



# Spark of SCIENCE

Grade 6  
Answer Key





Grade 6

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Spark of  
SCIENCE





What is electricity?

## Vocabulary



- Static electricity
- Charges
- Lightning
- Attract
- Repel
- Electric current
- Series circuit
- Parallel circuit
- Conductors
- Insulators

## Objectives



- Define electricity.
- Distinguish between static and current electricity.
- Build series and parallel circuits.
- Compare conductors and insulators.
- Explain how conductors and insulators are used.

### What causes your hair to stand up straight when you glide down a slide?

Why do you feel a shock when you touch a metal door knob after rubbing your feet on a carpet? The cause of these things is static electricity as you have learned before. Let's review static electricity.

### Activity

#### Materials:

4 balloons, a metal can of soft drink, paper scraps, and a piece of wool

**Note:** a narrow stream of water from a tap is needed in the third part of this activity.

#### Procedure:

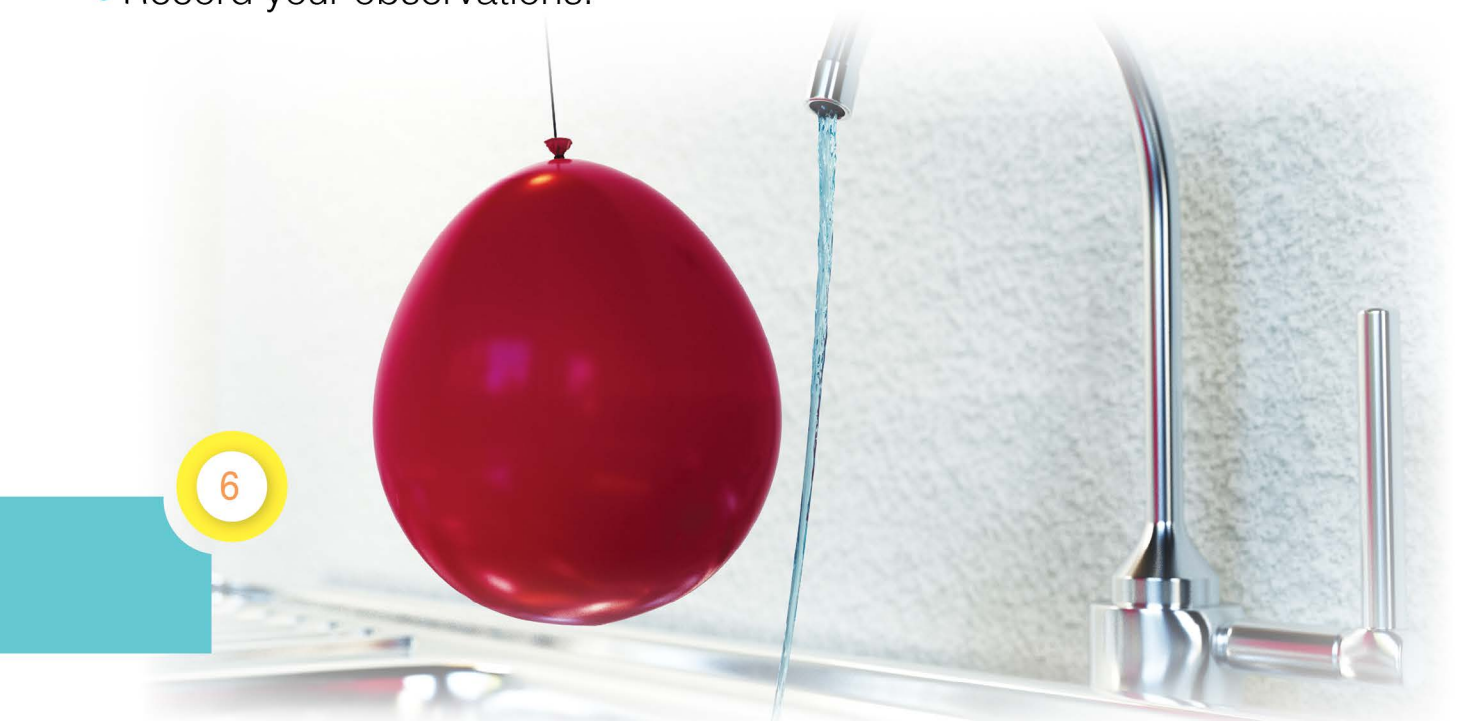
- Rub one of the balloons to the piece of wool.
- Move the balloon near the paper scraps.
- Observe what happens.





- Record your observations.
- Move the same balloon near the metal can.

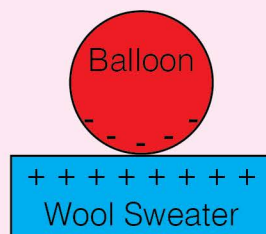
- Record your observations.
- Let the tap run gently so that it has a narrow stream of water coming out.
- Move the second balloon near the stream of water. Does any change occur?
- Rub the balloon to the piece of wool.
- Move the rubbed balloon near the stream of water. Observe what happens.
- Record your observations.



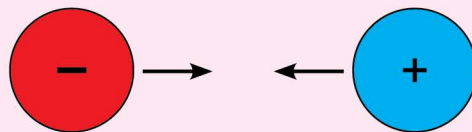
- Rub two balloons to the piece of wool.
- Hold the two rubbed balloons next to each other, and observe what happens.

**Static electricity** is the build-up of an electrical charge on the surface of an object. Static electricity can cause materials to attract or repel one another.

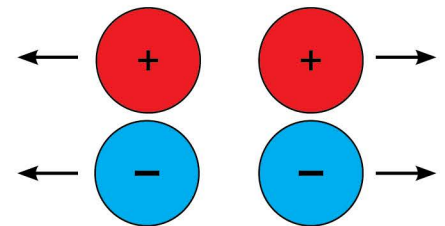
When we rub a balloon with a piece of wool, the balloon becomes negatively charged and the piece of wool positively charged.



Opposite charges attract; so that the rubbed balloon will attract the piece of wool when they are placed next to each other.



Similar charges repel. The two rubbed balloons repel each other because they have the same charge.



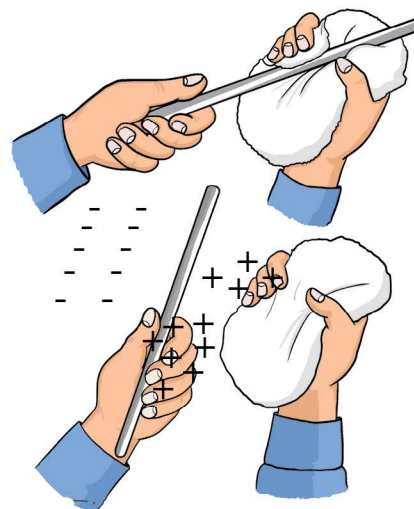
Both types of charges (the positive and the negative charges) will be attracted to neutral material; so that the charged balloon attracts paper scraps when it moves near the scraps, and the rubbed balloon causes the water stream to bend towards it.



There are three methods of charging an object:

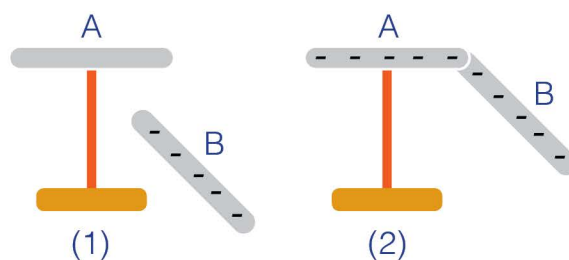
### 1. Charging by friction:

When two uncharged objects rub together, the negative charge from one object can move to the other object.



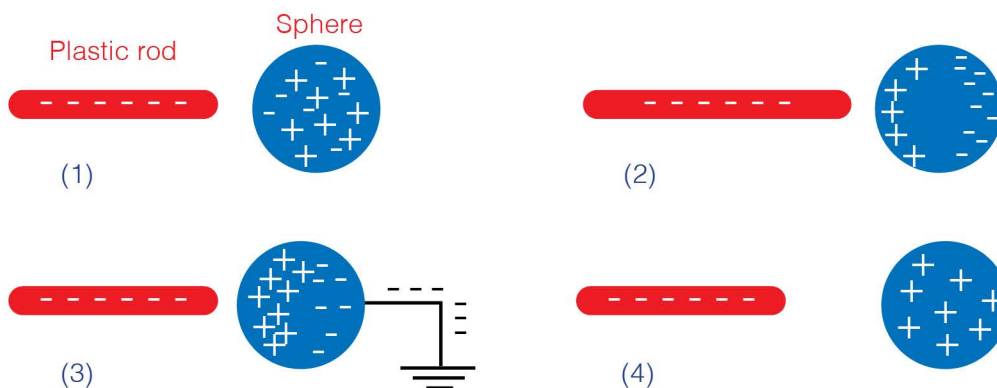
### 2. Charging by conduction:

When a charged object touches another object, negative charges transfer from a charged object to another object by direct contact.



### 3. Charging by induction:

In this method, objects do not touch. The negative charge on an object repels negative charges and attracts positive charges of the other object. The overall positive charge is induced on the near edge of the other object.



# Think



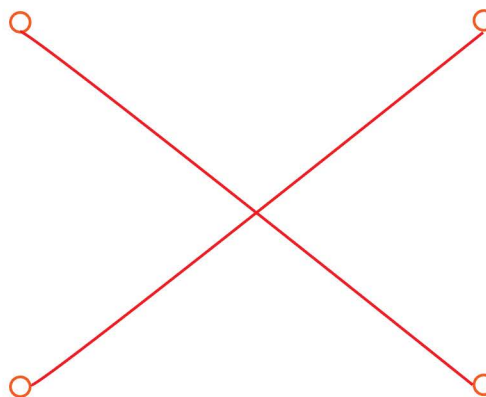
**Search:**  
How is lightning related to static electricity?

Stay at home while lightning strikes and away from windows, doors and garages because the electrical current associated with lightning may cause death.

Does a bigger rubbed balloon make the stream of water bend more?  
Design an experiment to check your answer.



- Why did the stream of water bend towards the rubbed balloon?  
~~.Because negative and positive charges will be attracted to neutral material material..~~
- Choose the sentence that matches each of the following forms.



Unlike charges attract each other.

Like charges repel each other.

# Lesson 2

## Electric circuit

**An electric current is the flow of electric charges in an electric circuit.**

You learned previously how to build a simple electric circuit. Let's review the simple electric circuit.

