



Lesson Plan: Respiration and excretion

Grade Level: 8

Subject: Life Science

Duration: 45–60 min

NGSS MS-LS1-3: Use argument supported by evidence for how the body is a system of interacting subsystems composed of groups of cells.

Learning Objectives

By the end of this lesson, students will be able to:

- **Trace** the path a breath of air takes from the nose through the pharynx, trachea, and bronchi to the alveoli.
- **Explain** how gas exchange at the alveoli moves oxygen into the blood and carbon dioxide



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is about the size of a classroom, and that large surface is what lets the lungs move so much gas so quickly.

- **Gas exchange:** The trade that happens where the alveoli meet the capillaries: oxygen passes through both walls into the blood and attaches to the red blood cells, while carbon dioxide passes out of the blood into the alveoli to be breathed out.
- **Capillaries:** The smallest blood vessels, found in dense networks between arteries and veins. Their walls are thin enough for substances such as oxygen, carbon dioxide, water, and wastes to pass through, so they are the site where blood actually exchanges materials with the rest of the body.



- **Diaphragm:** The large muscle beneath the lungs that drives breathing. It contracts and moves downward so the chest enlarges and air is pulled in, and relaxes upward so the chest shrinks and air is forced out.
- **Excretion:** The removal from the body of the wastes its own cells produce, including carbon dioxide, excess water, and urea. If these wastes were not removed they would build up and poison the body.
- **Urea:** The waste chemical the body produces when it breaks down proteins. The kidneys filter urea out of the blood, and it leaves the body dissolved in urine.
- **Nephron:** One of about a million tiny filtering units inside each kidney. Blood entering a nephron loses water, glucose, urea, and other wastes into a capsule, the materials the body still needs are reabsorbed into the blood, and what remains becomes urine.

 **Materials Needed:** (all links are included in this PDF)



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neck as a lung, a second balloon stretched across the open bottom as the diaphragm, and a rubber band

- Kidney filtration model parts: a coffee filter, a clear cup, sand, dried beans, and water
- Desk-sized labeled diagrams of the respiratory system and of the kidney, ureters, urinary bladder, and urethra

Lesson Procedure

Step 1: Introduction (5 minutes)



- Open by asking: 'You take about 20,000 breaths a day. What is your body pulling out of that air, and what is it sending back out?'
- Have students place one hand on the ribs and one just below them, take a slow deep breath, and describe aloud what moves and in which direction.
- Tell students the lesson follows two journeys: one breath of air in and back out, and one waste product from the blood out of the body.

Step 2: Direct Instruction (15 minutes)

- Walk the class through the path of air in the Study Guide, from the nose through the pharynx, trachea, and bronchi, pointing out the cilia and mucus that trap particles and the cartilage rings that hold the trachea open.

(<https://newpathworksheets.com/api/guide/study-guide-science-grade-8-respiration-and-excretion-1.pdf>)

- Use the Study Guide's alveoli and capillary diagram to explain gas exchange, and point out that oxygen is only 21 percent of the air breathed in while the lungs' inner surface is about the size of a classroom. (<https://newpathworksheets.com/api/guide/study-guide-science-grade-8-respiration-and-excretion-1.pdf>)



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and which stand for the blood cells too large to be filtered out.

- Complete the first five items of Practice Worksheet 0 together, checking the order of the air pathway and the composition of the atmosphere against the Study Guide.

(<https://newpathworksheets.com/api/worksheet/worksheet-science-grade-8-respiration-and-excretion-1-0.pdf>)

Step 4: Independent Practice (15 minutes)

- Have students complete Practice Worksheet 1 independently, covering where the alveoli sit, which blood cells carry the gases, which muscle expands the rib cage, and which system



removes wastes. (<https://newpathworksheets.com/api/worksheet/worksheet-science-grade-8-respiration-and-excretion-1-1.pdf>)

- Assign Practice Worksheet 2 on the excretory system: where urea comes from, how nephrons act as filters, what is reabsorbed rather than excreted, and how the kidneys hold water levels steady. (<https://newpathworksheets.com/api/worksheet/worksheet-science-grade-8-respiration-and-excretion-1-2.pdf>)
- Ask students to draw a labeled one-breath flow diagram on the back of their worksheet, from nose to alveoli to blood, with a return arrow showing carbon dioxide leaving.

