

Chapter 4

New Matter

We learnt about chemical change and physical change.



We can find rust on the surface of the ship. Is the process of producing rust a physical change?



4.1

Common Chemical Changes

Lesson 1

How to Tell a Chemical Change

When we burn wood, the wood changes into ash. Burning wood is a chemical change.



How can we tell if a chemical change has taken place?



Activity : Hammering and heating sugar

What We Need:

- 2 sugar cubes, tablespoon, candle, match, hammer, aluminium foil



What to Do:

1. Draw a table like the one shown below.

	Texture	Colour	Smell	Others
Sugar cubes				
Crushed sugar				
During & after heating sugar				

2. Crush the sugar cube with the hammer. Observe the properties of the sugar cube and the crushed sugar.
3. Wrap the spoon with an aluminium foil. Put the crushed sugar onto the spoon and heat the sugar on a lit candle until it changes colour. Observe what happens to the sugar.
4. After cooling down the spoon, observe the properties of the sugar. Record your observations in the table.
5. Share your findings with your classmates.



Wrap the bowl of the spoon with an aluminium foil.



Use a piece of cloth to hold the spoon when heating sugar!



Discussion

How do we tell a physical change from a chemical change?

1. Think about the following questions based on your results.
 - (1) Do the sugar cube and the crushed sugar have the same or different properties?
 - (2) Is the crushed sugar a physical or a chemical change?
 - (3) Does the sugar after heating have the same properties as the sugar cube?
 - (4) Is the heated sugar a physical change or a chemical change? Why do you think so?
2. Talk about how we can tell if a chemical change has taken place.

A physical change is a change in the physical properties of matter!



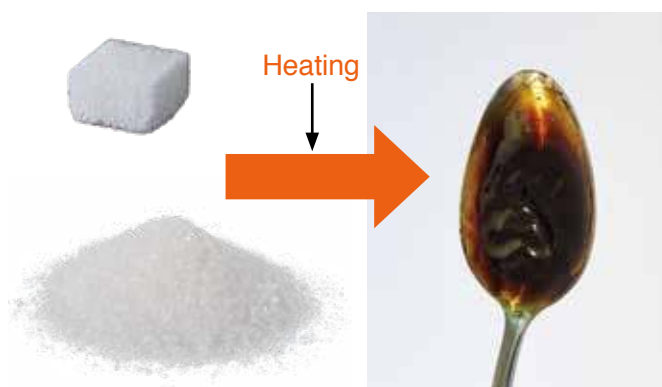
Summary

A **chemical change** produces new kinds of matter. A physical change does not produce new matter. New matter has different properties. For example, burning is a chemical change. After burning wood, the wood changes into ash. The wood and ash have different properties. Burning wood produces new kind of matter such as ash. Ash is no longer wood.

A chemical change produces gas, odour, heat, light, and changes in colour and state. For example, when sugar is heated, odour is produced, its colour and state changes. Therefore, heating sugar is a chemical change.



Burning wood is a chemical change. It produces ash.



Heating sugar produces melted sugar (caramel) and the colour changes.

Lesson 2 Rusting

When we leave an iron nail outside for some time, it will rust. Why does an iron nail rust? What is rust?



Is rusting a chemical change?



Activity : Properties of rust

What We Need:

- ➔ a piece of dry steel wool, a piece of steel wool dipped in salt water for a week, scissors, hand lens, magnet, A4 paper

What to Do:

1. Draw a table like the one shown below.

Material	Texture	Colour	Magnet
Dry steel wool			
Wet steel wool			

2. Cut the dry steel wool onto the piece of paper. Use a hand lens to observe the properties of the pieces of steel wool. Hold the magnet close to the pieces.
3. Record your observations in the table.
4. Repeat Steps 2 and 3 for the pieces of steel wool that was dipped in salt water for a week.
5. Share your findings with your classmates. Discuss how they are similar or different.



Let's compare the properties of a dry and a wet steel wool!



Result

We found out that properties of a dry steel wool were glossy, glory and silver in colour while the properties of a rusted steel wool were rough, dull and reddish brown in colour. The pieces of dry steel wool were attracted by the magnet. Some pieces of wet steel wool were not attracted by the magnet. These results show that a dry steel wool and a wet steel wool have different properties.

Is dry steel wool same or different from wet steel wool?



