

Name _____ Period _____

Chapter 41: Animal Nutrition

Animals require food to obtain the energy and essential nutrients necessary to grow and reproduce, and use various strategies in order to maximize resources. Topics in this chapter will relate to Big Idea 2, especially in symbiotic relationships and feedback regulation as important elements of successful resource acquisition and maintenance of homeostasis. The important actions of enzymes and application of your knowledge of organic molecules and their components is part of the study of digestion. Although there are details of anatomy and enzyme pathways outside the Curriculum Framework, this chapter is rich with material that illustrates important aspects of biology.

Concept 41.1 *An animal's diet must supply chemical energy, organic molecules, and essential nutrients*

1. When asked “Why do animals eat?” you might answer with something like “in order to live.” However, this is not a college-level response, so carefully read the first two paragraphs of this concept to pull out what animals must obtain from the food they eat. What are the three nutritional needs an adequate diet must satisfy?
2. What are *essential amino acids*? What must vegetarians do in order to obtain them?
3. Table 41.1 presents a comprehensive list of vitamins, their dietary sources and functions, and the symptoms of deficiency or excess. Are you surprised to see that vitamin overdoses are possible? How could an individual have extreme excess of a vitamin?
4. Which category of vitamin, *water soluble* or *fat soluble*, is most likely to result in overdose? Why?
5. AP Biology is not a nutrition course, so you will not have to know this entire chart. However, complete this chart to gain an understanding of the most common deficiency disorders as well as common vitamin sources.

Deficiency Disorder	Symptoms	Vitamin Deficient?	Dietary Source?
Beriberi			
Scurvy			
Rickets			
	neural tube defects in babies (see end of concept)		
	blindness		

6. Complete this chart to understand the important role of these selected minerals.

Mineral	Major Functions/Deficiency Symptoms	Dietary Source?
Calcium		
Iron		
Phosphorus		
Iodine		
Fluorine		

7. What is the difference between *malnutrition* and *undernutrition*?

Concept 41.2 *The main stages of food processing are ingestion, digestion, absorption, and elimination*

8. Distinguish between mechanical digestion and chemical digestion.
9. In what sense are nutrients from a recently ingested meal not really “inside” your body before they enter the absorption stage of food processing?
10. The enzymes of digestion could break down the molecules that make up the animal—how is this prevented?
11. Explain the difference between *intracellular* and *extracellular digestion* and give a description of each process in different organisms.

Concept 41.3 *Organs specialized for sequential stages of food processing form the mammalian digestive system*

12. The Curriculum Framework does not require you to know all the structures of the digestive system nor the names and functions of the many enzymes involved, but a biologically literate person should have knowledge of the function of the major organs. What is the function of the *stomach*?
13. Does stress cause ulcers? Discuss the finding that received the 2005 Nobel Prize.
14. What is the pH of the stomach? _____ What is the pH of the small intestine? _____
15. Explain, based on tertiary structure, why *pepsin* does not function in the small intestine.

16. What is the digestive function of the liver?
17. What is the function of *bile*? Where is it stored?
18. What are the two digestive functions of the small intestine?
19. Remember the mantra: *Structure fits function*. How is that true for the *villi* of the small intestine?
20. Monosaccharides and amino acids move directly into capillaries in the villi and then travel to the liver via the *hepatic portal vein*. What two major functions does this arrangement serve?
21. The small intestine connects to the *large intestine* at a T-shaped junction. One arm forms a blind pouch called the *cecum*. What is the cecum's role in grazing animals?
22. Where is the human appendix located? What function does it have?
23. What is a major function of the colon?
24. What makes up the *feces*?

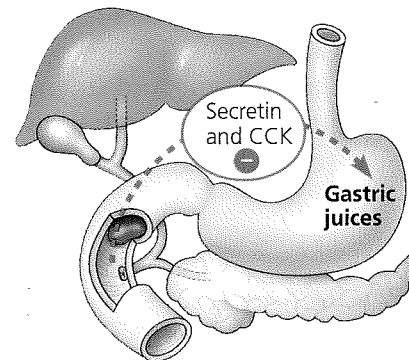
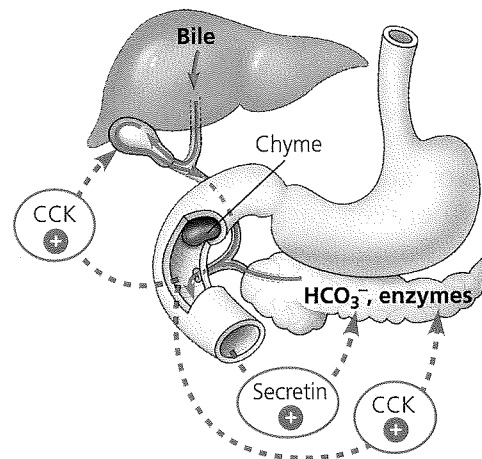
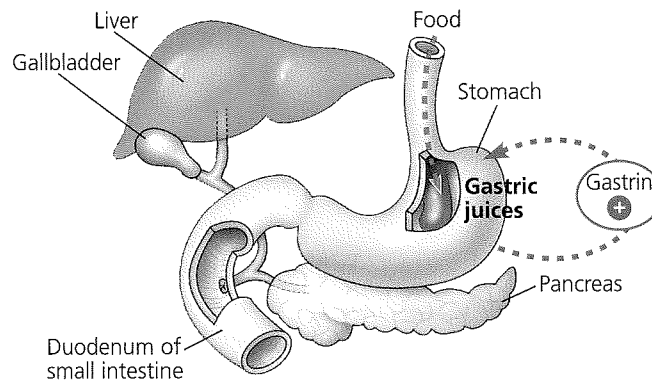
Concept 41.4 Evolutionary adaptations of vertebrate digestive systems correlate with diet

25. There are many adaptations associated with an animal's diet. In your textbook Figure 41.16 shows how the dentition varies between carnivores and herbivores, and Figure 41.17 shows how their alimentary canals vary. Summarize and explain these differences.
26. Your colon is inhabited by an immense number of bacteria. Although they produce sometimes embarrassing gases and odors, they are actually your friends. What do these mutualistic symbiotic bacteria do for you?
27. You may recently have heard about your *microbiome* and its importance to your health. This idea was first introduced with the discussion on ulcers and *H. pylori*. Summarize the information presented in Figure 41.18 and use it to predict another effect of *H. pylori* colonization in the gut.

28. Mutualistic symbiosis is important to digestion in many other species besides man. Select any three examples and explain how the host benefits in each case.

Concept 41.5 *Feedback circuits regulate digestion, energy storage, and appetite*

29. Regulation of digestion involves several feedback pathways. Study the three examples in Figure 41.20. In these examples, explain why the feedback pathway is considered positive or negative.



30. Explain the role of the two pancreatic hormones insulin and glucagon in glucose homeostasis.
31. What health problems are related to obesity? Do you think obesity is a major health problem in America? Cite data from your home state if possible.
32. Several hormones interact to regulate appetite. What is the role of leptin in maintaining body fat levels? How is it countered by *ghrelin*? What is the target for all the hormones involved in appetite regulation?

Test Your Understanding Answers

Now you should be ready to test your knowledge. Place your answers here:

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