Step 5: Assessment (10 minutes)

- Review the completed Practice Worksheet 2 against its answer key, checking that students can name protein breakdown as the source of urea and can order the path from nephron to urethra. (<https://newpathworksheets.com/api/worksheet/worksheet-science-grade-8-respiration-and-excretion-1-2.pdf>)
- Have students sort everyday examples as something the body takes in or a waste it excretes: the oxygen in an inhaled breath, the carbon dioxide in an exhaled breath, the water vapor



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For learners needing support:

- Provide a pre-labeled respiratory-system diagram with the nose, pharynx, trachea, bronchi, and alveoli already named so students can trace the path of air with a finger before writing it.
- Give students a cut-apart set of five cards reading kidney, nephron, ureter, urinary bladder, and urethra to physically order before starting Practice Worksheet 2.



Extension Activities

- Build individual bottle-and-balloon lung models in pairs, then test how far the diaphragm sheet must be pulled to fully inflate the balloon and relate that to a deep breath versus a shallow one.
- Measure breathing rate at rest and again after one minute of jumping in place, then explain the change in terms of how much oxygen working muscle cells need and how much carbon dioxide they produce.
- Track water intake for three days against the Study Guide's two-liter recommendation and describe how the kidneys respond when intake falls short.

Complete List of Available Resources:

- NewPathWorksheets: Respiration and excretion
(<https://newpathworksheets.com/science/grade-8/respiration-and-excretion-1>)



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RESPIRATION AND EXCRETION

Respiratory System Functions

The respiratory system is the process of taking oxygen from the air and bringing it into the body and removing carbon dioxide from the body.

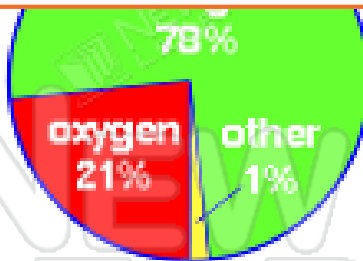
In order to get energy from glucose, the cells of the body require oxygen. As we learned in Topic 4, respiration is a process that cells use to get energy by breaking down food molecules and releasing the energy that the food holds.

The process of respiration in the body creates the waste materials of carbon dioxide and water. The carbon dioxide and some of the water is eliminated from the body through the lungs.



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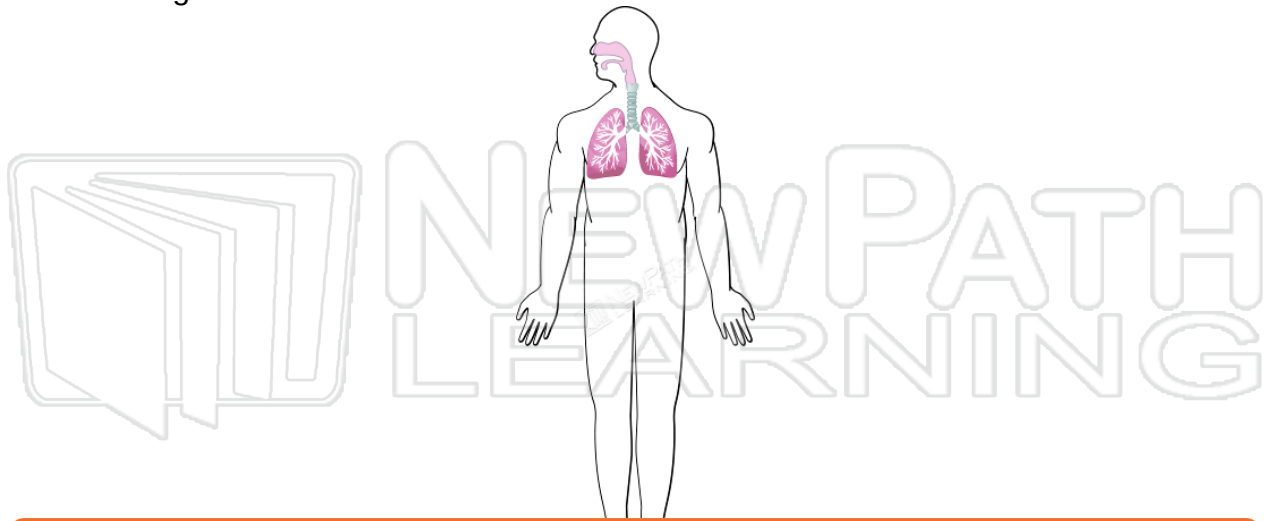
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There are many filters throughout the respiratory system that trap and eliminate pathogens and other materials. The system's structures also help to warm and moisten the air in the body.