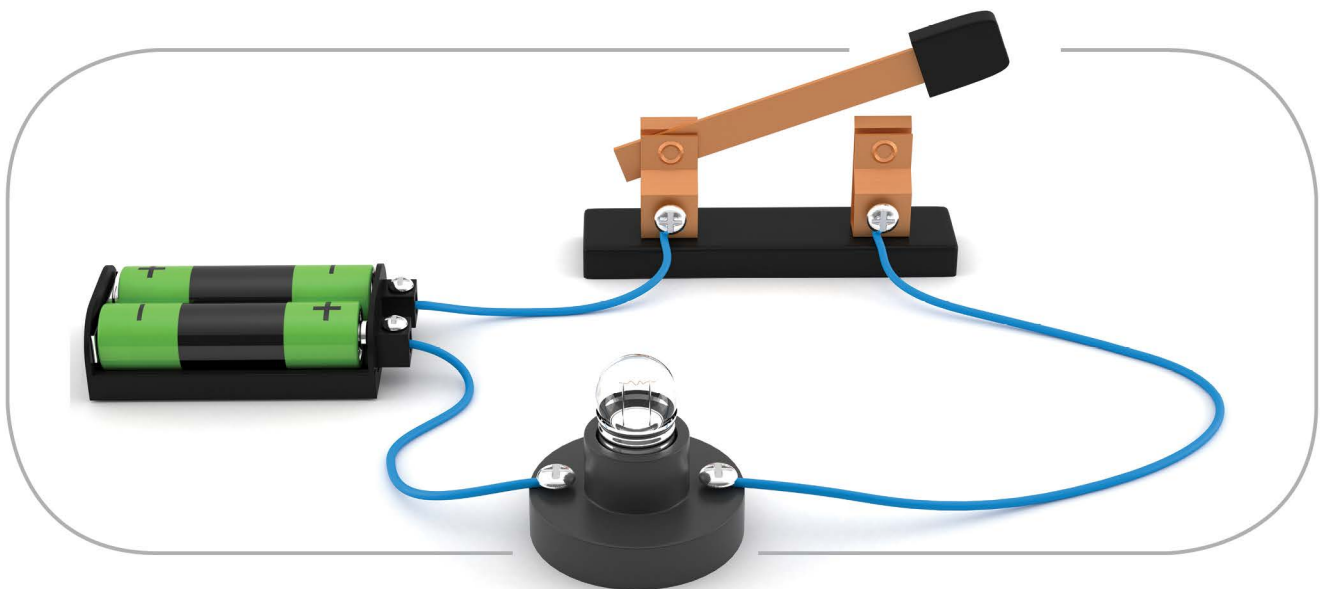
### Activity

#### Materials:

A battery, copper wires, a switch, and a light bulb

#### Procedure:

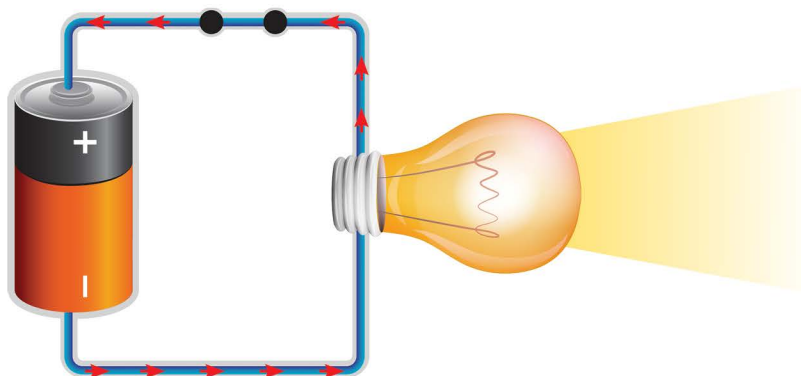
- Build an electric circuit using the materials. This figure will help you.



- Draw a diagram of what the circuit would look like if the switch was in the “off” position. **Students' own answers**
- What would happen if you replace the copper wires with rubber bands? **Rubber is an insulator which will cause the circuit not to turn on.**

- Trace the electric current in the following diagram.
- What is the type of charges that flow in a circuit (positive or negative)?

negative



Electric current flows only through a closed circuit. Turning off a switch or removing a part of the circuit will stop the current flow. When the electric current does not travel through a circuit, the circuit is open.

When a battery is in a closed circuit, the negative charges flow out from the negative end of the battery through the wires and back to the battery's positive end.

Learn More



Some standard symbols are used to represent the components of a circuit.

- Here are some of these symbols.

The component	The symbol
The battery	
The wire	
The switch	
The light bulb	

**Think**



Why do scientists use symbols to represent the components of a circuit? Draw a circuit using symbols.

symbols make it easier to show how the different components are wired.

We must be very careful and stay away from the places where this sign is because this sign warn us about danger of electric shock.



DANGER ELECTRIC  
SHOCK RISK



- Which component of the circuit indicates that it is closed?

The switch.....

- What is the effect of opening the switch of a circuit

(the switch at the off position)? Opening the switch interrupts the flow of electricity, causing the circuit to become open, and any connected devices (like light bulbs) will not work.

- Why is a battery used in a circuit?

A battery provides electrical energy to power the circuit.....

- Draw the symbols of the following components:

A- The wire



B- The switch



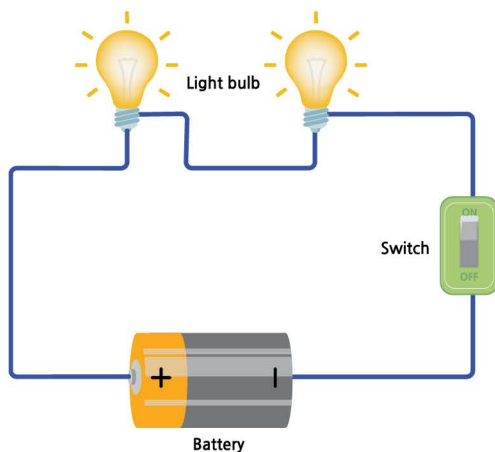
C- The light bulb



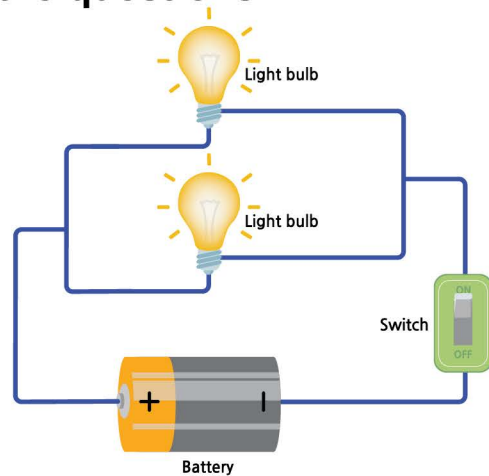
**There are two basic types of circuits:** series and parallel circuits. What is the difference between these types? Let's find out.

### Activity

**Look at the figures below and answer the questions.**



(A) Series Circuit



(B) Parallel circuit

- Trace the path of the current through the series circuit.
- Trace the path of the current through the parallel circuit.
- How many possible paths in the series circuit for the electric current to follow?

**One**.....

- How many possible paths in the parallel circuit for the electric current to follow?

**Two or more**.....

- In which circuit were the light bulbs brighter?

**parallel**.....

- Build series and parallel circuits.

Series and Parallel circuits differ from each other. In a series circuit several light bulbs are connected in one path; there is only one path for the electric current to follow. In a series circuit, if even one light bulb is burned out the whole circuit will not work.

In a parallel circuit, each bulb has its own path; if one light bulb is burned out, the other bulb will still work.



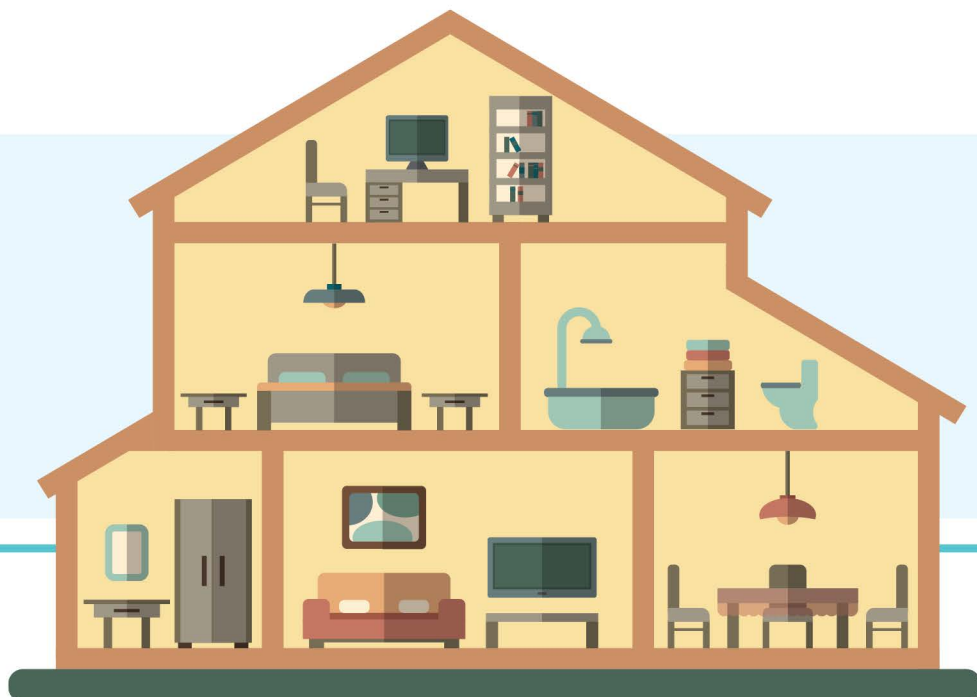
Series circuit connections are employed in electrical equipment. Fuses are connected in series with the device they protect.



Does the number of light bulbs in a series or a parallel circuit affect the brightness of the bulbs? Design an experiment to check your answer.

- How is the electricity wiring in your house? (Series or parallel wiring).

..parallel.....



# Electrical conductors and insulators

## Lesson 4

**Electrical wires are covered with insulating materials; explain why.**

What are electrical conductors and insulators? Let's find out.

### Activity

#### Materials:



Wood



Copper Wire



Wool



Metallic spoon



Incomplete circuit

## Procedure:

Try each of the previous materials to close the circuit.

- How would you know that the circuit is closed?
- Discuss the results with your classmates.

**An electrical conductor** is material through which charges can flow easily. For example, copper, silver, aluminum, and iron are good conductors.

**An electrical insulator** is material through which charges cannot flow easily. For example rubber, glass, plastic, and wood are good insulators.

### Insulator

Wood



Toothpicks



Cardboard Strips



Rubber Band



Clothespin



### Conductor



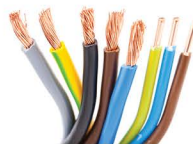
Aluminium



Jar Lid



Nails



Copper Wires



Key



- Insulated tools and handling equipment must be used when dealing with electricity.
- Insulating materials protect us from electricity.

Your body is a good conductor. Be aware while using appliances and electricity; electricity may cause death.



**Think**



Which part of the pencil is an insulator and which is a conductor?  
Wood is an insulator, metal is a conductor.





- Is a rock a conductor or an insulator?

An insulator.....

- Why is this worker wearing gloves while fixing electrical problems?

Because they are insulating gloves that protect him from potential electric.....  
shock.....

# REVISION

## 1. Circle the correct answer.

What happens when two objects with positive charges **come close to each other**?

- They attract each other.
- They will join together.
- They repel each other.

When a balloon is charged by rubbing it with a wool cloth:

- It can repel small pieces of paper.
- It can attract small pieces of paper.
- It does nothing when brought near small pieces of paper.

Which of the following is **not** an insulator?

- Wool.
- Plastic.
- Copper.

Which of the following is **not** an example of an insulator in the kitchen?

- Pots and pans.
- A wooden spoon.
- A plastic measuring cup.

## What is the difference between a conductor and an insulator?

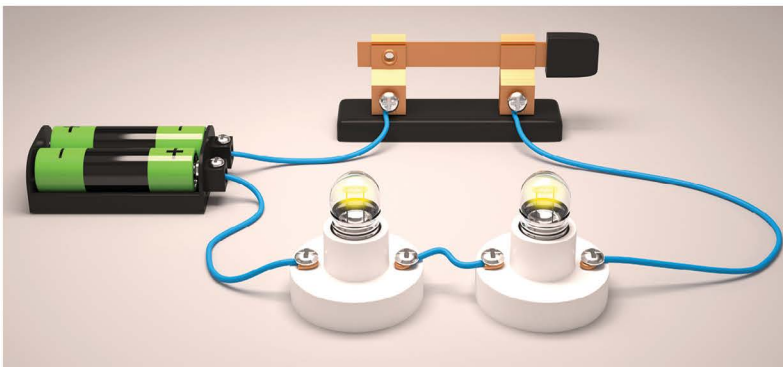
- An insulator allows electricity to flow through it easily and a conductor does not.
- A conductor allows electricity to flow through it easily and an insulator does not.
- An insulator is magnetic and a conductor is not.

