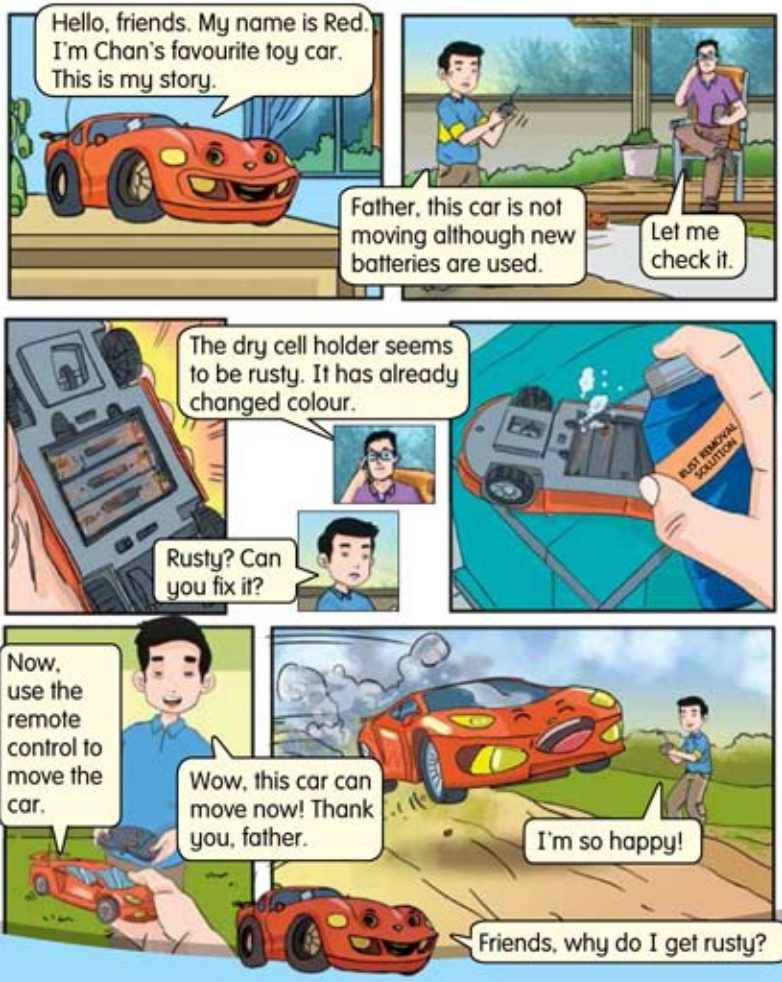
Unit 7

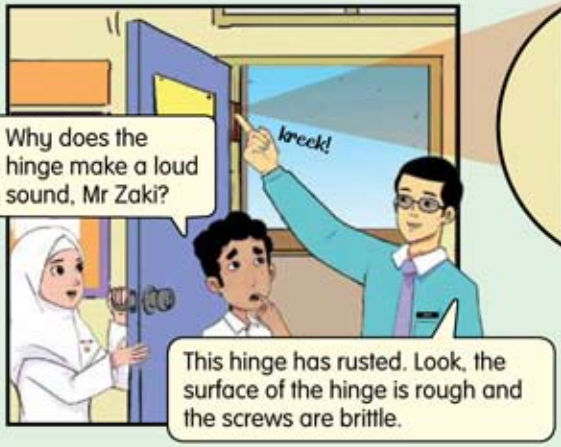
RUSTING

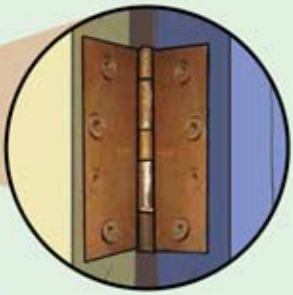


Why are some parts of the car rusty? How to prevent rusting from occurring?

CHARACTERISTICS OF RUSTY OBJECTS

There are rusty objects around us. Rusty objects have certain characteristics. Let us read the story below to identify the characteristics of rusty objects.