Structures of Respiratory System

Air travels through the nose, pharynx, trachea, and the bronchi within the lungs.



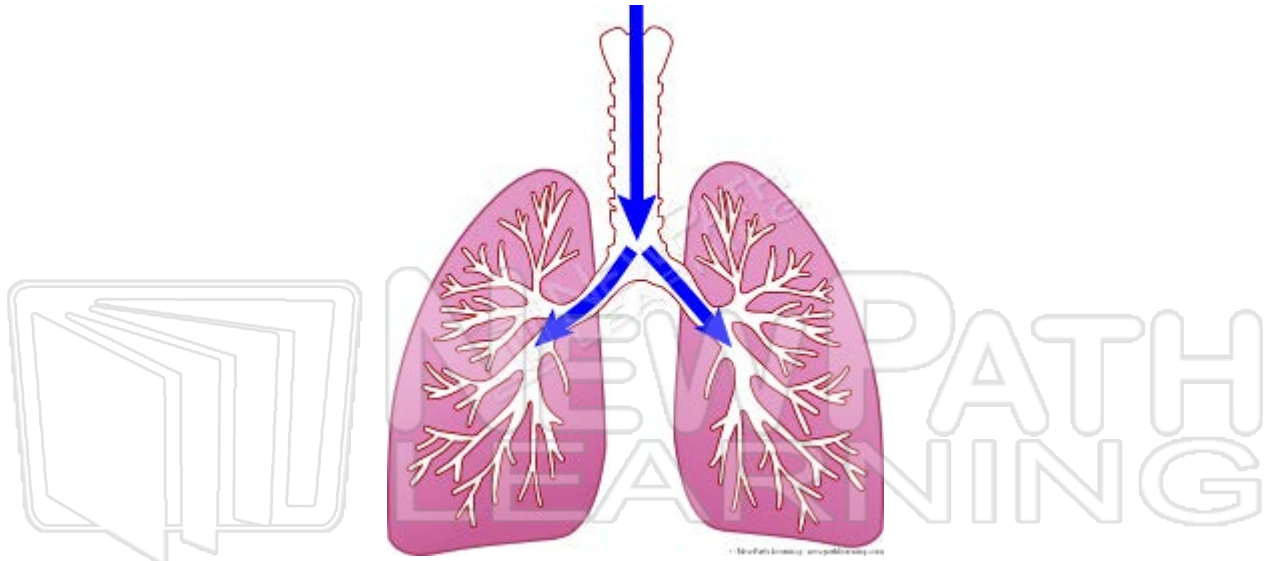
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invading particles to be ejected from the body. The **epiglottis** seals off the opening to the trachea so that food does not enter.

Bronchi: The air then enters the **bronchi**, which are two passages that lead into the lungs.





The **lungs** are the key organs of the respiratory system.
The left bronchus leads into the left lung and the right bronchus leads



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Process of Respiration

On average, a person will take around 20,000 breaths a day! Here is what happens with each breath:

When air enters the nose, passing through the pharynx, trachea, and bronchi to get to the alveoli, oxygen will pass through the walls of the alveoli and then the walls of the capillaries (yes, there are blood vessels in your lungs) and into the blood. Carbon dioxide will pass from the blood, through the capillary walls and into the alveoli.

As a red blood cell passes through a capillary, it is loaded with carbon dioxide until it reaches the alveoli. Once the cell is next to the alveoli, the carbon dioxide quickly unloads while oxygen attaches to the hemoglobin. This is the **process of gas exchange**.

If you were to open every surface within the lungs, the surface area would be the size of an average classroom! This large amount of surface area allows the alveoli to exchange a large amount of gases.

Muscles in the respiratory process

Every breath that you take is controlled by muscles. Muscles attached to **the ribs and the diaphragm** are used when you breathe.

The diaphragm plays an important role in the breathing process. When a person inhales, the rib muscles contract, causing the chest to move up and out. The diaphragm also contracts moving downward.