## Why are electrical insulators important?

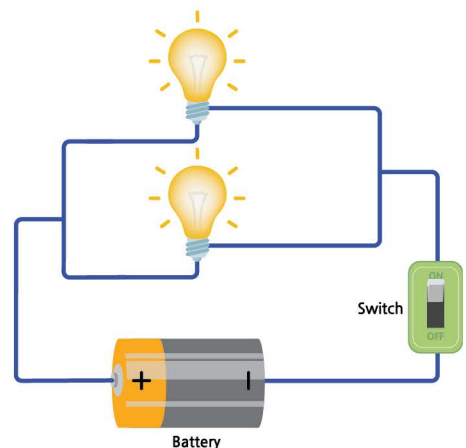
- They help the flow of electricity.
- They provide power for electric circuits.
- They are used to protect us from electricity.

**2. Is wood a conductor or an insulator?** ..... **An insulator** .....

**3. Identify which of the following circuits is a parallel circuit and which is a series circuit.**

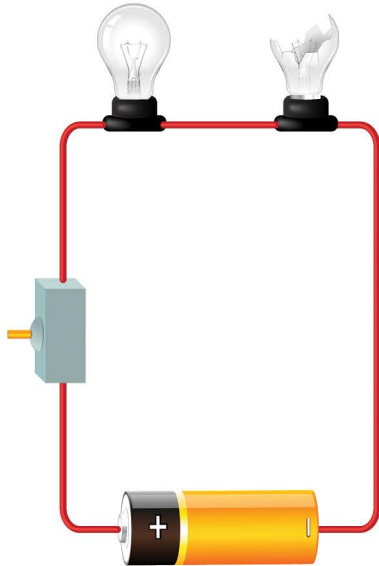


..... **Series** .....

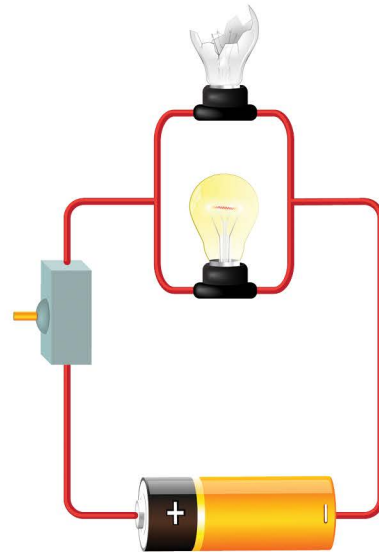


..... **Parallel** .....

4. What will happen to the electric current in the following circuits?

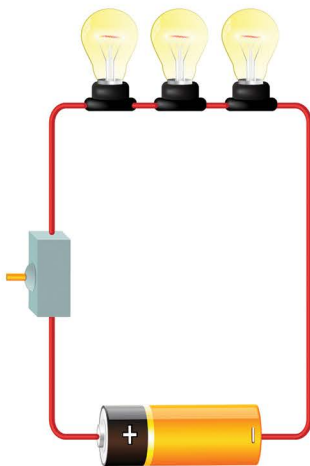


...electric flow stops.....

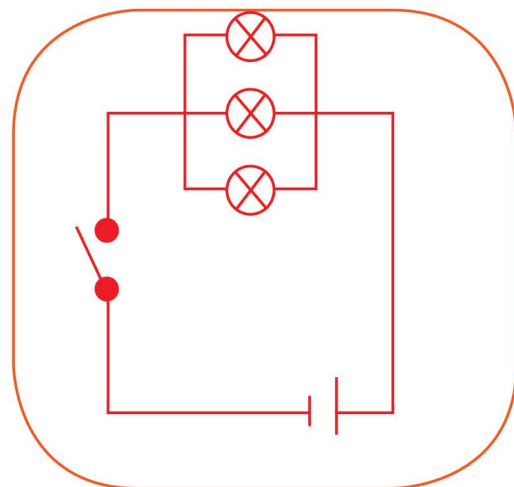


...electric flow continues..

5. Draw a parallel circuit with three light bulbs.



Series Circuit



Parallel Circuit



What are the properties of gold?  
Why does it differ from silver?

## Vocabulary



- Element
- Compound
- Acid
- Base
- Neutral
- Chemical symbol

## Objectives



- Recognise that matter is made up of elements.
- Compare the properties of different elements.
- Differentiate between element and compound.
- Explore the composition of different compounds.
- Classify substances into acids, bases or neutrals using litmus paper.

**Matter is anything that occupies space and has mass.**

It is made up of substances called elements. Elements are pure substances that cannot be broken down into any other substance. Elements are the simplest substances. Let's explore some of these elements.

### Activity

**Look at the following pictures of elements and answer the questions.**

Elements are represented by chemical symbols. Let's recognise some of these elements and their symbols.



Carbon



Copper



Bromine



Sulphur



Chlorine



Sodium

- Do all elements have the same properties? Discuss your answer with your classmates.

# Activity

## Elements and Symbols

Look at the table, and answer the questions.

- What are the symbols of:  
gold ..... **Au** ..... silver ..... **Ag** .....
- What element has the symbol (cu)?  
.. **Copper** .....

Element	Symbol	Element	Symbol
Nitrogen	N	Potassium	K
Sodium	Na	Copper	Cu
Chlorine	Cl	Hydrogen	H
Carbon	C	Helium	He
Cobalt	Co	Iron	Fe
Gold	Au	Mercury	Hg
Silver	Ag	Boron	B
Oxygen	O	Fluorine	F

Matter is made up of substances called elements. Elements are pure substances that cannot be broken down into any other substance. Elements have different properties, and they are represented by chemical symbols.



Most of the elements have symbols derived from their English name, but a few symbols are derived from Latin. These are: copper (Cu) from cuprum, gold (Au) from aurum, iron (Fe) from ferrum, potassium (K) from kalium, silver (Ag) from argentum, and sodium (Na) from natrium.



Choose an element and search for its properties.  
Students' own answers

- Define what an element is?  
**Elements are pure substances that cannot be broken down into any other substance.**  
.....
- Give two examples of elements and their chemical symbols.

.. **Silver (Ag)** .....

.. **Iron (Fe)** .....

**Elements chemically combine (join) to form compounds.**

It is hard to separate the elements out of the compound.  
Let's explore the formation of different compounds.

### Activity

Look at the following pictures and answer the questions.

A



B



C



Sodium (**Na**)

+

Chlorine (**cl**)

=

Table salt (**NaCl**)

- Name the elements that combine to form table salt (compound).  
..Chlorine and sodium.....
- Are the compounds and the elements that form it similar in properties?  
Explain your answer.

..No, compounds and their forming elements differ in properties, as compounds  
..often exhibit new characteristics not found in the individual elements.....

.....

**A compound** is a substance made up of two or more elements. Water is a compound. It is composed of hydrogen and oxygen. Hydrogen and oxygen are both gases. They combine to form water (compound) which is liquid.

Sugar is also a compound. It is composed of carbon, hydrogen and oxygen. The properties of the compound are different from the properties of the elements that form it.



Your body is composed of six major elements; oxygen, carbon, hydrogen, nitrogen, calcium, and phosphorus.



Search for other examples of compounds. **Glucose**



From where does our body get the necessary elements to stay healthy?  
**from food**

**1. Circle the element from the following:**

Carbon dioxide	Water	Table salt	Gold
Hydrogen	Silver	Fruits	Sugar

**2. Name the elements that form carbon dioxide.**

**Carbon and Oxygen**.....

**Chemical composition of each substance helps us to classify different substances and distinguish between them.**

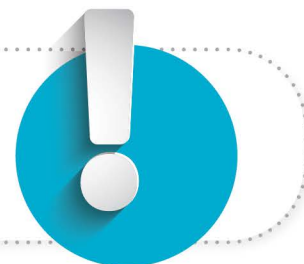
Substances are classified into acids, bases, and some are neutrals. Let's classify different substances.

### Activity

#### Materials:

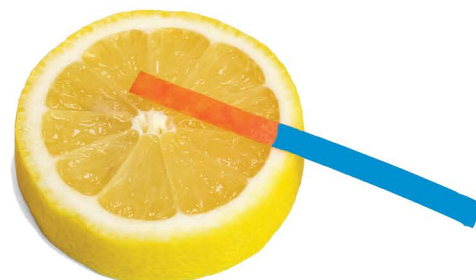
Litmus paper (blue and red), distilled water, lemon, vinegar, and baking soda

**Safety note:** when working in the lab, always wear goggles and gloves. Never touch, taste, or mix any materials that you are working with.



#### Procedure:

1. Place one end of a strip of blue litmus paper into each of the materials.



2. Observe the colour of the litmus paper, and record the result each time in the following table.

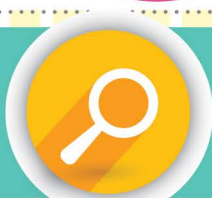
Material	Blue litmus paper	Red litmus paper

3. Place one end of a strip of red litmus paper into each of the materials; record the results in the table.

Substances are classified into acids, bases, and some are neutrals. Litmus paper turns from blue to red in the presence of an acid such as; vinegar and lemon juice, and from red to blue in the presence of a base such as backing soda and soap. Litmus paper stays as it is without any change of colour in the presence of neutral material.



Some acids and bases are very harmful. When you come into contact with some acids and bases, they cause eye damage and burning of your skin. Be aware when you see this sign.



Search for examples of indicators other than litmus paper that can be used to detect if the substance is a base or an acid. **Red cabbage juice or phenolphthalein.**

- A drop of liquid was placed on a blue litmus paper, and it turned red.

Was the liquid an acid or a base?

**Acid**.....

- Match to classify the following substances practically into acids or bases.

**cleaning detergent**

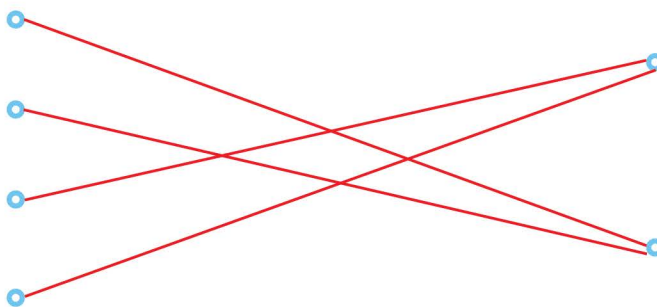
**chalk**

**tomato juice**

**milk**

**acids**

**bases**



# REVISION

## 1. Circle the correct answer.

What is the type of matter made of a combination of elements?

- Element.
- Compound.
- Indicator.

Which of the following is a compound?

- Carbon.
- Chlorine.
- Water.

Which of the following is an element?

- Sugar.
- Copper.
- Salt.

When we test an acid:

- Red litmus turns blue.
- Blue litmus turns red.
- Red litmus remains red.

## 2. Complete the following sentences.

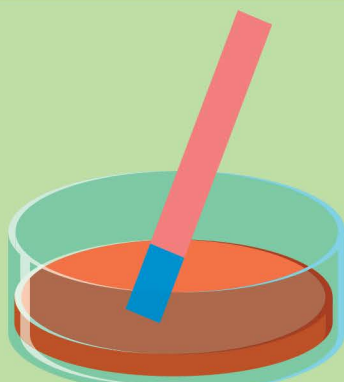
- ...**Litmus**..... paper is used to test acids and bases.
- Soaps and cleaners are examples of ...**bases**.....
- ...**Matter**..... is anything which has mass and occupies space.

### 3. Which of the two solutions is an acid and which is a base? Explain your answer.

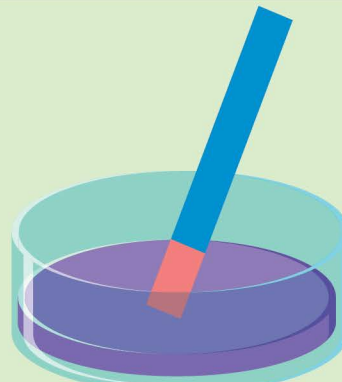
A is base because litmus paper turned blue.....

B is acid because litmus paper turned red.....

.....



(A)



(B)

### 4. Write true (T) if the statement is true and false (F) if the statement is false.

- Substances are classified into acids, bases and some are neutrals.
- An element can be broken down into a simpler substance.
- All elements have the same properties.
- A compound is a substance made up of one kind of element.
- Most of the elements have symbols derived from their English name, but a few symbols are derived from Latin.
- The properties of a compound are the same as the properties of the elements that form it.
- Baking soda is a base.