	Texture	Colour	Magnet
Dry steel wool	glossy, glory	silver	attracted
Wet steel wool	rough, dull	reddish brown	some attracted but some are not

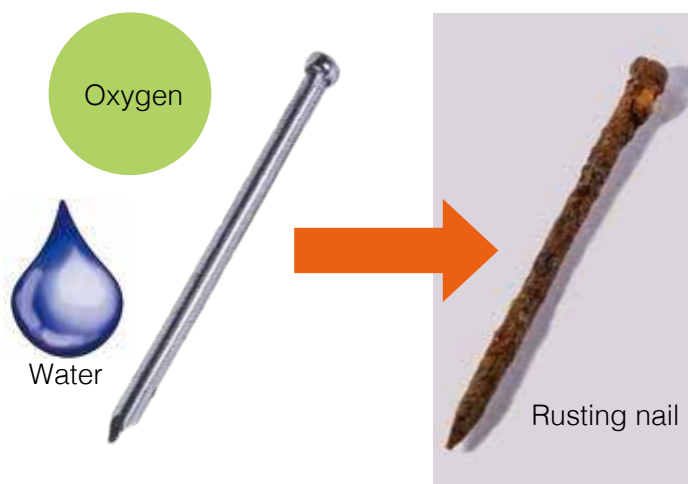
Summary

Rusting is a type of chemical change. It usually happens slowly. When iron or steel comes into contact with water and oxygen in the air, rusting happens. We may find brownish patches on the metal parts of cars or ships. Rust is a coating that forms on the surface of iron or steel.

When we leave an iron nail outside in the rain, rust will form on the surface of the nail. Rust has a different property from iron. It is a different kind of matter. Rust is no longer iron. Rusting produces new matter.



Rust on the surface of a ship



Rust has a different property from iron. Iron and rust are different kinds of matter.

Lesson 3

Chemical Changes in Daily Life

When a chemical change occurs in matter, what happens to matter?
What kind of chemical changes take place around us?



How does a chemical change take place in daily life?



Activity : Finding chemical change around us!

What to Do:

1. Draw a table like the one shown below.

	How do properties of matter change?	Is new matter produced?	Chemical change or Physical change
Burning paper			
Boiling water			
Boiling egg			
Dissolving sugar			
Cutting papaya			
Rotting banana			

2. Study the pictures below. Observe the change in the properties of the matter and record your observations in the table.

3. Share your ideas with your classmates. Discuss where a chemical change occurs and how chemical and physical changes are different.



Burning paper



Boiling water



Boiling egg



Dissolving sugar in water



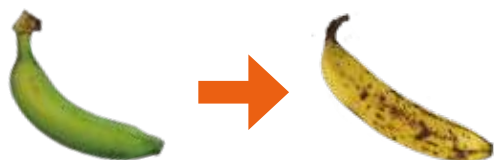
Cutting papaya



Rotting banana

Summary

Chemical changes take place all around us. Burning wood, rusting iron nails, cooking food and ripening and rotting fruits are chemical changes. Chemical change also happens in our body. Our body changes food chemically into new matter that it can use as energy.



Rotting and cooking are chemical changes.



Our body changes food chemically into energy that our body can use.

Energy is always involved in a chemical change. Chemical changes take in or give off energy in the form of heat, light, electricity, sound or motion.

For example, heat energy can be added when we light a fire or cook food to produce a new kind of matter. Energy is often released when a chemical change takes place. Burning paper gives off energy in the form of heat and light. An explosion of fireworks is a chemical change. When fireworks explode, they produce many loud sounds and lights.



Heat energy is added when cooking food.



An explosion of fireworks gives off sounds and lights.

How to Tell a Chemical Change

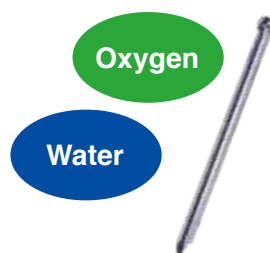
- ☒ Chemical change produces new kinds of matter that has different properties.
- ☒ Burning paper or wood is an example of a chemical change. Ash is the new matter formed after burning.
- ☒ A chemical change produces gas, odour, heat or light and changes in colour and state.



Burning paper is a chemical change.

Rusting

- ☒ Rusting is a type of chemical change that usually occurs slowly.
- ☒ Rusting comes in brownish colour on objects that are made of iron or steel.
- ☒ Rust is formed when iron or steel comes in contact with water and oxygen in the air.
- ☒ Iron and rust are different kinds of matter because they have different properties.