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actual process of waste removal is called **excretion**.

If wastes were not eliminated from the body, they would begin to poison the body and cause you to get sick or even die. This system is another important system in your body! Excretion eliminates potentially harmful materials from the body and helps to maintain homeostasis.

As we learned in Topic 16, kidneys are organs that eliminate wastes produced by the cells. The waste products are carbon dioxide, excess water, and **urea**. Urea is a chemical that is produced when the body breaks down proteins. All of the waste materials produced by the two kidneys are combined in a fluid called **urine**. The kidneys act like filters, removing wastes that are in the blood.

Lesson Checkpoint:
What is the waste product from the processing of proteins?

Each of the two kidneys contains a million structures called **nephrons** that filter the blood. After entering the kidneys, blood flows through smaller and smaller arteries until it reaches capillaries in a nephron. Materials such as water, glucose, urea and other wastes are filtered out of the blood.



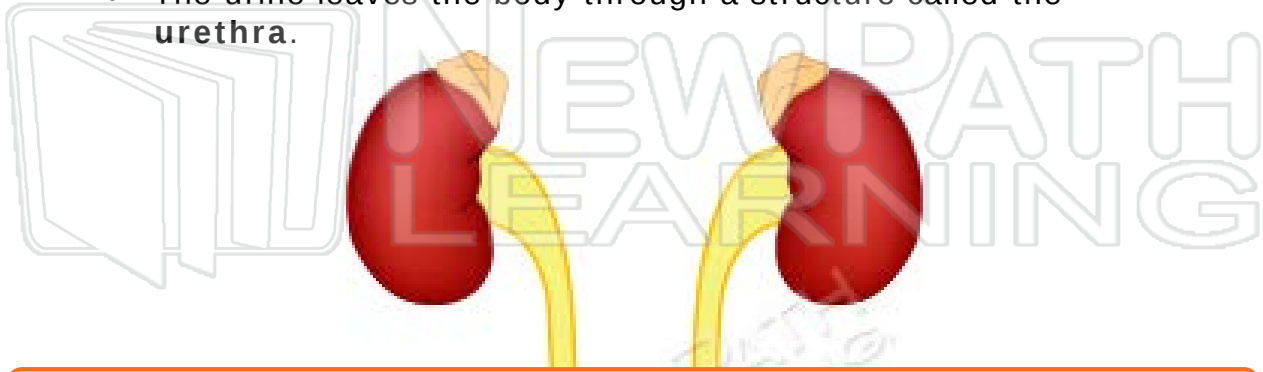
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The filtered materials then move through a capsule of the nephron. Blood and other materials stay within the capillaries. The filtered materials form urine and run through tubes. Some of the materials that were filtered are needed by the body, so they are reabsorbed into the blood. Waste products remain in the tubes and flow through the tubes out of the body by the following path.

Path of Urine Removal

- The wastes produced by the kidneys run through tubes called **ureters**.
- The ureters carry urine to a structure called the **urinary bladder**. When this structure is full, it pushes on nerves that let the body know that the urinary bladder must be emptied.
- The urine leaves the body through a structure called the **urethra**.



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Excretion and Homeostasis

The kidneys are involved in maintaining the level of water that is in the body. The amount of water that is reabsorbed into the body depends on the conditions inside and outside the body. If the temperature is hot outside the body, the kidneys will allow more water to reabsorb than if it were cold.

It is important to keep the kidneys working the best they are able by bringing in at least two liters of water into your body everyday. This ensures that a water balance within your body is maintained.

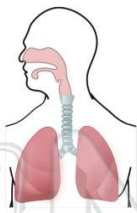


Name _____ Class _____ Date _____

1

What is the **function** of the **respiratory system**?

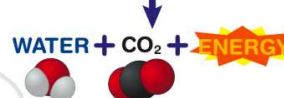
- A get carbon dioxide and get rid of oxygen
- B get oxygen and get rid of carbon dioxide
- C break down nutrients
- D deliver nutrients to the cells of the body



2

Which is a **waste** created by **respiration**? **GLUCOSE + OXYGEN**

- A oxygen
- B energy
- C nitrogen
- D water



3

Which **body systems** are most important for **respiration**?

