

THE BODY'S FILTERING SYSTEM

BENCHMARKS AND TASKS

SC.F.1.2.1 The student knows that the human body is made of systems with structures and functions that are related.

SC.F.1.2.3 The student knows that living things are different but share similar structures.

- The student knows that processes needed for life are carried out by the cells and that complex animals have specialized organs to carry out life processes.
- The student uses a model to explain the functions of the major organ systems of the human body (e.g., digestion, respiration, circulatory, skeletal, nervous, muscular, excretory).

KEY QUESTION

How are waste products removed from the blood in the kidneys?

BACKGROUND INFORMATION

The job of the excretory **system** is to remove wastes produced by the activities of cells. Many of these wastes are eliminated as liquid urine. Urine is formed by the urinary system, which is made up of the kidneys, the ureters, the urinary bladder, and the urethra.

Kidneys are filters that are located near your spine in the middle of your back. The kidneys perform two jobs. They retain non-waste materials (e.g., proteins, sugar) to be reabsorbed into the blood stream through the circulatory system, and they rid the body of wastes. These waste products are eliminated from the body in the form of urine. This separation is accomplished through a process called filtration. Each kidney is a mass of more than a million filter tubes, called nephrons, where blood is filtered in and then out again. In one minute, more than one quart of blood will make its way through the kidneys. The blood enters the kidney through a large artery and flows into ever-smaller blood vessels. Waste products are collected in these tubes and drain from each kidney to the bladder in the form of urine through tubes called ureters. The bladder is a muscular bag located in the middle of your lower abdomen. The urine enters and is stored in the bladder and exits the body through a single tube called the urethra.

The roles of the excretory system and the digestive system are different in eliminating wastes from the body. Feces are the unusable remains of food you eat. Urine is cellular waste that has been filtered from your bloodstream.

MATERIALS

Teacher

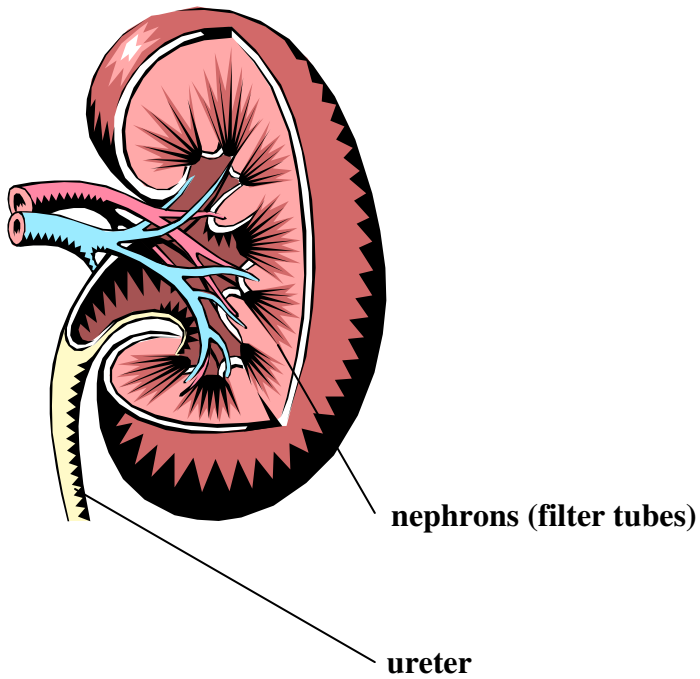
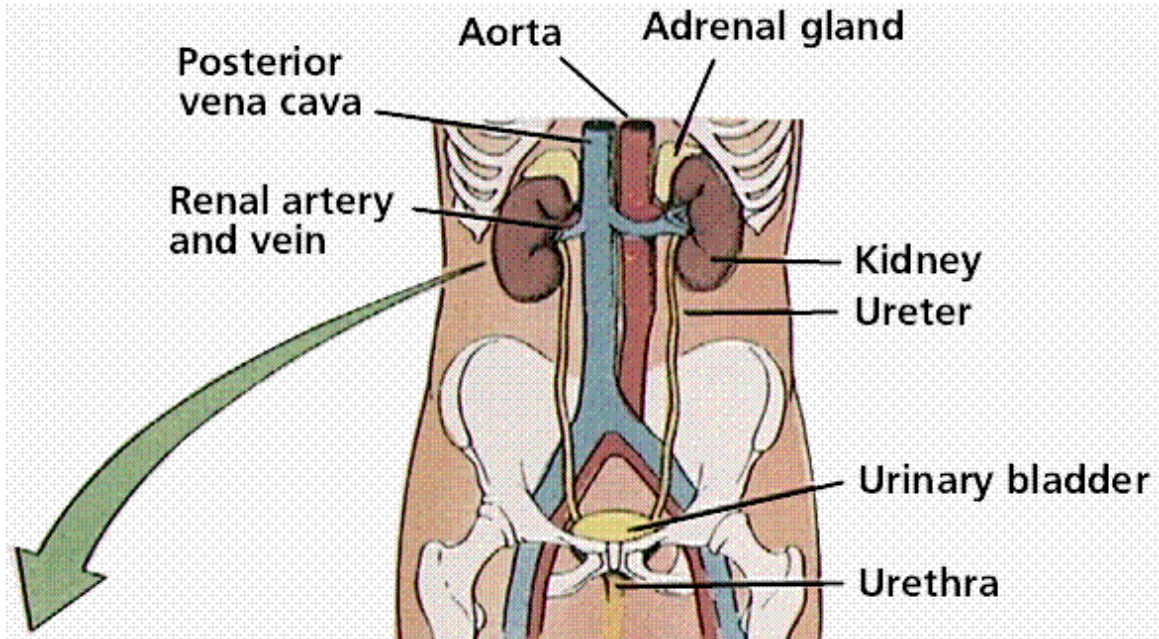
coffee pot and filter (optional)