Chemical Changes in Daily Life

- ☒ Chemical change often takes place in our daily lives.
- ☒ Chemical change takes in or gives off energy in the form of heat, light, electricity, sound or motion.
- ☒ Burning wood, rusting iron nails, cooking food, ripening and rotting of fruits are chemical changes.
- ☒ Chemical change occurs in our body by changing food into new matter that can be used as energy.

Q1. Complete each sentence with the correct word.

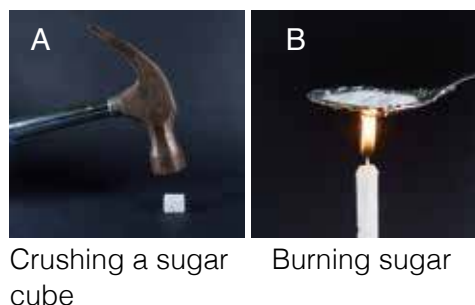
- (1) Energy is always involved in a _____ change.
- (2) The new matter formed after burning wood is _____.
- (3) Chemical change produces _____ kind of matter.
- (4) Iron and rust have different _____ such as colour and texture.

Q2. Choose the letter with the correct answer.

- (1) Which of the following is a chemical change?
 - A. Boiling water.
 - B. Tearing of a paper.
 - C. Sharpening a pencil.
 - D. Rotting banana.
- (2) What happens to an iron nail when it is left outside in the rain for a while?
 - A. Rust would form on the surface of the nail.
 - B. The iron nail would not change but remain as iron nail.
 - C. The nail would go missing.
 - D. The surface of the nail would become shinny.

Q3. Answer the following questions.

- (1) Which of these pictures shown on the right is a chemical change?
- (2) What things were produced when the sugar was burnt?
- (3) Explain why it is a chemical change.



Q4. Plants take in water and gas called carbon dioxide and absorb sunlight. Then plants make sugar as their own food and give off oxygen gas. What can you conclude about the kind of changes that take place inside a plant to produce sugar and oxygen? Explain your answer.

Change of leaf colours during autumn

In many places of the world there are four seasons; spring, summer, autumn (fall) and winter. During autumn, falling temperatures prompts trees to prepare for winter. In these preparations, some kinds of trees change colour of their leaves dramatically.

Most leaves of trees look green because of the pigment they contain which is the chlorophyll. Chlorophyll absorbs sunlight and the light energy is converted to chemical energy through the process of photosynthesis. In addition to the chlorophyll, there are other pigments



Leaves change their colour during autumn.

present in the leaves, which are carotene and anthocyanin. While carotene is yellow, anthocyanin is red. The change in temperature during autumn(fall) causes the trees to cut off supply of water to the leaves. In the absence of water, photosynthesis stops, and the chlorophyll breaks down through chemical change. Therefore, the leaves take the colour of the other pigments, and we can see a change in colour from green to red and yellow.



Chemical change takes place in leaves of trees.

4. New Matter

Q1

Complete each sentence with the correct word.

- (1) Cooking food, rotting banana, burning paper, and rusting iron are some _____ changes in daily life.
- (2) Rust is a coating that forms on the surface of iron or _____.
- (3) _____ energy is added when cooking food.
- (4) A new solid matter produced after burning paper is called _____.

Q2

Choose the letter with the correct answer.

- (1) Which list contains chemical changes only?

- A. baking cake, boiling water, tearing paper, cutting mango
- B. rotting banana, burning wood, rusting iron, cooking food
- C. breaking glass, burning paper, slicing bread, popping pop corn
- D. crushed can, squeezing a paper, spoilt milk, rotting mango

- (2) Which of the following statements is not true about rust?

- A. Rust occurs when iron or steel comes in contact with water and oxygen.
- B. Rust has the same property as iron.
- C. Rust is a kind of chemical change.
- D. Rust comes in brownish colour.

- (3) A pair of metal scissors left outdoor was rusted. What evidence shows that a chemical change has taken place?

- A. It had a deep scratch.
- B. The sunlight has warmed it.
- C. The soil has stuck on its surface.
- D. It changed to a brownish colour.

Q3

(1) Sandy wants to experiment with some sugar cubes. What should she do to change the sugar cube chemically?

(2) An explosion of fireworks is a chemical change. What three forms of energy does it produce when it explodes?



(3) Think about how an egg changes when it is cooked. Is this a physical change or a chemical change? Explain your answer.

Q4

(1) A silver spoon that has turned black can be made shiny again by rubbing off the black tarnish with silver polish. Is polishing a physical change or a chemical change? Explain your answer.

(2) Explain why the melting ice is not a chemical change.