FUN ACTIVITY

CHARACTERISTICS OF RUSTY OBJECTS

21ST Century Learning

GROUP ACTIVITY

APPARATUS AND MATERIALS

Marker pens, coloured A4 paper, and adhesive tape.

STEPS

1. Identify rusty objects found in the school compound.

2. Based on the observation, discuss the characteristics of the rusty objects.

Location	Rusty object	Characteristics of the rusty object

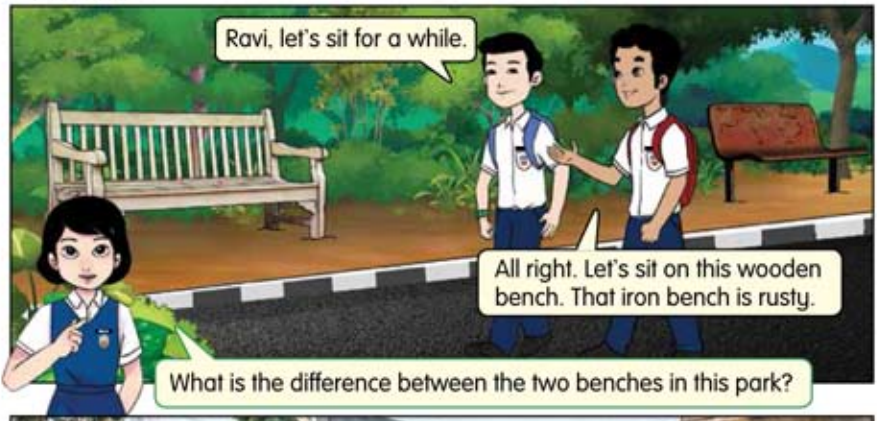
3. Construct a table on the coloured A4 paper using a marker pen and record the results of the observation.

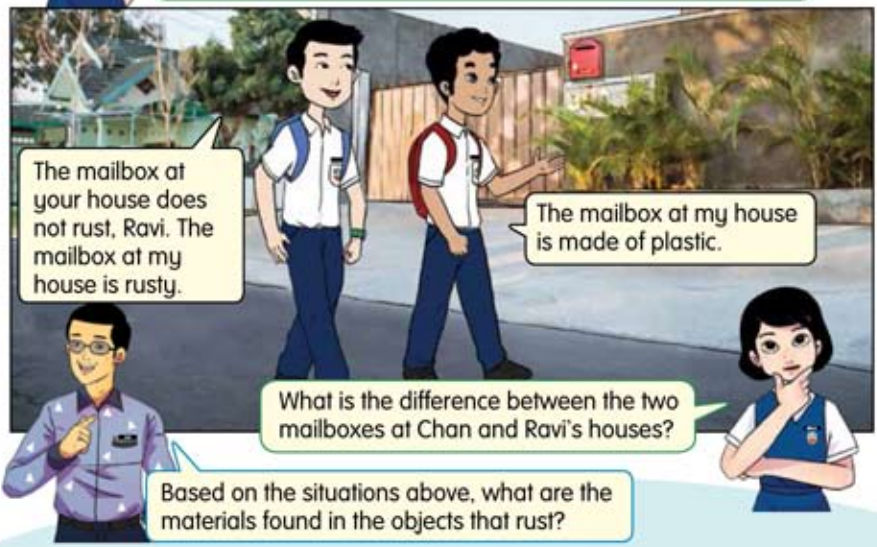
4. Present the results of the observation in front of the class.

(a) List the rusty objects that you have observed in the school compound.
(b) What are the characteristics of those rusty objects?

RUSTY OBJECTS

There are objects found in our surroundings that are made of many different materials. Some materials become rusty while some materials do not rust. Let us observe the situations below to find out the materials that rust.





LET'S TEST RUSTY OBJECTS

AIM To identify objects that rust.

GROUP ACTIVITY

APPARATUS AND MATERIALS Needle, glass rod, drinking straw, wooden skewer, nail, cotton roll, and vinegar.

