Australian Curriculum

YEAR 3

AGES 8–9

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# SCIENCE: A STEM APPROACH

AC

Biological sciences

Chemical sciences

Earth and space sciences

Physical sciences

SCIENCE TECHNOLOGY ENGINEERING MATHEMATICS

SAMPLE - NOT FOR SALE

RIC-6173 8.8/1258

# Teacher notes

### Science inquiry focus:

What are insulators?

What materials are good insulators?

### Science Inquiry Skills:

- Questioning and predicting QP
- Planning and conducting PC
- Processing and analysing data and information PA
- Evaluating E
- Communicating C

### Science as a Human Endeavour:

- Students predict characteristics common to a group of everyday objects.
- Students predict what type of material would be a good insulator.
- Students discuss how knowledge of materials that are good insulators affects the design of everyday items.

### Technology/Engineering/ Mathematics links:

- using a thermometer to measure temperature and record data in a table
- using a timer to calculate 5 minute intervals
- investigating the suitability of materials and their purpose

### Assessment focus:

- Use page 159 as an indication of the student's ability to plan an experiment, list the materials used, write a simple procedure and record results in a table.
- Use page 160 to check understanding of the concept of conduction and insulation.

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## Background information

- Heat can transfer easily through some materials. An insulator makes it harder for heat to enter or leave a material. An oven mitt works by not allowing the heat to move easily to your hand. A thermos acts as a barrier making it harder for heat to escape a hot drink, or for heat to enter a cold drink.
- An insulator does not stop the process of heat transfer altogether, but it slows the process down.
- Plastic, wood and some fabrics are good heat insulators. Cottonwool balls are an effective material to demonstrate insulation in a simple experiment. Foam or polystyrene cups would also be effective.
- For more information about heat transfer, conductors and insulators see <https://tinyurl.com/zwht8fw>.
- Answers for cloze activity on page 160:

| | | | |
|---|---|---|---|
| 1. | heat | 5. | metal |
| 2. | cold | 6. | oven mitts |
| 3. | foam | 7. | blanket |
| 4. | cottonwool | 8. | insulator |

## Resources

- Digital copy of page 158
- Plastic cups (5 per group), newspaper or any type of paper, aluminium foil, cottonwool, foam, fabric, warm water, thermometers
- Copies of page 159 (alternatively, conduct online experiment at <https://tinyurl.com/hd3jlqk>)
- Copies of page 160
- Digital insulator experiment for early finishers <https://tinyurl.com/4vh7rt9>


978-1-925431-96-4
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# Lesson plan

### Introduction:

1. Use the Concept attainment strategy and display the T-chart on page 158. In pairs or small groups students discuss what criteria might be applied to those things listed in the 'Yes' column and those things in the 'No' column. *What might the question be for the answer to be yes or no?* **QP**
2. Students write their prediction and then test it out using the images shown in the tester row. *Does your prediction still apply?* **QP**

### Development:

3. Explain the criteria for the two columns as 'Is the object designed to keep heat from passing through it?' Apply this to the 'testers' to confirm if the criteria works.
4. Students use this idea to predict what type of material will best insulate a cup of warm water—paper, aluminium foil, cottonwool, foam or fabric—and then conduct the experiment using page 159. Students wrap five plastic cups with the materials listed and fill with warm water. An initial temperature of each cup is recorded straight away, and then every 5 minutes. Alternatively, if time or resources are limited, conduct a similar online interactive experiment at <https://tinyurl.com/hd3jlqk> (just register online first). **PC** **PA**

   Differentiation
   - Less capable students can use an experiment sheet that has the materials and procedure sections done for them so it is simpler to follow.
   - More capable students or early finishers can attempt an online insulator experiment at <https://tinyurl.com/4vh7rt9>.

### Reflection:

5. Discuss results as a class and, using a show of hands, form a consensus of which material the groups' results showed was the best insulator. Discuss any varying results and the validity of them; e.g. if one group concluded that foam was the best then does this mean they did something wrong or could foam also be a valid insulator? Discuss results for the second best insulator and worst insulator and compare any variances. Discuss how the results compared to students' initial predictions. **E** **PA**
6. Students individually complete the cloze activity on page 160. **C**

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# Concept attainment chart

| Yes | No |
|---|---|
| | |
| | |
| | |
| | |

## Testers

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# Insulation experiment sheet

**Question:**
Which material will best insulate (keep warm) a cup of warm water?

paper | aluminium foil | cottonwool | foam | fabric

**Materials:**

- _____
- _____
- _____
- _____
- _____
- _____
- _____
- _____

**Procedure:**

1. _____
2. _____
3. _____
4. _____

**Results:**

| Time passed (minutes) | Paper (temp. of water °C) | Aluminium foil (temp. of water °C) | Cottonwool (temp. of water °C) | Foam (temp. of water °C) | Fabric (temp. of water °C) |
|---|---|---|---|---|---|
| 0 | | | | | |
| 5 | | | | | |
| 10 | | | | | |
| 15 | | | | | |
| 20 | | | | | |
| 25 | | | | | |

**Conclusion and explanation:**

_____

_____

_____

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# Cloze activity

**Word bank**

| | | | |
|---|---|---|---|
| metal | oven mitts | cottonwool | foam |
| blanket | cold | insulator | heat |

When two objects touch, _____[1.] can pass through them. Heat only travels in one direction—from hot things to _____[2.] things.

To slow heat down from passing through to a touching object, materials such as _____[3.] and _____[4.] can be used as insulators.

The material that is the worst at insulating is _____[5.].

In our everyday life we use items that protect us from heat, such as _____ _____[6.]. We also use items that are designed to keep heat in, like a _____[7.].

We need to consider how the item is being used to decide what material is best. If it needs to hold a liquid then the material can't absorb the liquid; e.g. a takeaway coffee cup can't be made from cottonwool balls. Plastic coated cardboard is a better solution and still works as an _____[8.].

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