- A circulatory, digestive, and respiratory
- B respiratory, excretory, and digestive
- C digestive, immune, and muscle
- D nervous, respiratory, and immune

4

How much of the **atmosphere** is **oxygen**?

- A 78%
- B 21%
- C 9%
- D 1%



5



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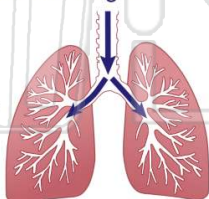
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9

Which item best **resembles the bronchi** that spread out inside the lungs?

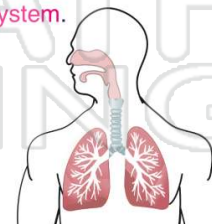
- A a garden hose
- B a carpet
- C a blade of grass
- D a tree



10

The _____ the **main structure** of the **respiratory system**.

- A bronchi are
- B lungs are
- C nose is
- D pharynx is



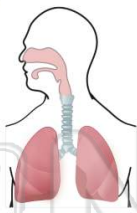


Name _____ Class _____ Date _____

1

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- B get oxygen and get rid of carbon dioxide
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B

2

Which is a **waste** created by **respiration**? **GLUCOSE + OXYGEN**

- A oxygen
- B energy
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- D water



D

3

Which **body systems** are most important for **respiration**?

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- B respiratory, excretory, and digestive
- C digestive, immune, and muscle
- D nervous, respiratory, and immune

A

4

How much of the **atmosphere** is **oxygen**?

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- B 21%
- C 9%
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B

5



D

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7

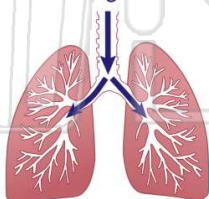
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C

9

Which item best **resembles the bronchi** that spread out inside the lungs?

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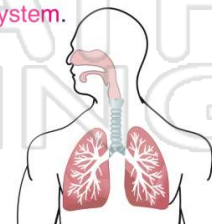


D

10

The _____ the **main structure** of the **respiratory system**.

- A bronchi are
- B lungs are
- C nose is
- D pharynx is



B

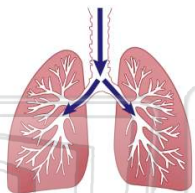


Name _____ Class _____ Date _____

1

The **left bronchus** leads into the **left lung** and the **right bronchus** leads into the **right lung**.

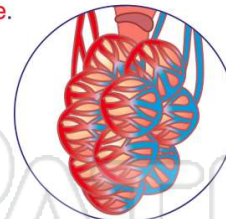
- A true
- B false



2

The **alveoli** specialize in **gas exchange**.

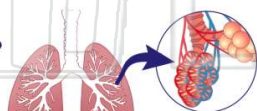
- A true
- B false



3

Where are the **alveoli** located?

- A at the end of the bronchi
- B inside the nostrils
- C surrounding the heart



4

Which part of the blood **exchanges** carbon dioxide for oxygen?

- A plasma
- B platelets
- C white blood cells
- D red blood cells



5



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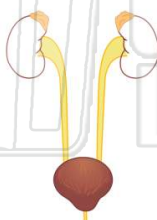
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9

What body system **removes wastes** from the body?

- A respiratory
- B circulatory
- C digestive
- D excretory



10

Why is it important to **get rid of wastes** created by the body?

- A to make room for more blood
- B to prevent sickness
- C to waste our white blood cells
- D to increase blood flow

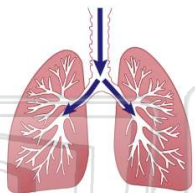




Name _____ Class _____ Date _____

- 1 The **left bronchus** leads into the **left lung** and the **right bronchus** leads into the **right lung**.

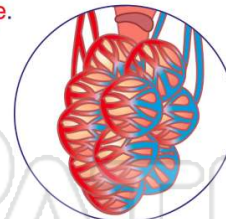
A true
B false



A

- 2 The **alveoli** specialize in **gas exchange**.

A true
B false



A

- 3 Where are the **alveoli** located?

A at the end of the bronchi
B inside the nostrils
C surrounding the heart



A

- 4 Which part of the blood **exchanges** carbon dioxide for oxygen?

A plasma
B platelets
C white blood cells
D red blood cells



D

5



B

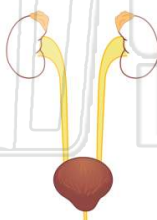
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B

- 9 What body system **removes wastes** from the body?