T

F

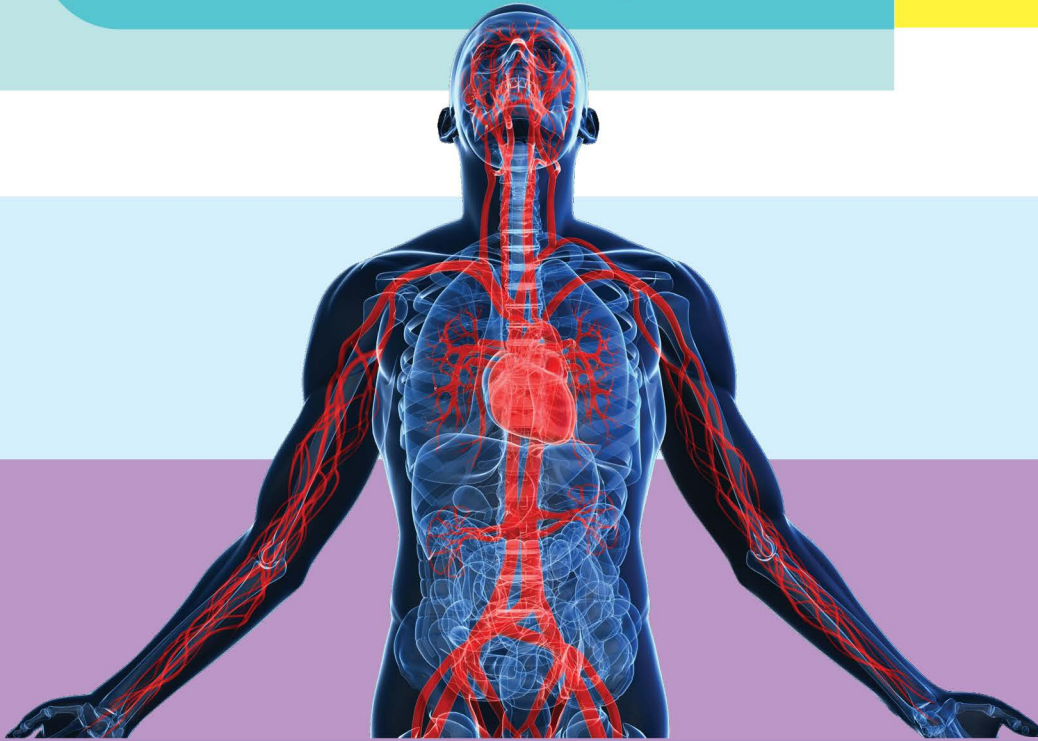
F

F

T

F

T



How does my body work?

### Vocabulary



- Organ
- System
- Digestive system
- Circulatory system
- Respiratory system
- Urinary system

### Objectives



- Investigate the major organs of the systems.
- Identify the parts of each system.
- Describe the systems which perform the necessary life functions of circulation, digestion, and excretion.
- Describe the relationships between the human systems.

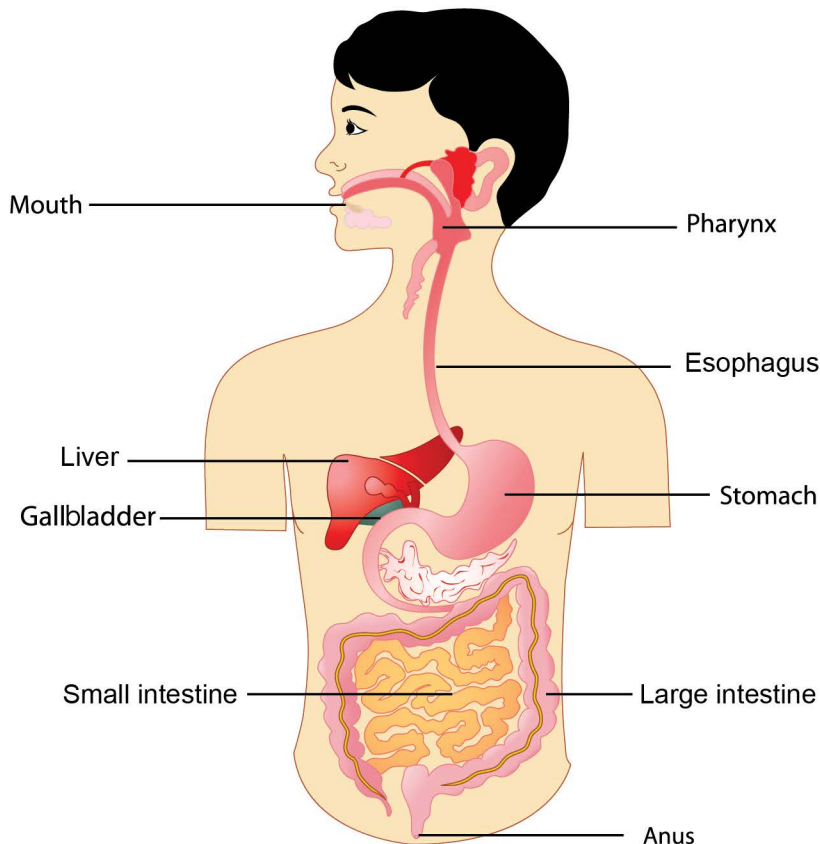
# Lesson 1

## The digestive system

**Your body is composed of many systems.** Each body system has a specific function that helps keep you alive. All body systems work together; a single body system cannot keep you alive. One of these systems is the digestive system. Let's find out the composition of the digestive system.

### Activity

**Look at the following figure, and trace food through the digestive system.**



Predict the function of each part in the digestive system.

## What is the main function of the digestive system?

Your digestive system breaks food into nutrients. Nutrients are used to produce energy. Energy is needed for your body to do its work and to keep you alive.

The digestive system begins in your **mouth** where the **tongue** and **teeth** work together to break up the food. **Salivary glands** produce liquid called saliva which makes the food wet and soft.

As you swallow, the food goes down a tube called the **esophagus**.

This tube goes into your **stomach**. The stomach contains acid and chemicals that digest, (break down) food. After the food has been ground and stirred in the stomach, it moves to the intestines. The intestines are very long and coiled up. The narrow part of the intestine is called the **small intestine**. The bigger part is called the **large intestine**.

In the small intestine, the food is mixed with more chemicals and liquids. The pieces of food become very small to see, and are called **nutrients**. They are absorbed into the blood. Blood carries these nutrients to all parts of the body. **Liver and gallbladder** also helps in digestion.

Some of the food is left in the small intestine and cannot be digested. It is then passed to the large intestine. It leaves the body through a little hole called the **anus**.



There are several things that you can do to help keep your digestive system healthy. Eat healthy food, drink enough water, sit down to eat your meals, and make sure that you chew your food well. If you don't chew your food well, your stomach has to work much harder to break the food down.

- It is very important to clean your teeth after each meal.
- Don't eat too much junk food.



Search for types of food that keep your digestive system healthy. **Fruits, vegetables, and grains**

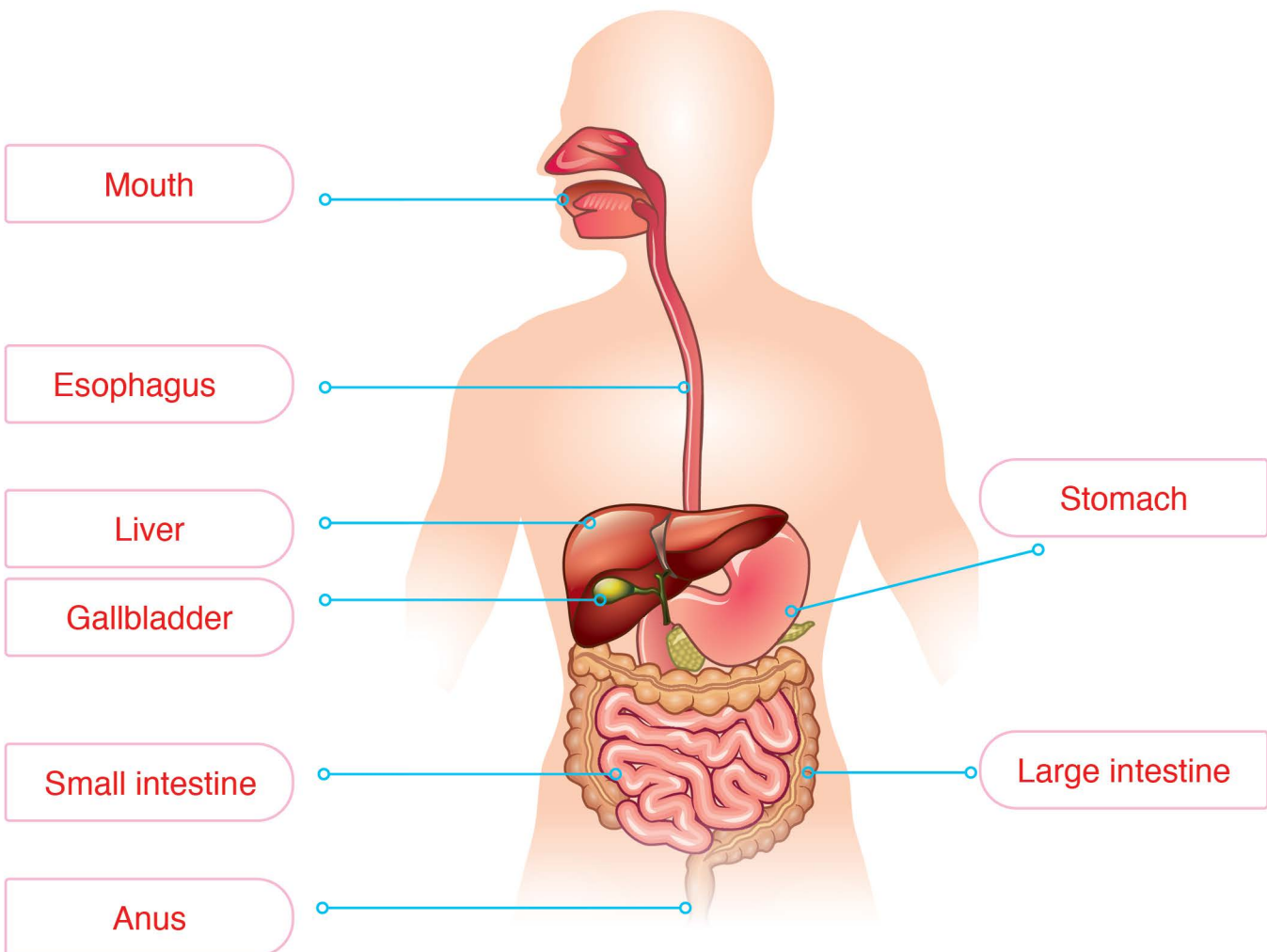


Make a poster to illustrate the importance of hygiene in digestive system care.

