.

10. An improper or insufficient diet leads to ___malnutrition___.

11. Briefly explain why obesity in modern humans may be linked to our evolutionary past.
    We crave high-calorie foods because food was not always plentiful. We evolved to crave these foods as a survival mechanism.
12. Which data indicate that it's not what you cut from your diet; rather, it's how many calories overall you cut? Refer to Figure 21.20 on page 448 of your textbook.
    The fact that people on different diets lost the same amount of weight when they all consumed the same amount of calories indicates this. It didn't matter if you cut carbohydrates, fats, or proteins; all that mattered was your total calorie count.
13. Compare LDLs to HDLs. Which one is good and which one is bad? Briefly explain your answer.
    LDL is bad and HDL is good. LDL is associated with high blood pressure, coronary disease, and blocked vessels. HDL carries cholesterol to the liver, where it can be broken down.

CONNECTING THE BIG IDEAS

Use your knowledge of the information contained within this chapter's "Big Ideas" to answer this question.

Briefly explain what would happen if a person had a mutation in one or more enzymes that caused vitamins to be broken down during chemical digestion as opposed to being absorbed into the circulation.

