

# UNIT 8

# MATERIALS



Mother, why are there many different types of items in this shop?

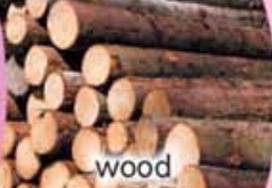


The items are made from different types of materials.

The items above are made from different types of materials. Why?

## Basic Sources of Materials

There are many objects in our daily lives. The objects are made from a variety of basic sources such as plants, animals, petroleum, and rocks. Observe the objects below.

|                        |  | Material      | Examples of objects  |
|------------------------|--|---------------|--|
| Basic Source<br>Plants |   | rubber trees  |  tyres           |
|                        |   | rubber        |  rubber gloves  |
|                        |   | trees         |  wooden cupboard |
|                        |   | wood          |  wooden chair   |
|                        |  | cotton plants |  shirts          |
|                        |  | cotton        |  towels         |

|                         |   | Material    | Examples of objects  |
|-------------------------|---|-------------|--|
| Basic Source<br>Animals |  | sheep       |  woollen cap   |
|                         |  | wool        |  sweater      |
|                         |  | cow         |  leather shoes |
|                         |  | cow skin    |  leather sofa |
|                         |  | silkworm    |  silk neck tie |
|                         |  | silk cocoon |  silk cloth   |

### SCIENCE-INFO

Petroleum is a black oil obtained from the ground to produce petrol and other materials. Petroleum is formed from living things that had died millions of years ago.

|   | Material   | Examples of objects   |
|---|--|---|
| <b>Basic Source</b><br><b>Petroleum</b> | <br>petroleum       | <br>plastic bag     |
|   | <br>plastic         | <br>plastic bottle |
|   | <br>synthetic cloth | <br>rain coat       |
|   |  | <br>tent           |

|                                     | Material  | Examples of objects   |
|-------------------------------------|---|---|
| <b>Basic Source</b><br><b>Rocks</b> | <br>gold   | <br>gold necklace  |
|                                     | <br>metal  | <br>pewter objects |
|                                     | <br>copper | <br>coins          |
|                                     | <br>clay   | <br>ceramic bowl   |
|                                     | <br>soil   | <br>brick          |
|                                     | <br>sand   | <br>mirror          |
|                                     |   | <br>glass bottle   |

What are other examples of objects made from plants, animals, petroleum, and rocks? Explain the properties of the materials for the objects you have mentioned.



**Apparatus and Materials**

Flip chart paper, various coloured marker pens, envelopes with 16 pictures of various objects

**Steps**

1. Each group gets an envelope containing 16 pictures of various objects.



2. Observe all the pictures. Then, identify the properties of each object based on the type of material and its basic source.



3. Based on the discussion, produce a classification chart in a creative way.



4. Present your group work in front of the class.

**Questions**

1. Based on this activity, how did you classify the picture of an object by its basic source?
2. How do you identify the characteristics of the objects which have been matched to their basic sources?

## Properties of Materials

Do you know that materials have various properties? Humans invent objects according to their uses based on the properties of materials. Let us investigate the properties of the material around us.



### LET'S TEST

### Knowing the Properties of Materials



#### Activity 1

**Aim** To determine the properties of materials that absorb water.

**Apparatus and Materials** Straw, stopwatch, balloon, tissue paper, rock, cotton, plastic ruler, leather string, polystyrene, glass slide, water

#### Steps

1. Put a few drops of water using a straw onto all the tested objects one by one.
2. Observe the water droplets on the objects after two minutes.
3. Record your observations as shown in the table below.

| Tested Object | Observation (✓)        |                       | Inference |
|---------------|------------------------|-----------------------|-----------|
|               | water droplets present | water droplets absent |           |
| balloon       |                        |                       |           |
|               |                        |                       |           |

#### Questions

1. What are your observations for this activity?
2. State the properties of the materials tested in this activity.
3. How do you identify the properties of the materials in this activity?

TEACHER'S NOTES

- Activities 1-6 are conducted using the "station method". The materials can be changed to other suitable objects based on the properties that are being tested.
- Water absorbent (non-waterproof) materials absorb water when water droplets are dropped onto them.
- Non-water absorbent (waterproof) materials do not absorb water when water droplets are dropped onto them.

8.2.1  
8.2.4

## Activity 2

**Aim** To determine the properties of materials that can float or sink.

**Apparatus and Materials** Plastic container, water, stopwatch, rock, plastic ruler, key, balloon, popsicle sticks, straw, cotton, leather string, glass cup, pencil

### Steps



1. Fill the plastic container with water until it is half-full.



2. Put all of the objects into the plastic container and start the stopwatch.



After one minute, observe the tested objects, whether the tested objects are above or below the water surface.