## Activity

**Fill the blanks with the suitable word.**

Liver, Gallbladder, Mouth, Anus, Stomach, Small Intestine, Large intestine, Esophagus

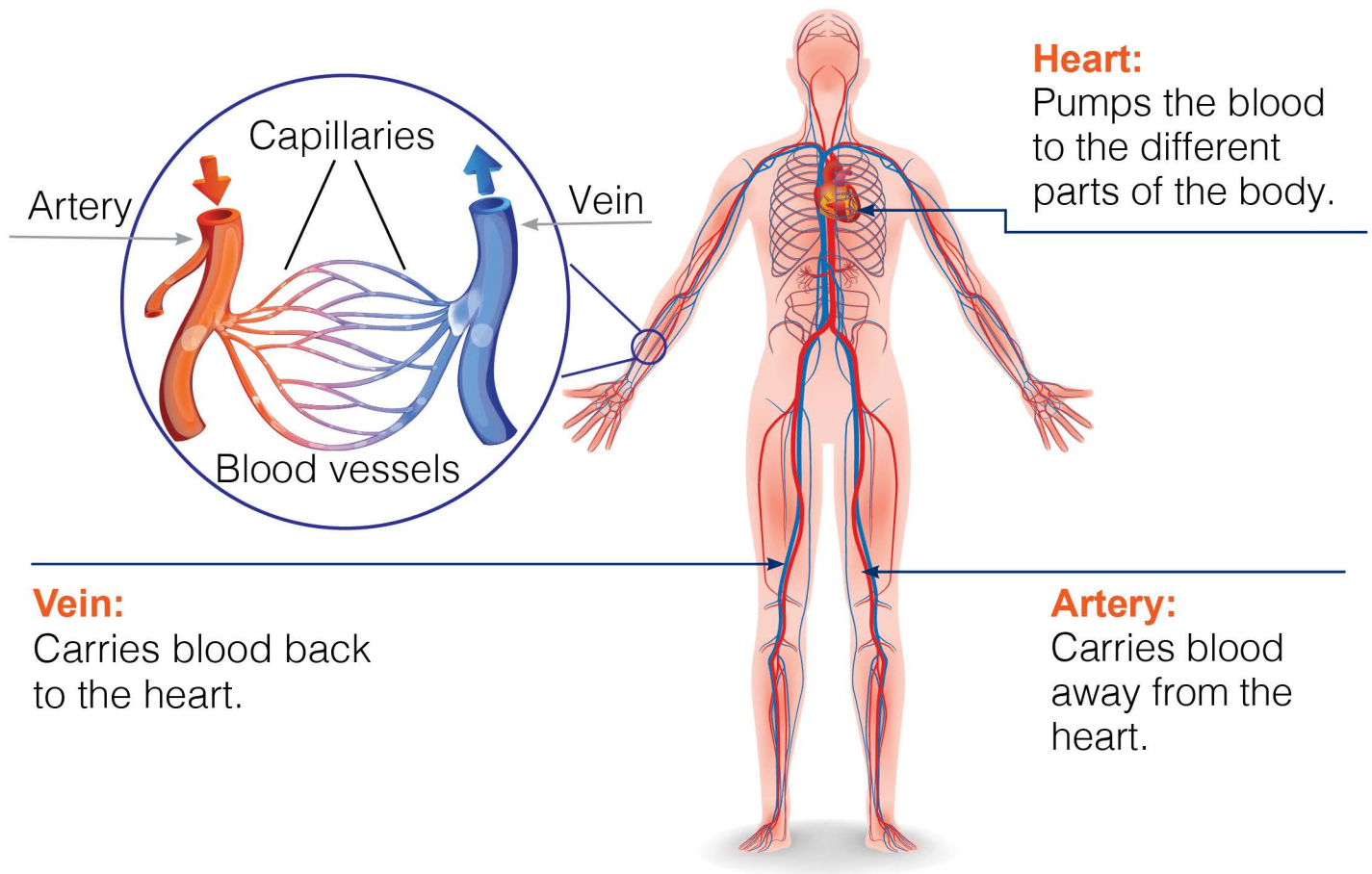


**We learned previously that the nutrients which result from digestion are carried by blood into all parts of the body.**

Blood is one of the circulatory system components. Let's find out other components.

### Activity

**Look at the following figure and answer the questions.**



- Name the three types of blood vessels.

.....**Artery**.....      .....**Capillaries**.....      .....**vein**.....

- What type of blood vessel carries blood away from the heart?

.....**Artery**.....

- What type of blood vessel carries blood back to the heart?

...**vein**.....

## What is the main function of the circulatory system?

**Circulatory system** is a transport system; its main function is to distribute nutrients and oxygen to all parts of the body, and to take away carbon dioxide back to the heart.

Circulatory system is composed of **the heart, blood vessels** and **blood**. Arteries carry blood away from the heart to the parts of the body. Veins carry blood from the parts of the body back to the heart. The very tiny blood vessels are called capillaries.



To keep our circulatory system healthy, we must eat healthy food, exercise regularly, never smoke, and maintain normal body weight.



### Search:

What is the effect of obesity (overweight) on the circulatory system?

Obesity can lead to increased blood pressure, higher cholesterol levels, and a greater risk of heart disease, negatively impacting the circulatory system.

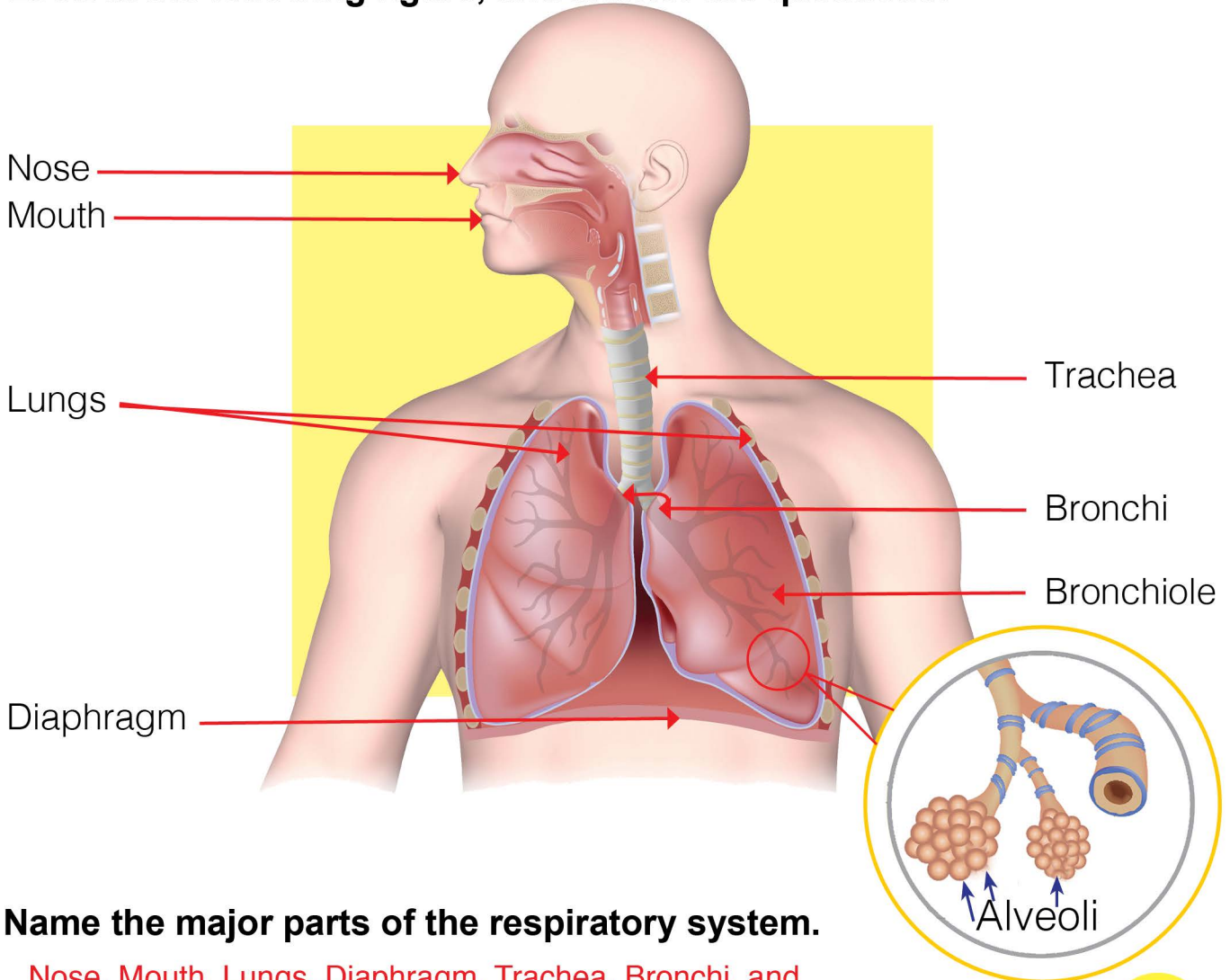
- Compare between the artery and the vein according to the direction of blood transport. **Artery carry blood from the heart to the body. Veins carry blood from the body to the heart.**
- Which type of blood vessels is the smallest? ...**Capillaries**.....
- Which part of the circulatory system pumps blood?.....**The heart**.....

**We can live without food for a few weeks, without water for a few days, but we can live without air for only a few minutes.**

To understand how the body breathes in air. Let's explore the respiratory system.

### Activity

Look at the following figure, and answer the questions.



**Name the major parts of the respiratory system.**

...Nose, Mouth, Lungs, Diaphragm, Trachea, Bronchi, and...

...Bronchiole.....

- How many lungs do you have?

~~Two~~.....

- Trace the passage of air to the body on the figure.

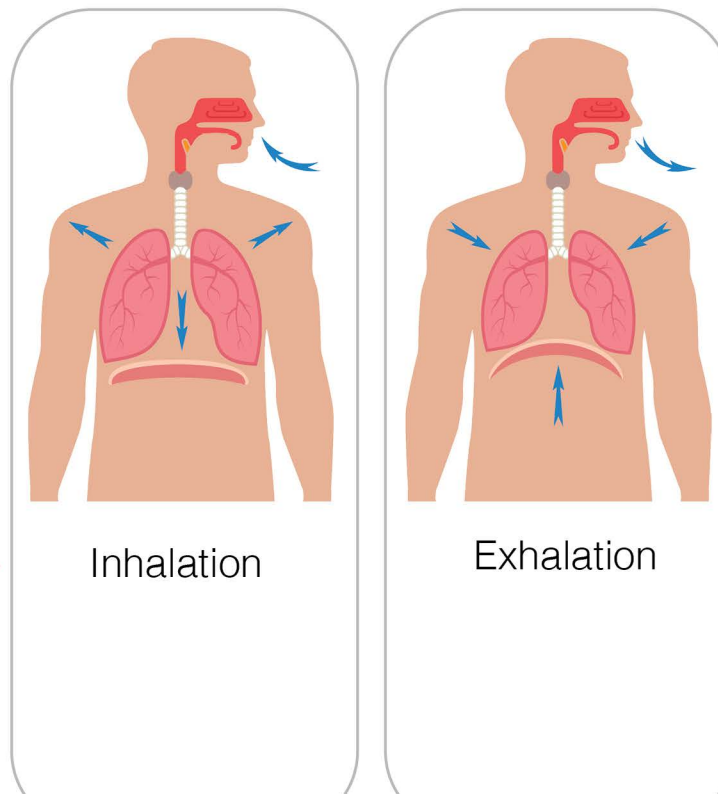
Oxygen is very important for our body to stay alive. As your body uses oxygen, your body produces another gas known as carbon dioxide. Too much carbon dioxide can be toxic, even deadly. For this reason, it is important that your body has a way to get rid of it. Respiration is the process in which oxygen is taken in and carbon dioxide is released from the body.

The air enters the **nose**, and then passes through the **trachea** which is divided into two parts called **bronchi** as it enters the **lungs**. Inside the lungs, there are very small branches called bronchioles end with tiny sacs called the alveoli. The gas exchange occurs, and oxygen is transported to the heart. From the heart, oxygen-rich blood is pumped to other parts of the body.

**Let's find out how we breathe.**

## Activity

**Look at the following figure, and answer the questions.**



- Compare between the air inhaled in our bodies and that exhaled out of our bodies.

...**We inhale oxygen and exhale carbon dioxide.**.....

- What happens to the diaphragm during inhalation? Does the size of the chest cavity increase or decrease?

...**Increase**.....

- What happens to the diaphragm during exhalation? Does the size of the chest cavity increase or decrease?

...**Decrease**.....

When you breathe in (**inhale**), the diaphragm contracts and moves downward. The size of the chest cavity increases, and the air rich in oxygen enters in. When you breathe out (**exhale**), the diaphragm relaxes and moves upward. The size of the chest cavity decreases, and the air rich in carbon dioxide gets out.