Per class

model of the human body

Per group

2 plastic cups
food coloring
1 coffee filter
1 piece of chalk
water
1 small spoon
paper towels
1 rubber band



KIDNEY

ENGAGE

Discuss how the body must separate waste products from useful products. Relate to things students have seen filtered in daily life (e.g., coffee, water). Display a coffee filter and coffee pot. Discuss why the coffee filter is necessary because it separates the waste – the used coffee grounds – from the coffee.

EXPLORE

Part 1

1. Use the model of the human body to point out the main parts of the urinary system.
2. Have students draw and label a diagram of the kidneys and bladder. Discuss the function of each part. Clarify and discuss the following terms: kidney, bladder, urethra, ureter.

Part 2

Tell students that they will be demonstrating how the kidneys work as a filtration system for the body. Provide the following directions for each group, along with 2 plastic cups, water, food coloring, coffee filter, spoon, paper towel, and chalk.

1. Pour enough water to fill one cup half full.
2. Add a few drops of food coloring.
3. Crush the chalk on a paper towel.
4. Add ½ spoonful of crushed chalk to the colored water.
5. Place the coffee filter over the top of the second cup and secure with a rubber band, if needed.
6. Slowly pour the colored water mixture onto the filter.
7. Observe the contents of the coffee filter and the cup.

EXPLAIN

What happened in this investigation that is similar to what happens to blood in the kidneys? (The filter separated the waste products from non-waste products.)

Where is the waste product and where is the non-waste product? (The waste product, urine, is in the filter. The non-waste is in the bottom container.)

If the colored water in the bottom container represents the non-waste product found in the urinary system, what will happen to it in the body? (It will be reabsorbed into the body through the circulatory system.)

If what remains in the coffee filter represents the waste product known as urine, what will happen to it in the body? (The urine will pass from the kidneys into the bladder through the ureters. The urine will be stored in the bladder until it is released, and it will then exit the body through the urethra.)

EXTEND/APPLY

Discuss ways to keep the kidneys in good working order. (e.g., Stress the importance of drinking water every day to flush out the body's excretory system.)

ASSESSMENT

Have students answer the key question: How are waste products removed from the blood in the kidneys?