4. Record your observations as shown in the table below.

| Tested Object | Observation (✓)   |   | Inference   |
|---------------|---|---|---|
|               | above the water surface   | below the water surface   |   |
| balloon       |  |  |  |
|               |   |   |   |

### Questions

1. What are your observations for this activity?
2. What are the properties of the materials tested in this activity?
3. Which tested objects can float on the water surface?



Why are some materials able to float or sink?

### Activity 3

**Aim** To determine the properties of materials that can conduct electricity.

#### Apparatus and Materials

2 dry cells, dry cell holder, bulb, bulb holder, switch, connecting wires, balloon, skewer, keys, ceramic spoon, plastic ruler, leather string, coins, aluminium foil, pencil lead

#### Steps



1. Build a complete electric circuit as shown in the picture above. Observe the bulb.
2. Replace the switch on the electric circuit with the balloon. Then, observe the bulb.
3. Repeat step 2 with another test object.
4. Record your observations as shown in the table below.

| Tested Object | Observation (✓)   |   | Inference   |
|---------------|---|---|---|
|               | bulb lights up  | bulb does not light up  |   |
| balloon       |  |  |  |
|               |   |   |   |

#### Questions

1. What are your observations for this activity?
2. What are the properties of the materials tested in this activity?
3. Which of the tested objects can conduct electricity in this activity?

## Activity 4

**Aim** To determine the properties of the materials that allow light to pass through.

**Apparatus and Materials** Balloon, clear plastic, coloured paper, glass slide, popsicle sticks, tracing paper, coloured paper



### Steps

1.



Put a test object in front of your eyes. Then, look through it.

2. Observe the clarity of your vision.
3. Repeat steps 1 and 2 with the other test objects.
4. Record your observations as shown in the table below.

| Tested object | Observation (✓) |           |                | Inference |
|---------------|-----------------|-----------|----------------|-----------|
|               | clear           | not clear | cannot be seen |           |
| balloon       |                 |           |                |           |
|               |                 |           |                |           |

### Questions

1. What are your observations for this activity?
2. What are the properties of the materials tested in this activity?

## Activity 5

**Aim** To determine the properties of materials that can conduct heat.

**Apparatus and Materials** Aquarium, skewer, stopwatch, adhesive tape, hot water, aluminium foil, popsicle sticks, ceramic spoon, polystyrene, clear plastic, balloon, leather string

### Steps



1. Attach the test objects to a skewer as shown in the picture.



2. Touch the top of each test object and determine its initial condition.



3. Fill the aquarium with hot water. Then, soak the test objects carefully. Start the stopwatch.



4. After 2 minutes, touch the end of each test object and compare its present condition to its initial condition.

5. Record your observations into the table as shown below.

| Tested object | Observation of object condition after being soaked (✓) |           | Inference |
|---------------|--|-----------|-----------|
|               | no change  | feel warm |           |
| balloon       |  |           |           |
|               |  |           |           |

### Questions

1. What are your observations for this activity?
2. What are the properties of the materials tested in this activity?
3. Which objects are warm after being soaked in hot water?

## Activity 6

**Aim** To determine the elasticity of materials.

**Apparatus and Materials** Balloon, leather string, rubber band, spring, plastic spoon, popsicle sticks, pencil, straw, nail

### Steps

1.



Hold and pull the balloon with both hands. Then, release it.

2. Observe changes in the conditions of the balloon.
3. Repeat steps 1 and 2 using a spring and other test objects.
4. Record your observations as shown in the table below.

| Tested Object | Observation (✓)                               |                     | Inference |
|---------------|---|---------------------|-----------|
|               | can be stretched and return to original shape | cannot be stretched |           |
| balloon       |   |                     |           |
|               |   |                     |           |

### Questions

1. What are your observations for this activity?
2. What are the properties of the materials tested in this activity?
3. What are the objects that can be stretched and returned to their original shapes?

Based on all the activities that you have carried out, what can you conclude about the properties of the materials?



## Applications of Properties of Materials

Knowledge of the properties of material is important in designing an object. Choosing a suitable type of material will ensure proper functioning of the created objects.

