

**Chapter 34: Digestive System and Nutrition**

1. Compare the structural features of incomplete versus complete digestive tracts.
2. Describe several examples of animals that are either continuous or discontinuous feeders.
3. Compare the teeth of carnivores to those of herbivores.
4. Trace the path of food from the mouth to the large intestine.
5. Explain how the stomach, small intestine, and large intestine are each adapted to perform their particular functions.
6. Discuss how each accessory organ contributes to the digestion of food.
7. Describe the location in the digestive tract where each of the major types of nutrients is broken down. Explain what final molecule (monomer) results from the digestion of carbohydrates, proteins, and fats.
8. Describe the overall characteristics and functions of each of the digestive enzymes.
9. List the major types of nutrients, and provide examples of foods that are a good source of each.
10. Distinguish between vitamins, coenzymes, and minerals.

**Chapter 35: Respiratory Systems**

1. Distinguish between ventilation, external respiration, and internal respiration.
2. List some features common to animals like hydras, earthworms, and salamanders, which are able to exchange gases directly with their environment.
3. Explain why the countercurrent flow that occurs in the gills of fish is much more efficient than concurrent flow would be.
4. Identify the specialized structures for respiration in insects.
5. Trace the path of a molecule of oxygen as it passes from the human nose to an alveolus.
6. Compare the mechanisms used by amphibians, mammals, and birds to inflate their lungs.
7. Explain how the breathing rate in humans is influenced by both physical and chemical factors.
8. Describe how carbon dioxide is carried in the blood, and the effect that blood partial pressure of carbon dioxide has on blood pH. Define the role of oxyhemoglobin, reduced hemoglobin, and carbaminohemoglobin in homeostasis.
9. Describe several common disorders that mainly affect the upper respiratory tract, and several that affect the lower respiratory tract.
10. Classify several common respiratory disorders according to whether they are mainly caused by allergies, infections, a genetic defect, or toxin exposure.

**Chapter 36: Body Fluid Regulation and Excretory Systems**

1. Describe the overall, specific functions of animal excretion systems. Distinguish between osmoregulation and excretion.
2. List the costs and benefits of the excretion of ammonia, urea, or uric acid as nitrogenous waste products.
3. Compare and contrast the excretory organs of earthworms, arthropods, aquatic vertebrates, and terrestrial vertebrates.
4. List five strategies used by kangaroo rats to conserve water.
5. Trace the anatomical path taken by urine from the glomeruli to its exit from the body.
6. Discuss the contributions of glomerular filtration, tubular reabsorption, and tubular secretion to the formation of urine.
7. Summarize the four major functions of human kidneys in maintaining homeostasis.
8. Identify the hormones that affect urine formation, and describe the effect each one has on it.
9. Describe how the kidneys contribute to the maintenance of normal blood pH.

**Chapter 39: Locomotion and Support Systems**

1. Describe a typical hydrostatic skeleton, and list some examples of animals that possess one.
2. Discuss some advantages of having an endoskeleton versus an exoskeleton.
3. Provide several examples of how mammalian skeletons are adapted to particular forms of locomotion.
4. Review the five major functions of the skeletal system.
5. Describe the function of osteoblasts, osteoclasts, and osteocytes.
6. List the major bones that comprise the human axial and appendicular skeletons.
7. Define an “antagonistic pair” of muscles and give an example of one.
8. Explain the molecular mechanism of muscle contraction.
9. Discuss the specific role of ATP in muscle contraction.
10. Explain the specific role of acetylcholine (ACh) in stimulating a muscle fiber to contract.

## Past AP Exam Essay Questions

### 2001 Question 1

In biological systems, structure and function are related. Choose three of the following components of organ systems.

alveolus	villus	nephron
sarcomere	capillary	neuron

- For each component, describe the structure of the component and explain how that structure is responsible for the function of that component.
- For the three components that you chose in part (a), explain how the structure of the component contributes to the functioning of the organ system to which it belongs.

### 2004 Form B Question 3

Homeostasis, maintaining a steady-state internal environment, is a characteristic of all living organisms. Choose three of the following physiological parameters and for each, describe how homeostasis is maintained in an organism of your choice. Be sure to indicate what animal you have chosen for each parameter. You may use the same animal or different animals for your three descriptions.

- Blood-glucose levels
- Body temperature
- pH of the blood
- osmotic concentration of the blood

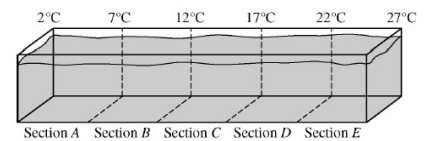
### 2006 Question 4

The evolution of circulatory systems allowed larger and more-complex animals to arise.

- Describe the respiratory and digestive systems' specialized structures that facilitate the movement of oxygen and glucose into the circulatory system of mammals.
- Explain how glucose and oxygen are transported within the circulatory system of mammals.
- Explain the transfer of oxygen and glucose from the blood and active cells of mammals.

### 2009 Question 1

An experiment on a species of small freshwater fish recorded their behavioral responses to different temperatures. Ten fish were each tested once, one at a time. First, a fish was removed from a stock tank (maintained at 22°C) and placed in the temperature-gradient tank. After the fish had spent 30 minutes in the temperature-gradient tank, the section where the fish was located was recorded. Other observations were taken every 5 minutes, for 7 observations per fish.



- Construct the appropriate type of labeled graph showing the relationship between water temperature and fish distribution. Summarize the outcome of the experiment.
- Identify two variables that were not specifically controlled in the experimental design, and describe how these variables might have affected the outcome of the experiment.
- Discuss two ways that water temperature affects the physiology of fish in this experiment.

Section	Fish/Section
A	9
B	11
C	34
D	12
E	4

### 2009 Form B Question 4

Many organisms require a continuing source of oxygen for respiration. Discuss important structural and physiological adaptations for oxygen uptake in three of the following

- A paramecium
- A tree
- A fish
- A mammal

### 2013 Question 7

Rats averaging mass of 300 g were tested over a three-month period. For each rat, urine was collected over a three-hour period after eating 10 mL of liquid (water, 1% ethanol solution, or 5% ethanol solution). The volume of urine was measured, and results were averaged for rats within each experimental group. The data are shown in the table below

THREE-HOUR URINE OUTPUT FOLLOWING FLUID INGESTION

Fluid ingested (10 ml)	Water	1% Ethyl Alcohol	5% Ethyl Alcohol
Average urine output (ml)	3.5	3.8	4.7

- Pose ONE scientific question that the researchers were most likely investigating with the experiment.
- State a hypothesis that could be tested to address the question you posed in part (a).
- Using the data in the table, describe the effect of ethyl alcohol on urine production.