STEPS

1. Wet the cotton roll with vinegar.

2. Arrange the needle, glass rod, drinking straw, wooden skewer, and nail on the wet cotton roll.

3. Roll up the wet cotton and leave it for five days. Unroll the cotton after five days.

Object	Observation
needle	
wooden skewer	
nail	
drinking straw	
glass rod	

4. Record the observations in the table as shown above.

5. Construct a mind map using the data in the table.

6. Upload the mind map on Google Classroom.

1. Be careful when handling the vinegar and sharp objects.
2. Wash your hands after completing this activity.

What can you conclude from this activity? Why?

FACTORS THAT CAUSE RUSTING

1. Aim
To investigate the factors that cause rusting.

2. Problem statement
Do air and water cause rusting?

3. Hypothesis
Water and air will cause iron wool to rust.

4. Defining variables
- manipulated variable: presence of water and air.
- responding variable: condition of the iron wool.
- constant variable: quantity of the iron wool.

5. Apparatus and materials
Test tubes, test tube rack, test tube stoppers, iron wool, anhydrous calcium chloride, oil, tap water, and boiled tap water.

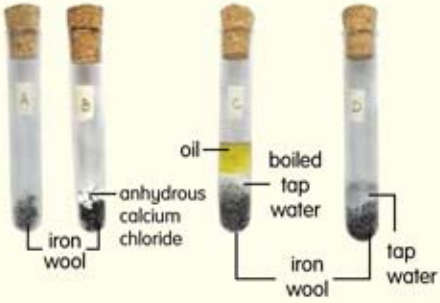
6. Steps

(a) Place four test tubes on the test tube rack. Label the test tubes as A, B, C and D.

(b) Put 20 g of iron wool into each test tube.

Be careful when handling the iron wool and boiled tap water.

TEACHER'S NOTES Teachers prepare 20 g of iron wool and boiled tap water.



(c) Add each test tube with the material as shown in the pictures above.

(d) Close the test tubes using the test tube stoppers.

(e) Leave the test tubes for four days.

(f) After four days, observe the condition of the iron wool in each test tube.

(g) Record your observations in the table as shown below.

7. Data

Test tube	Observation
A	
B	
C	
D	

SCIENCE INFO

Anhydrous calcium chloride is used to absorb moisture so that the condition inside the test tube is dry. Boiled water does not contain any air. Cooking oil is used to prevent air from entering the water.

8. Interpreting the data

(a) Which test tube contains rusty iron wool? Why?
(b) Which test tube contains non-rusty iron wool? Why?
(c) What are the factors that cause rusting?
(d) What is the conclusion of this experiment?

9. Conclusion

(a) The hypothesis is (accepted/not accepted).
(b) The presence of water and air (cause/do not cause) the iron wool to rust.

WAYS TO PREVENT RUSTING

Objects made of iron that are left exposed to water and air for some time will undergo rusting process. Rusting can be prevented in several ways. The pictures below show several ways to prevent rusting.

Ways to prevent rusting

WAYS TO PREVENT RUSTING

Applying oil or grease
Oil or grease is applied to the surface of objects made of iron.

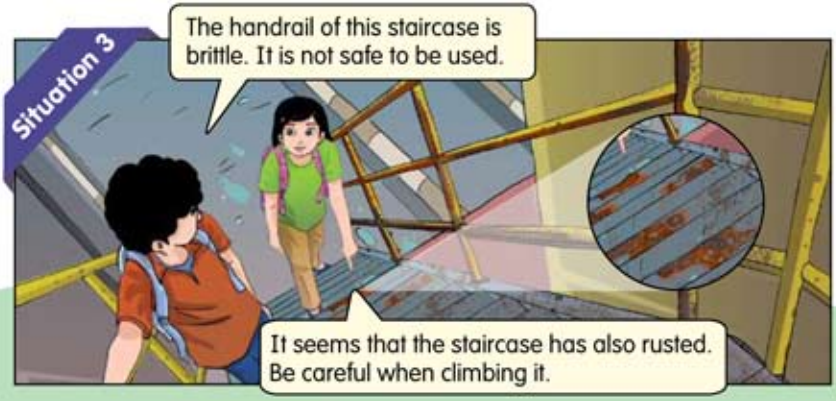
Coating with a layer of rustproof material
Rustproof materials such as plastic are coated onto the surface of objects made of iron.

