Heat and Temperature
By the end of this unit you should know:

- The difference between heat and temperature.
- How to measure the temperature.
- Things will either warm up or cool down to match the temperature of their surrounding.
- Substances are different in their conducting and insulating properties.

Heat and Temperature


Is it hot or not?

- Collect three bowls of water; fill the first one with warm water, the second one with tap water. Fill the last bowl with ice cold water.

- Predict which bowl is the coldest. How do you know?

- Test each bowl carefully with your hands. Were you right?

Put the bowls starting with the hottest.
We use our sense of touch to find out how hot our surrounding is. You can feel the temperature of water because the heat flowed from the three bowls to your hand.

Now put one hand in the iced water, and the other hand in the warm water, for about a minute. Take them out and put your both hands in the third bowl. Record what do you observe?

Heat is a flow of energy from warmer matter to cooler matter.

We feel the heat with our hand but sometimes our sense can be fooled. Have you ever thought that you did not need a coat, and then you found out you were wrong?

Some times we need to know the exact temperature of things.

To measure the temperature accurately we use a thermometer.

Predict the temperature of each bowl.
- Check your predictions by using a thermometer.
- Record your results in the table.
- How close were your estimates?

<table>
<thead>
<tr>
<th>Bowl</th>
<th>Estimated Temperature</th>
<th>Measured temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Temperature is a measure of how hot or cold something is.

Measuring temperature

The temperature can be estimated using our sense of touch.

In order to measure the temperature accurately we use the thermometer.

Comparing heat and temperature

Heat, a flow of energy from warmer matter to cooler matter.

Temperature is the measure of how hot or cold something is.
Key Words:
- Heat
- Temperature
- Thermometer

Key idea
- How hot or cold something is, is called temperature.
- We can measure the temperature using a thermometer.
- Heat, a flow of energy from warmer matter to cooler matter.

Key Questions
1. What is the difference between heat and temperature?
   ما هو الفرق بين الحرارة ودرجة الحرارة؟

   -

   - What should we use to measure the temperature?
     مِقاس شدة الحرارة أو البرودة هي درجة الحرارة

   -

   -

   -
Flow of Heat


Don’t let it get cold

1. Imagine a hot dinner on a cold day. What happens to it if you don’t eat it straight away?

تخيل لو أنك تركت الغداء الساخن لفترة في يوم بارد، ماذا سيحدث؟

2. Imagine a cold drink on a hot day. What will happen to it if you leave it for a long time before you drink it?

Does the temperature of something hot or cold change to be more like the temperature of its surrounding?

هل تتغير درجة حرارة الشيء الحار أو البارد لتصبح أقرب لدرجة حرارة المحيط؟

Activity:

You will need:

3 thermometers
A bowl of iced water
A bowl of tap water
A bowl of warm water

Estimate and then measure the temperature of the water in each of the three bowls. Record your measurements.

<table>
<thead>
<tr>
<th>Bowl</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated temperature</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measured temperature</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature after 10 min.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature after 20 min.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature after 30 min.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. What do you predict the temperature of the water in the three bowls will be in one hour's time? Explain your prediction.
4. Leave the bowls for 10 minutes. Take the temperatures again. And after 20 minutes and 30 minutes.

5. What do you notice? Can you explain what happened?

6. Take the thermometer out and dry it.
   Leave it in the room for about 15 minutes.
   What is the temperature?

7. What do you notice about the temperature Of the bowls and the room?

Anything that is at a different temperature from its surrounding will change temperature over time. If left long enough, it will either warm up or cool down to match the temperature of all other things around it, including the air.

Both the hot dinner and the cold drink will end up at the temperature of the surrounding air.
Measuring the temperature in the classroom during day and night

Give us this graph.

Key Words:
Surrounding
المحيط

Key idea

- Over time, every material will become the same temperature as its surrounding.

Key Question

Explain why energy flows from the outside air into the inside of a refrigerator.

فسر لماذا تنتقل الحرارة من الهواء خارج الثلاجة إلى داخل الثلاجة؟
Heat movement

Standard number: 4.14.4

Materials that allow heat to pass through them easily are called thermal conductors. المواد التي تسمح بمرور الحرارة بسهولة تسمى موصلات للحرارة.

Metals and glass are good thermal conductors. المعادن والزجاج موصلة جيدة للحرارة.

Some materials do not conduct heat well. They are called thermal insulators. بعض المواد لا توصل الحرارة تسمى مواد عازلة للحرارة.

Materials such as plastics, wood, wool and air are good thermal insulators. المواد مثل البلاستيك والخشب والصوف والهواء مواد عازلة للحرارة.

Activity

You will need

Three cups made from different materials

Thermometers

Hot water

1. Fill the cups with hot water.

2. Measure the temperature of the cups.

3. After 15 minutes measure the temperature again.

4. Record your results what do you observe
Which material would you choose for a cup of tea? Why?

Think about it?

Five glasses containing water at 60°C were each wrapped in a different material. After 10 minutes, the water temperature in each glass was recorded. The results are shown in the table below.

<table>
<thead>
<tr>
<th>Material around glass</th>
<th>Temperature after 10 minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>paper</td>
<td>40°C</td>
</tr>
<tr>
<td>aluminium foil</td>
<td>30°C</td>
</tr>
<tr>
<td>cotton</td>
<td>45°C</td>
</tr>
<tr>
<td>polystyrene</td>
<td>55°C</td>
</tr>
<tr>
<td>cotton wool</td>
<td>50°C</td>
</tr>
</tbody>
</table>

Which material would you choose to wrap around a water pipe in winter to stop the water from freezing? Explain why.
Some materials **conduct** heat very well.

Think of a metal spoon that has been left in a steaming cup of coffee— it gets very hot! **Metals** are materials that **heat** well.

That is why saucepans are made from **metals**: they heat up quickly. However the handles are usually conduct made from another material such as **plastic** or **wood**, because they are **insulators**.

بعض المواد توصل الحرارة بشكل جيد.

المعادن هي مواد موصولة جيدة للحرارة.

البلاستيك و الخشب هي مواد عازلة للحرارة.
Key Words:
Thermal conductor
موصلة للحرارة
Thermal insulator
عازلة للحرارة

Key idea
- Materials that allow heat to pass through them easily are called thermal conductors.
المواد التي تسمح بمرور الحرارة بسهولة تسمى مواد موصولة للحرارة
- Some materials do not conduct heat well. They are called thermal insulators.

Key Questions

1. Which of these cups is made from an insulating material?

أي من الكوبين مصنوع من مواد عازلة؟

2. Design a cup for keeping drinks cold in hot weather. Think about where the heat can get in. How can you slow this down?

صمم كوب ليبقي السوائل باردة في الطقس الحار. فكر من اين مصدر الحرارة، و كيف تستطيع ان تقلل ذلك.