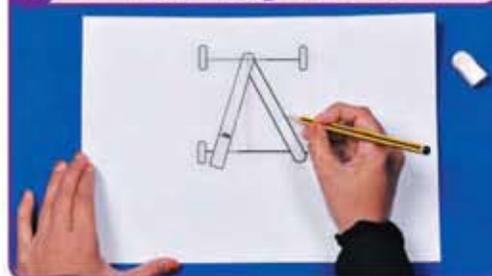
### 1 Identifying the problem



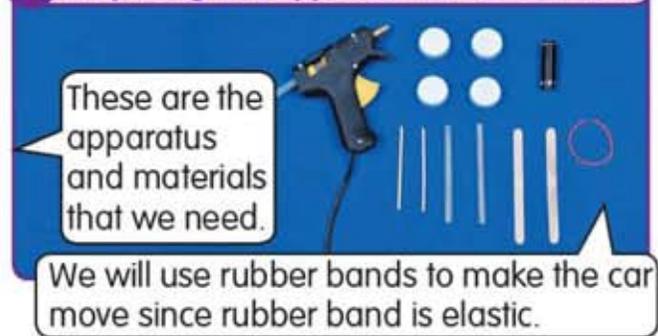
### 2 Generating idea



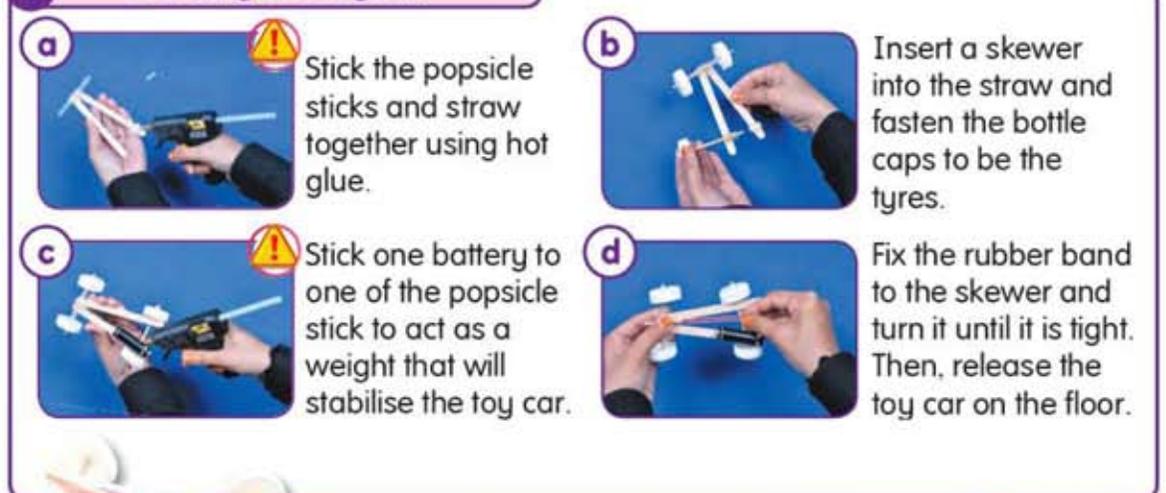
### 3 Sketching the idea



### 4 Preparing the apparatus and materials



### 5 Building the toy car



Create other models by applying your knowledge on the properties of materials.



## Choosing Types of Materials to Invent an Object

An object is invented based on the suitability of the materials to the function of the object. Observe the situations below.

### Situation 1



Why are most cooking utensils such as pots made of metal?

### Situation 2



Why is cotton cloth best used for wiping liquid?

Why is choosing the types of materials important in the invention of objects?

**Steps**

Make a lamp shade in a creative way using used materials. Use your knowledge of basic sources of materials and the properties of materials to produce a lamp shade.

**MIND REFLECTION**

1. The basic sources of materials for making objects are:

| Basic source | Material        | Examples of objects |
|--------------|-----------------|---------------------|
| Plants       | wood            | wooden chair        |
|              | cotton          | shirt               |
|              | rubber          | tyre                |
| Animals      | skin            | leather shoes       |
|              | wool            | sweater             |
|              | silk            | silk cloth          |
| Rocks        | metal           | coins               |
|              | soil            | mirror              |
| Petroleum    | plastic         | plastic bottle      |
|              | synthetic cloth | tent                |

2. Properties of materials of an object are as follows:

- water absorbent and waterproof
- float and sink
- conduct electricity
- ability for light to pass through
- conduct heat
- elastic

3. Choosing the types of materials to be used in the invention of an object is important to ensure that the object works properly and is suitable for its uses.



## MIND TEST

Answer all questions in the Science exercise book.

1. Match the material to its basic source.

| Material                 | Basic Source |
|--------------------------|--------------|
| wood, cotton, rubber     | animals      |
| leather, wool, silk      | rocks        |
| plastic, synthetic cloth | petroleum    |
| metal, soil              | plants       |

2. Create a classification table based on their basic sources.

|              |                |                 |         |
|--------------|----------------|-----------------|---------|
| metal pot    | plastic bottle | rain coat       | sweater |
| silk clothes | tent           | mirror          | towel   |
| tyres        | wooden chair   | leather handbag | bricks  |

- What are the properties of materials used in the manufacturing of footballs and balloons? Explain.
- Why are most electrical appliances such as rice cookers and irons made of materials that can conduct heat?
- Look at the picture below and answer the following questions.



- What are the basic sources for making parts M and N?
- Suggest other suitable materials to replace part M if it is to be replaced with another type of material. Give your reasons.