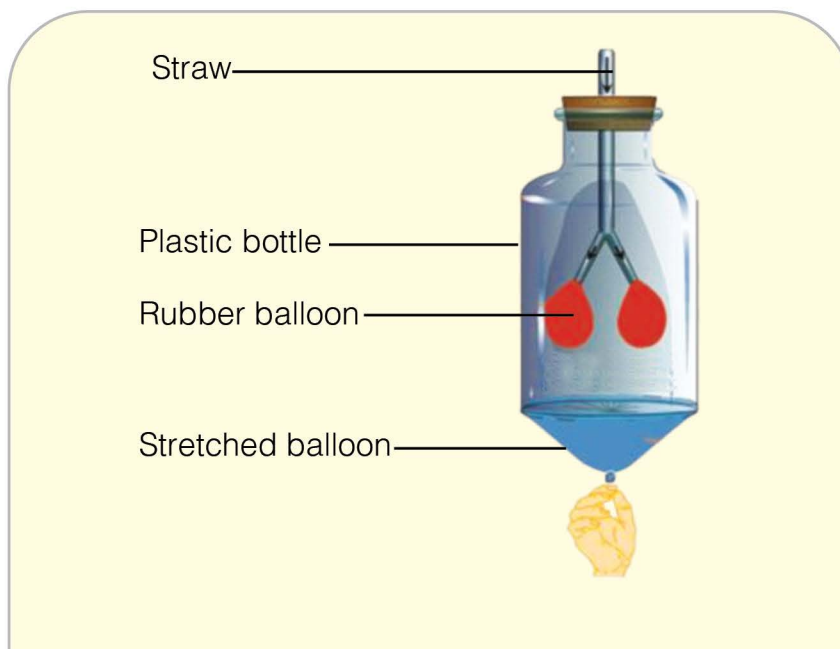
## Activity

### Materials:

A straw, a plastic bottle, a rubber balloon, and a stretched balloon

### Procedure:

Make a model and demonstrate breathing as shown in the following figure.





Smoking can cause serious diseases, so don't smoke, and avoid sitting in smoking areas to reduce the risk of developing respiratory diseases, such as lung cancer. Getting enough exercise makes your lungs stronger and better at giving your body the oxygen it needs.

Washing your hands often, especially after sneezing or coughing, helps to protect you and others from diseases.



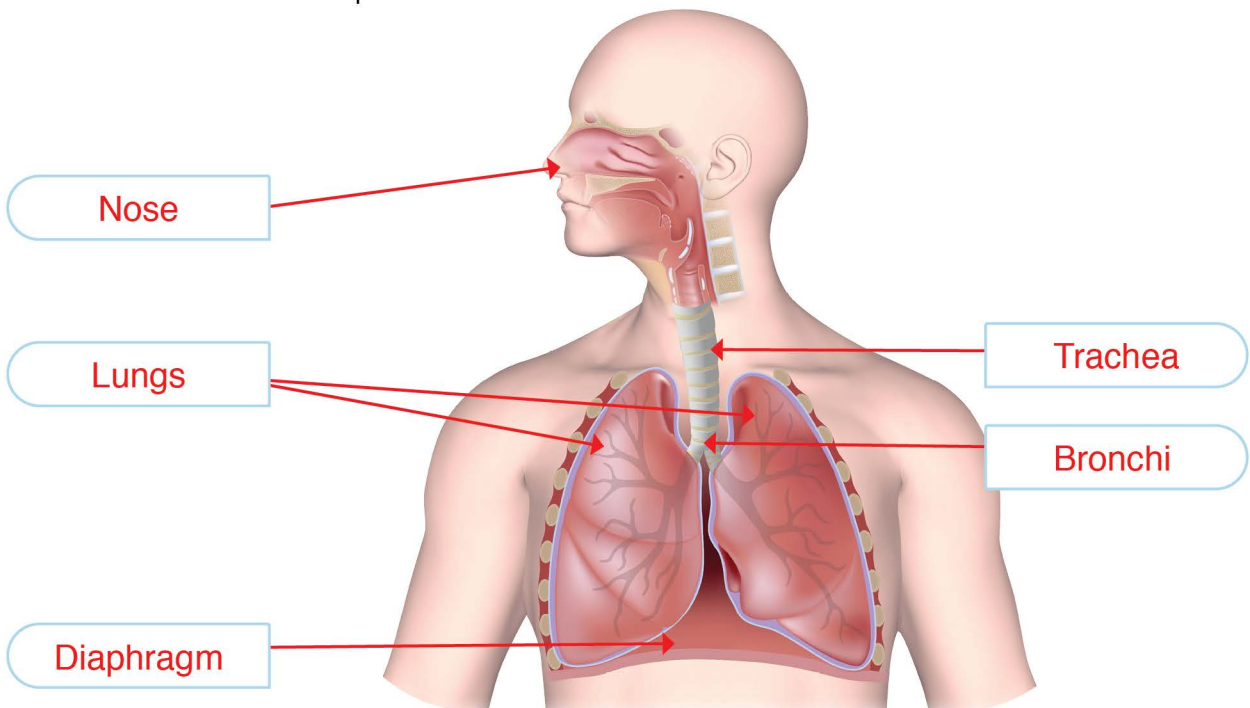
Write a paragraph to a smoker explaining the dangers of smoking and try to convince him to quit smoking.



Make a poster to illustrate the importance of hygiene to digestive system care.

## Activity

- Write the name of the part in each blank.



- Compare between inhalation and exhalation according to: nature of air, what happens to the diaphragm, the size of the chest cavity

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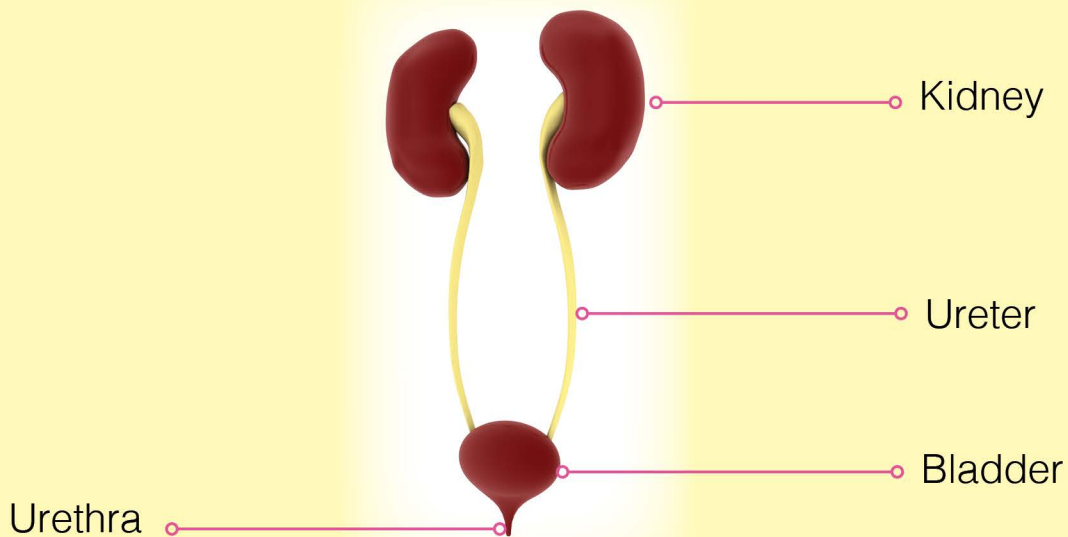
Inhalation: Air is drawn in. Diaphragm contracts and moves down.  
Chest cavity increases in size. Exhalation: Air is pushed out.  
Diaphragm relaxes and moves up. Chest cavity decreases in size.

### Your body performs many functions as you know.

We learned how the digestive system, the respiratory system and the circulatory system perform their functions to keep you alive. Wastes are produced inside your body. The solid wastes that results from digestion are released outside the body through the anus. Your body gets rid of Carbon dioxide through the respiratory system, but how can your body get rid of liquid wastes? These wastes are toxic; the urinary system removes these wastes from your body. Let's find out what the urinary system is.



Look at the following figure, and answer the questions.



- What are the main parts of the urinary system?

..Kidney, Ureter, Bladder, Urethra.....  
.....

- How many kidneys does a normal person have?

..Two.....

Liquid wastes and excess water are carried out by blood to the kidneys. The kidneys filter the wastes and extra water from the blood forming the urine. Urine travels from the kidneys through two thin tubes called ureters and fills the bladder.

The wastes are released outside the body through the urethra.



Drink enough fluids, especially water. Most healthy people should try to drink six to eight glasses of water each day. Eating fruits and vegetables that contain lots of water can help.



Search for other tips that keep your urinary system healthy.

**Drinking water**

Don't wait too long to use the W.C (a toilet) because accumulating urine in the urinary bladder may lead to infection.

**Think**



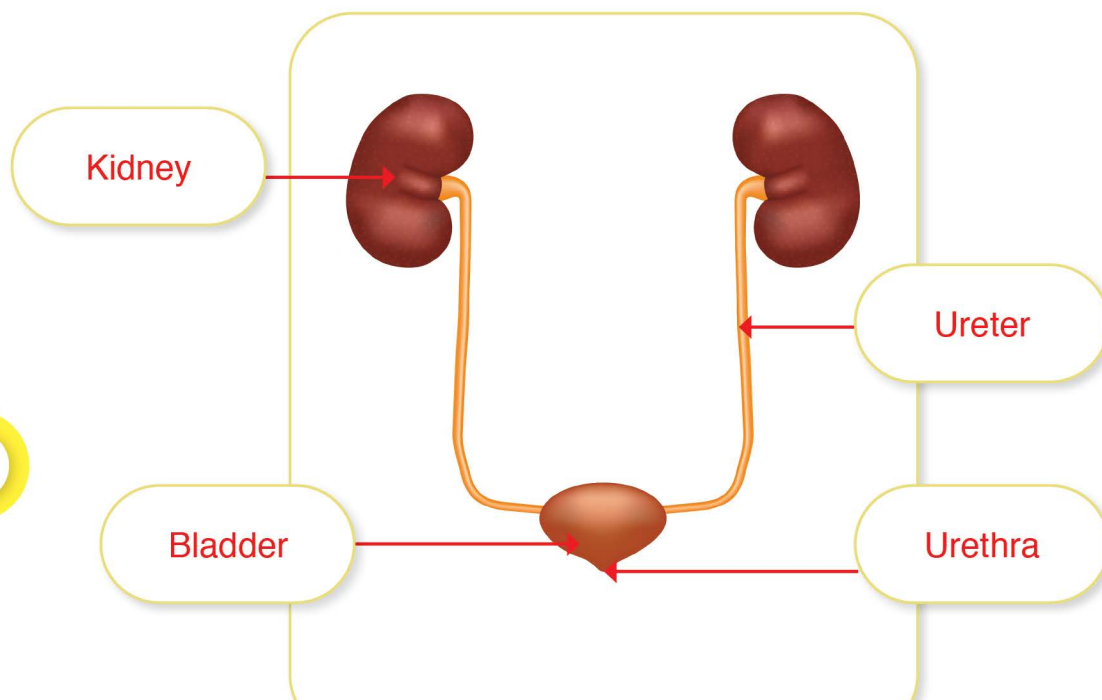
Adam drinks 800 ml of water. If a glass of water is about 240ml of water, how many glasses of water does he drink? What would you advise him?

About 3 glasses. He should drink more water.



## Activity

Write the name of the part in each blank.



# REVISION

## 1. Circle the correct answer.

In which part is the food chewed into smaller pieces and mixed with saliva?

- Stomach.
- Mouth.
- Esophagus.

In which part is the digested food absorbed into the blood?

- Small intestine.
- Liver.
- Esophagus.

Which of the following substances do we inhale?

- Water.
- Hydrogen.
- Oxygen.

Which of the following substances do we exhale?

- Carbon Dioxide.
- Nitrogen.
- Oxygen.