A respiratory
B circulatory
C digestive
D excretory



D

- 10 Why is it important to **get rid of wastes** created by the body?

A to make room for more blood
B to prevent sickness
C to waste our white blood cells
D to increase blood flow



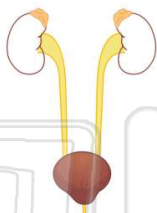
B



Name _____ Class _____ Date _____

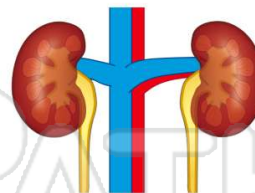
1 The breakdown of _____ produces **urea**.

- A carbohydrates
- B fiber
- C starch
- D proteins



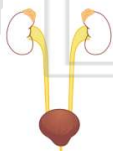
2 The **waste material** produced by the **kidneys** is called _____.

- A urea
- B urine
- C ureters
- D urethra



3 What is the **function** of the **urinary bladder**?

- A to store urine until it is eliminated
- B to eliminate waste from the body
- C to bring wastes from the kidneys



4 **Urine** leaves the body through the _____.

- A urinary bladder
- B urea
- C urethra
- D penis



5



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- C glucose
- D urea



9 In addition to filtering out urea, another **function of the kidneys** is to _____.

- A produce proteins
- B convert the waste into usable materials
- C maintain water levels in the body
- D help to pump blood around the body



10 The **kidneys** help the body **maintain** _____.

- A homeostasis
- B nephronites
- C body temperature
- D insulin

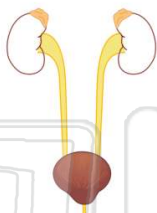




Name _____ Class _____ Date _____

1 The breakdown of _____ produces **urea**.

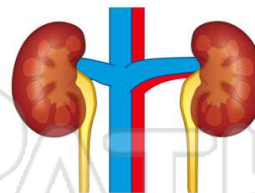
- A carbohydrates
- B fiber
- C starch
- D proteins



(D)

2 The **waste material** produced by the **kidneys** is called _____.

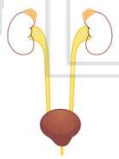
- A urea
- B urine
- C ureters
- D urethra



(B)

3 What is the **function** of the **urinary bladder**?

- A to store urine until it is eliminated
- B to eliminate waste from the body
- C to bring wastes from the kidneys



(A)

4 **Urine** leaves the body through the _____.

- A urinary bladder
- B urea
- C urethra
- D penis



(C)

5



(D)

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(A)

- C glucose
- D urea



9 In addition to filtering out urea, another **function of the kidneys** is to _____.

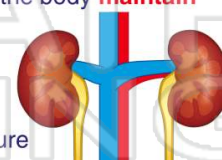
- A produce proteins
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- D help to pump blood around the body



(C)

10 The **kidneys** help the body **maintain** _____.

- A homeostasis
- B nephronites
- C body temperature
- D insulin



(A)



Name _____ Class _____ Date _____

Match each of the following terms to its definition:

Alveoli

Lungs

Bronchi

Bile

Complex carbohydrates

Esophagus

Capillaries

Emphysema

1.
to breathe

- the organ that animals who live on land use

2.
the exchange of gas between the blood and air

- small sacs within the lungs that specialize in

3.
tempo
fat dig

4.
to car

5.
netwo
excha

6.
of mar
rice and grains

7.
smokers, where the air spaces enlarge to where they no longer function

8.
the stomach

- a tube of muscle that connects the mouth to

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Name _____ Class _____ Date _____

Match each of the following terms to its definition:

Alveoli

Lungs

Bronchi

Bile

Complex carbohydrates

Esophagus

Capillaries

Emphysema

1. **lungs** - the organ that animals who live on land use to breathe

2. **alveoli** - small sacs within the lungs that specialize in the exchange of gas between the blood and air

3. **bile**
bladder

4. **bronchi**
out of

5. **capillaries**
between

6. **complex carbohydrates**
many
rice and grains

7. **emphysema** - a disease of the lungs very common in smokers, where the air spaces enlarge to where they no longer function

8. **esophagus** - a tube of muscle that connects the mouth to the stomach



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