Plating with a layer of rustproof metal
Rustproof metals such as tin and aluminium are plated onto the surface of objects made of iron.

Painting
Paint is applied on the surface of objects made of iron.

THE IMPORTANCE OF PREVENTING RUSTING

Rusting of objects made of iron brings many disadvantages. Observe the situations below.



Why do the spoons we use at home not rust although they are exposed to water and air?

FUN ACTIVITY

A PROJECT ON PREVENTING RUSTING

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GROUP ACTIVITY

APPARATUS AND MATERIALS

Camera, gloves, paint containers, paintbrushes, paint, oil, and grease.

STEPS

1. In groups, make posters on a rust prevention project.
2. Exhibit the posters on the school noticeboard.
3. Identify locations that have rusty objects in the school area.
4. Take photos of the locations and the rusty objects before the rust prevention work begins.
5. Conduct suitable rust prevention work at the locations.
6. When completed, take photos of the locations and the restored objects.
7. Upload the photos on Google Classroom.
8. Present the results of your project.

1. Wear gloves while carrying out the rust prevention work.
2. Wash your hands with soap and water after completing the rust prevention work.

(a) What ways did you use to prevent rust in this project?
(b) Why did you choose such ways? Explain.

FUN SCIENCE

RUST REMOVAL SOLUTION

Produce a rust removal solution using a glass container, spray bottle, wire brush, 100 mℓ of vinegar, three tablespoons of salt, three tablespoons of soda bicarbonate, and water.

STEPS

1. Pour 100 mℓ of vinegar into the glass container.

2. Add three tablespoons of salt into the glass container.

3. Add three tablespoons of soda bicarbonate into the glass container.

4. Stir the mixture of vinegar, salt, and soda bicarbonate.

5. Pour the rust removal solution into the spray bottle.

6. Spray the solution on a rusty object.

7. Leave the object for five minutes and clean it with a wire brush.
8. Rinse the object with clean water.

Wash your hands with soap and water after preparing the rust removal solution and when the rust removing activity is completed.

MIND REFLECTION

1. The characteristics of a rusty object are:
   - reddish-brown colour.
   - rough surface.
   - brittle.
2. Objects made of iron will rust.
3. The presence of water and air cause rusting of objects made of iron.
4. Ways to prevent rusting on objects made of iron are:
   - applying the objects with oil or grease.
   - coating the objects with a layer of rustproof material.
   - plating the objects with a layer of rustproof metal.
   - painting the objects.
5. The importance of preventing rusting of objects made of iron are as follows:
   - safe to be used.
   - durable and not easily damaged.
   - save on maintenance cost.
   - look pleasant.

MIND TEST

Answer all questions in the Science exercise book.

1. The pictures below show three types of rods made of different materials.

iron rod

plastic rod

wooden rod

(a) Which of the rods above can rust and cannot rust?
(b) Give your reason for (a).

2. Observe the picture shown and answer the following questions:
   (a) What can you observe on the objects?
   (b) State the characteristics of the objects.
   (c) What are the factors that cause this situation to occur?

3. Observe the picture below. Suggest a suitable way to prevent rusting. Give a reason for your answer.

4. The table below shows the results of an experiment to test the factors that cause rusting.

Test tube	Materials in the test tube
A	needle and tap water
B	needle and oil
C	needle, boiled tap water, and oil
D	needle

   (a) Which needles in the test tubes became rusty? Why?
   (b) Which needles in the test tubes did not become rusty? Why?
   (c) Based on your answers in (a) and (b), what can you conclude from this experiment?

5. Rust prevention benefits everyone. Efforts to prevent rusting should be appreciated.

   Based on the above statement, construct a mind map and state the importance of preventing rusting that you have learned.