---

What organ removes waste from blood?

- Heart.
- Kidney.
- Eyes.

You can keep your heart strong by:

- Eating heart-shaped candy.
- Doing activities, like playing outside and riding your bike.
- Smoking.

These are tubes that carry blood back to the heart:

- Arteries.
- Veins.
- Pipes.

Which type of blood vessels carries blood away from the heart?

- Veins.
- Arteries.
- Capillaries.

## 2. Complete the following sentences:

- The circulatory system composed of: .....heart..... , .....blood vessels..... , and .....blood.....
- Urine is stored in the .....bladder..... until you go to W.C.
- In the urinary system, .....kidneys..... filters waste out of blood.

### 3. Explain what happens to the food in the stomach.

...the stomach breaks down the food using acids and chemicals.....

### 4. Write (T) if the statement is true and (F) if the statement is false.

- Blood carries nutrients to all parts of the body.
- All the food in the intestine is digested and absorbed.
- The very tiny blood vessels are called arteries.
- The trachea is divided into alveoli.
- During inhalation the diaphragm relaxed.
- Urine travels from the kidneys through ureters and fills the bladder.

T

F

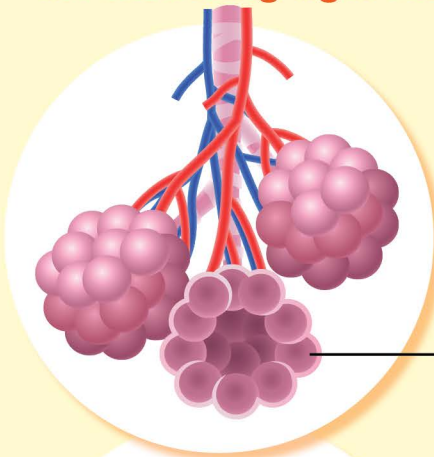
F

F

F

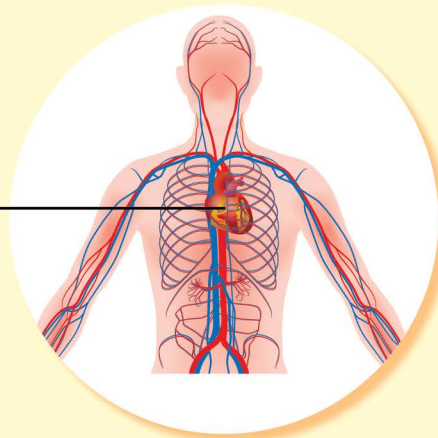
T

### 5. Write the name and the function of each part that is pointed to in the following figures.



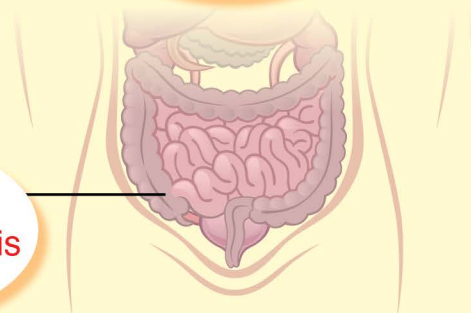
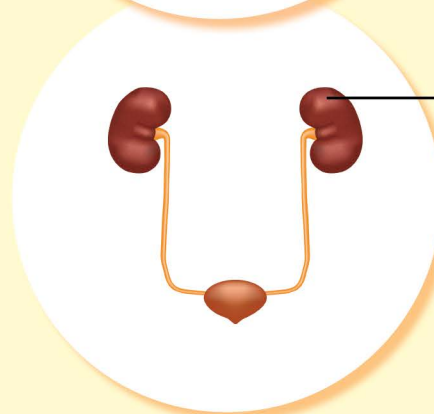
heart:  
pumps  
blood

Alveoli:  
where gas  
exchange  
happens



Kidney:  
filters  
waste

large  
intestine:  
where food is  
digested



## Unit 4

# Energy in our life



How does energy make our life easier?

### Vocabulary



- Energy
- Solar energy
- Thermal energy
- Magnetic energy
- Chemical energy
- Electrical energy
- Mechanical energy
- Renewable energy resources
- Non-renewable energy resources

### Objectives








- Identify some forms of energy.
- Recognise energy transformation in a food chain and in many appliances.
- Classify energy resources into renewable and non-renewable resources.
- Recognise the process of formation of fossil fuels' types.

**Energy is the ability to do work or the ability to move an object, or to cause any change in matter.** Energy makes things happen; when you drive a car, write a letter, switch on a machine you are using energy. Energy has many forms. Let's find out some of these forms.

### Activity

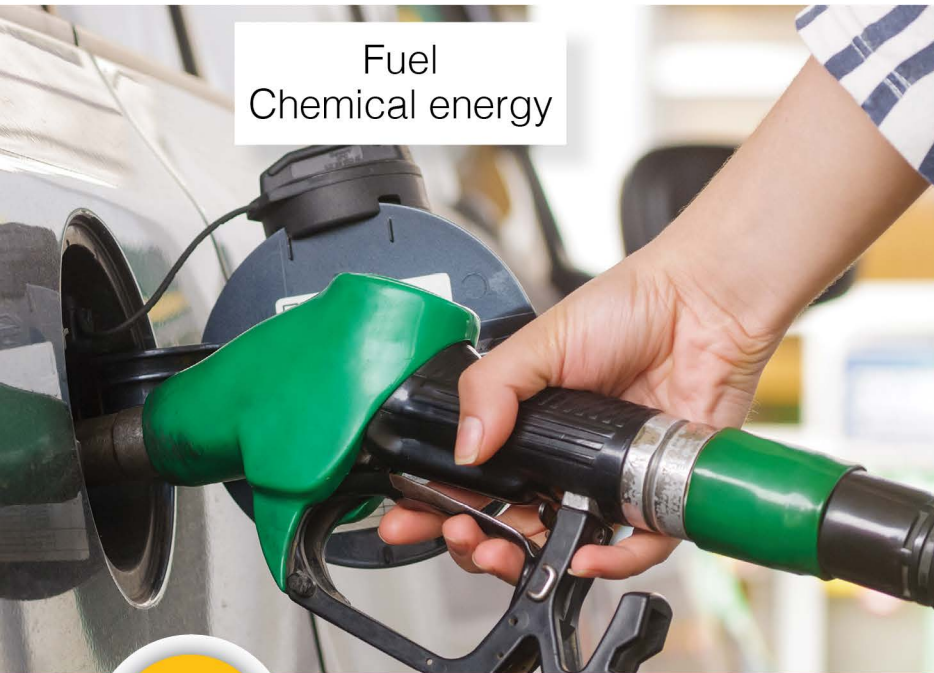
1. Complete the following table by writing the correct form of energy (light, magnetic, thermal, chemical, and electrical) in each blank.

Picture	Form of energy
<p><b>Energy stored in food.</b></p> 	Chemical
	Magnetic
	Light
	Electrical
	Thermal

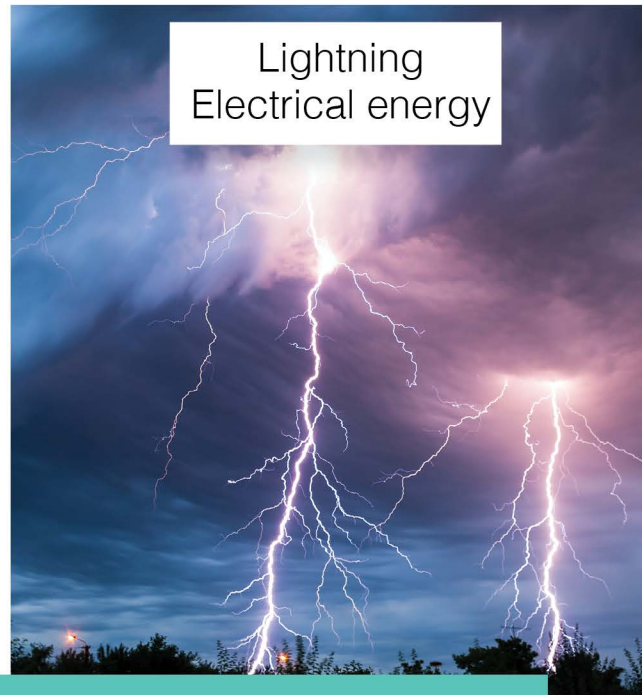
2. Name other forms of energy.

Mechanical, Sonic, Nuclear.....

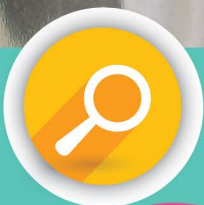
**Energy** is the ability to do work, the ability to move an object, or to cause any change in matter. There are many forms of energy such as: the chemical energy that is stored in food and fuel, magnetic energy, light energy, electrical energy, and thermal energy. The transfer of thermal energy from one substance to another is called heat.



Fuel  
Chemical energy



Lightning  
Electrical energy

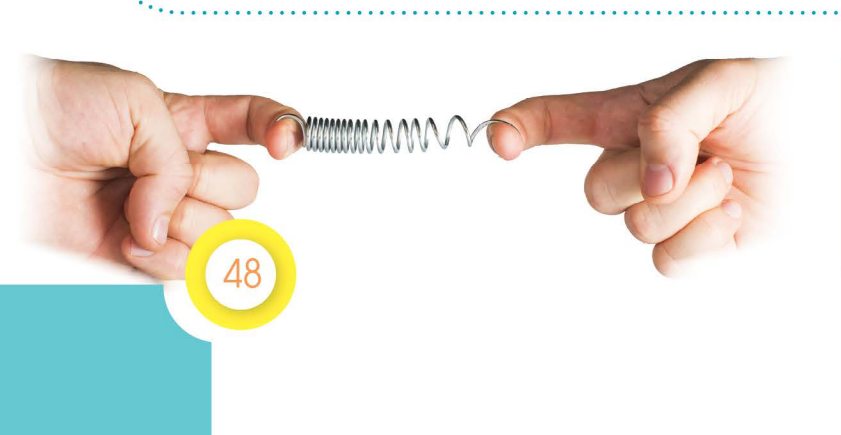


### Search for the law of conservation of energy.

The law of conservation energy states: in a closed system that is isolated from its surrounding, the total energy of the system is conserved.



Elastic potential energy is the energy stored in compressed springs, and stretched rubber bands. Any object that can be forced into a shape that differs from its natural shape can store elastic potential energy.



### Forms of energy can be transformed into other forms.

A change from one form of energy to another is called an energy transformation. Let's find out energy transformations in a food chain.

### Activity

Look at the following food chain, and answer the questions.



Light energy



Making food by photosynthesis  
(Stored chemical energy)



Thermal energy in the animal and mechanical energy while moving

- What is the main source of energy on earth?

..light energy (sun).....

- Explain the transformation of energy in plants. What is the name of the process in which energy transformation occurs in plants?

..plants transform light energy into chemical energy (food).....

..this process is called photosynthesis.....

- Explain transformation of energy in an animal after eating.

..The chemical energy that is stored in food is transformed in consumers into.....

..thermal and mechanical energy which allows the consumer to do its activities.....

The food chain begins in the presence of solar energy (light energy from the sun) with producers. Producers are organisms that can make their own food. Through photosynthesis, producers convert light energy to chemical energy that is stored in food. Producers are eaten by consumers, which are organisms that cannot make their own food. The chemical energy that is stored in food is transformed in consumers into thermal and mechanical energy which allows the consumer to do its activities.

Many devices transform electrical energy into other forms. Let's explore these transformations.

## Activity

**Look at the following pictures, and discuss with your classmates energy transformation in each device.**



Light energy

Table lamp



Sound and light energy

Television



Mechanical energy

Toaster



Thermal energy

Fan

Electrical energy is transformed to:

- Thermal energy, as in a toaster.
- Light energy, as in a table lamp.
- Mechanical energy, as in a fan.
- Sound and light energy, as in T.V.



In a car, multiple energy transformations occur; electrical energy produces a spark. The thermal energy of the spark releases chemical energy in the fuel. The fuel's chemical energy in turn becomes thermal energy. Thermal energy is converted into mechanical energy so the car moves.



Search for the energy transformation in a cell phone.

A cell phone transforms electrical energy from the battery into sound energy for audio output and light energy for the display.

## Activity

Write the energy transformation in the following appliances.



A drill

Electrical energy to kinetic energy.  
to mechanical energy.....



An electrical oven

Electrical energy to thermal energy

# Lesson 3

## Non-renewable energy resources

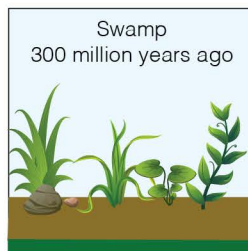
**Energy resources have existed in nature for a long time.**

Some of these resources are classified as non-renewable energy resources which are mainly fossil fuels. Fossil fuels are divided into three types. **Let's find out what these types are and how each type was formed.**

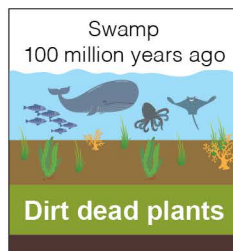
### Activity

#### Coal formation

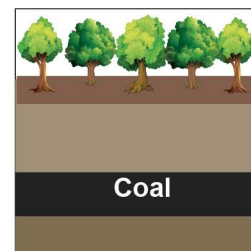
Before dinosaurs, many giant plants died in swamps.



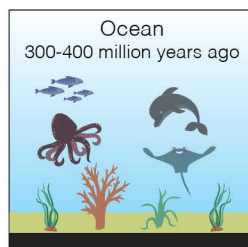
Over millions of years, the plants were buried under water and dirt.



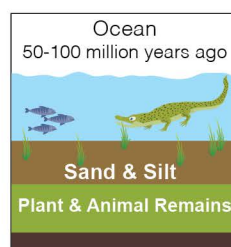
Heat and pressure turned the dead plants into coal.



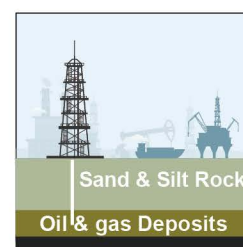
#### Oil (petroleum) and natural gas formation



Microorganisms died and were buried on the ocean floor. Over time, they were covered by layers of silt and sand.



Over millions of years, the remains were buried deeper and deeper. The enormous heat and pressure turned them into oil and gas.



Today, we drill down through layers of sand, silt, and rock to reach the rock formations that contain oil and gas deposits.

- Name the three types of fossil fuels. **Petroleum, Natural gas, Coal.**
- Track the formation of coal. **Coal is formed when dead plants decay.**
- Track the formation of petroleum and natural gas. **They are formed from the marine remains.**
- How many years were needed to form: coal, petroleum and natural gas? **Hundreds of years.**

A non-renewable energy resource is a resource that is being used at a much faster rate than it can be replenished or replaced.

Non-renewable energy resources are mainly fossil fuels. Fossil fuels are three types: coal, natural gas, and petroleum.

Coal was formed from dead plants that sank to the bottoms of swamps and buried under sediments. Heat and pressure turned the plants into coal.



**Coal**

Petroleum and natural gas were formed from dead microorganisms buried in the ocean floor. Heat and pressure turned the microorganisms into petroleum and gas.



**Petroleum**



**Natural gas**



Fossil fuels cause pollution.

Coal is the most abundant fossil fuel resource.

Burning coal generates electricity.

Petroleum mainly is used to fuel jets and automobiles.

It is also used to generate electricity, and it is used in the plastic industry.

Natural gas is also used to generate electricity and it is used in houses (cooking gas).

Unlike other fossil fuels, natural gas is cleaner.



Search for other uses and industries of fuels.

**Think**



How do humans have a role in environmental pollution? Write tips to stop or decrease pollution.

Students' own answers



We must preserve electricity to reduce the non-renewable energy resources depletion.

## Activity

- Write the type of fossil fuel in each of the following figures.



.....gas.....



.....petroleum.....



.....coal.....

- How do living things turn into fossil fuels?

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Living things die, get buried and decomposed, then convert into fossil fuels.....

**We learned that non-renewable energy resources are being used at a much faster rate than they can be replenished or replaced.**

However, renewable resources are resources that can be replaced within a reasonable amount of time. Let's explore the renewable resources.

### Activity

**Look at the following pictures and discuss with your classmates the renewable energy resources.**

Wind energy



Hydro energy



Tidal energy



Solar energy



- List with your classmates the renewable resources.
- Do you think that these resources pollute the environment?  
**Explain your answer.**

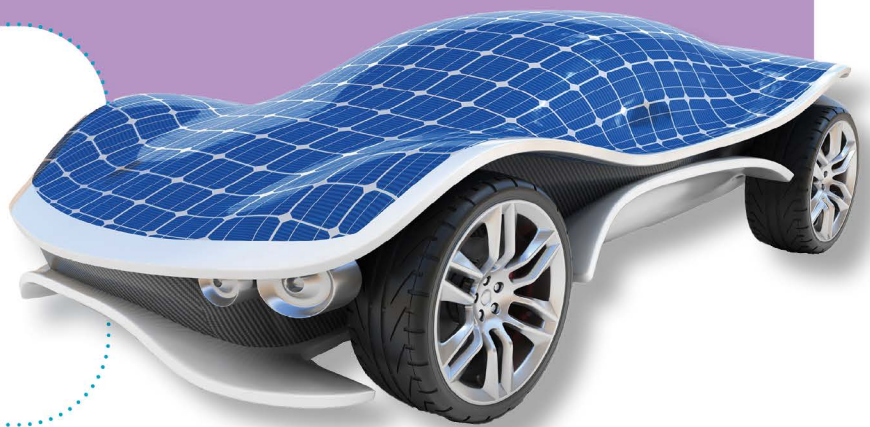
...Renewable resources include solar energy, wind energy, hydroelectric energy, geothermal energy, and biomass. These produce less pollution, making them more environmentally friendly.....

Renewable energy resources can be replaced within a reasonable amount of time.

- Wind spins the blades of huge turbines. The spinning blades turn a generator which produces electricity.
- Water flows through a dam, turning the blades of a turbine. The turbine spins a generator producing electricity.
- Geothermal heat is the heat from the earth. The steam from the underground spins the blades of a turbine. The turbine spins a generator producing energy.
- Solar energy is used to produce electricity by using solar panels that contain solar cells.
- Tidal energy is used. Turbines are fixed in the base of an ocean where tidal flow is strong, so electricity can be produced.
- Renewable resources are clean energy sources that don't pollute the environment.



Solar cars get their power from the sun. Solar cars will reduce environmental pollution.



Search for biogas as an energy source; how it is formed and its uses.

Biogas is a mixture of gases produced by breakdown of organic matter. It consists of methane and carbon dioxide. Biogas can be used as fuel.

- Compare between solar energy and tidal energy according to the way of electricity production.

56

Solar energy is used to produce electricity by using solar panels that contain solar cells.

Tidal energy is used. Turbines are fixed in the base of an ocean where tidal flow is strong, so electricity can be produced.

# REVISION

## 1. Circle the correct answer.

What is energy of motion?

- Sound energy.
- Electrical energy.
- Mechanical energy.

Coal, petroleum and natural gas are ..... fuels.

- Man-made.
- Artificial.
- Fossil.

The buried dead plants get converted into ..... due to high temperature and pressure underneath the Earth.

- Rocks.
- Coal.
- Metal.

What is the polluting type of energy?

- Fossil fuel.
- Wind.
- Geothermal.

What do solar panels convert solar energy into?

- Electrical energy.
- Thermal energy.
- Mechanical energy.

**2. Write true (T) if the statement is true and false (F) if the statement is false.**

- Energy is the ability to do work or the ability to move an object, or to cause any change in matter.
- There is only one form of energy.
- The transfer of thermal energy from one substance to another is called the chemical heat.
- Through photosynthesis, producers convert solar energy into chemical energy that is stored in food.
- Heat and pressure are important factors in fossil fuels formations.

T

F

F

T

T

**3. How are solar power, wind power, coal and natural gas different?**

- Solar and wind powers are renewable sources of energy.....
- Coal and gas are non renewable sources of energy.....

**4. What are the disadvantages of burning fossil fuels?**

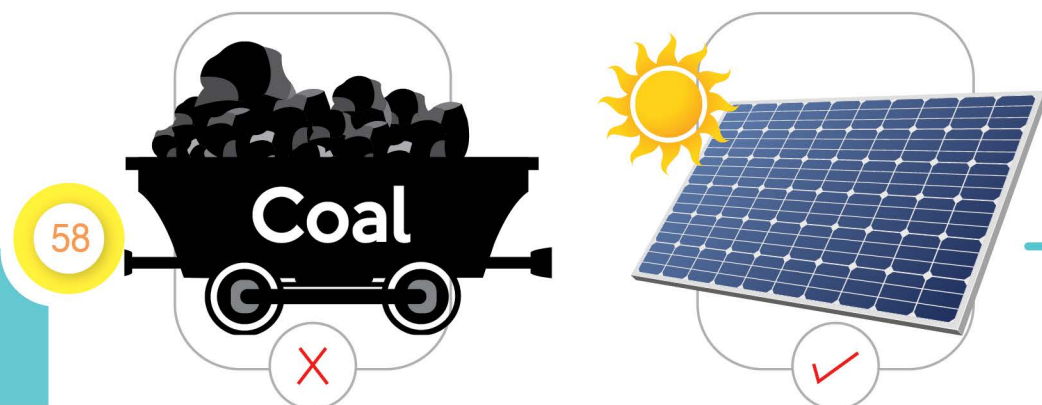
..Pollution.....

**5. Which of the energy sources makes life better on earth? why?**

..solar energy.....

..It is easier to use and creates less pollution.....

..less pollution because it's a renewable source.....



6. Write the energy transformation below each picture.



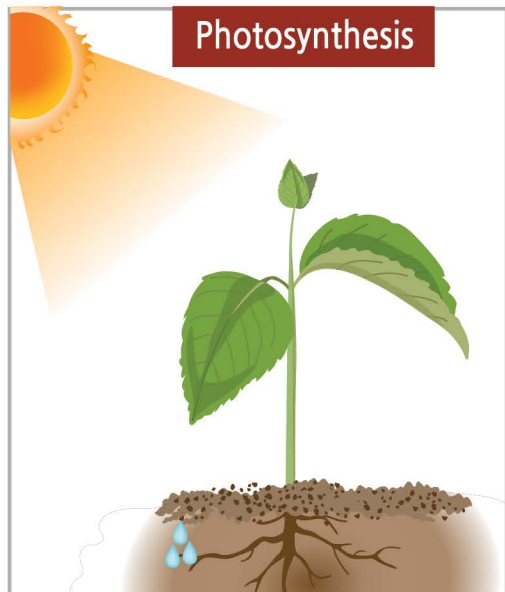
...Chemical to thermal energy...



.....Electrical to thermal.....



..Electrical to mechanical energy..



...Light to chemical energy.....

# Glossary

- **Alveoli:** are tiny sacs in the lungs in which gas exchange occurs.
- **Artery:** is a type of blood vessels that carries blood away from the heart to the parts of the body.
- **Electrical conductor:** is a material through which charges can flow easily.
- **Electrical insulator:** is a material through which charges cannot flow easily.
- **Elements:** are pure substances that cannot be broken down into any other substance.
- **Kidney:** is a part of the urinary system which filters the wastes and extra water from the blood forming urine.
- **Non-renewable energy resource:** is a resource that is being used at a much faster rate than it can be replenished or replaced.
- **Renewable energy resources:** are resources that can be replaced within a reasonable amount of time.
- **Respiration:** is the process in which oxygen is taken in and carbon dioxide is released from the body.
- **Static electricity:** is the build-up of an electrical charge on the surface of an object.
- **Vein:** is a type of blood vessel that carries blood from the parts of the body back to the heart.