D1 ACTIVITY 1: COMPARING COFFEE CUPS

Background

In this activity students use a disposable cup to test the insulation properties of various materials. There are two aspects to this investigation – one aspect looks at the merits of using a sleeve for holding the cup and the second one considers the materials of various coffee cups. The activity is an opportunity to teach students about the importance of applying the 'fair test' principle and considering all variables when making an assessment.

Suggested approaches:

- For this exercise the class is divided into group A and group B.
- Both groups are presented with the materials and given a brief of what to do. After a set period of time, each group presents the best insulation material according to their findings, and explains why this material provides better insulation than the others.
- Alternatively, each group can source their own material from a collection presented to them, and test their insulating properties. After a set period of time, each group presents an appropriate argument supported by their findings as to why their cup or sleeve is best.
- Another approach would be to divide the class in three. Group C could act as an audience. They could put their own questions to the groups as well as listening to the presentations.

Equipment required:

GROUP A:

- Five strong paper or polystyrene cups
- Five lids to fit the cups. If the lids do not have a gap for drinking through, pierce a hole in each lid, big enough for the thermometer to be inserted.
- Bubble wrap of sufficient size to cover one cup
- Cotton wool sheet of sufficient size to cover one cup
- Aluminium foil of sufficient size to cover one cup
- Foam sheeting of sufficient size to cover one cup
- Four elastic bands
- Five beakers or measuring jugs
- Timer
- Five thermometers
- Kettle or other water heating facility
- 1.5 litres water
- Paper and pen for taking notes
- Pencil and ruler for drawing graphs
- (Optional) Add any other material that the students wish to test for insulation properties. Add an extra cup, beaker, elastic band, lid, and thermometer per extra insulation material.

GROUP B:

- One Styrofoam cup
- One disposable plastic cup
- One smooth paper cup
- One disposable cup of fluted paper
- Four lids to fit the cups. If the lids do not have a gap for drinking through, pierce a hole in each lid, big enough for the thermometer to be inserted.
- Kettle or other water heating facility
- 1.5 litres water
- Timer
- Four thermometers
- Four beakers or measuring jugs
- (Optional) Any other type of disposable cup that may be tested for insulation. Add a lid, beaker and thermometer per extra cup.

What to do:

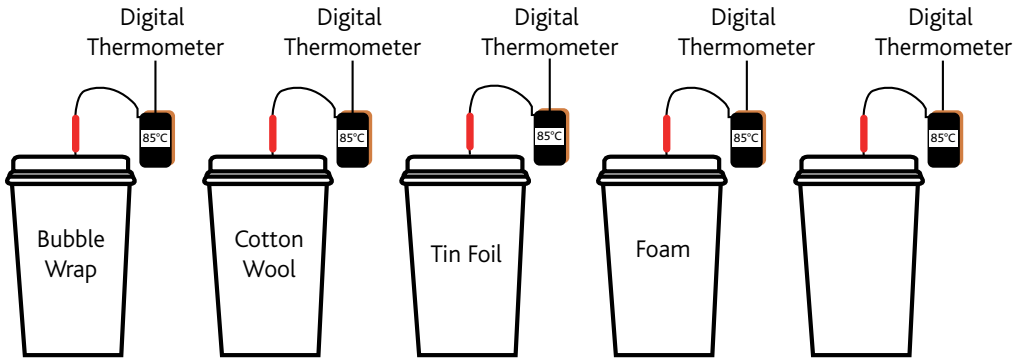

Figure 1

GROUP A:

1. Cover each cup with one of the insulation materials and hold in place with elastic bands. Leave the fifth cup bare.
2. Heat the water to approx. 85°C.
3. Measure 200 ml of water into each beaker and pour rapidly and simultaneously into the five cups.
4. Replace the lids.
5. Insert a thermometer through the slot in each lid.
6. Read and record the temperature of water in each cup.
7. Using the timer record the temperature every five minutes over a period of 40 minutes.

   ? ***What do you notice?***

   ? ***Why do you think this is happening?***
8. Discuss what type of graph would be appropriate for showing your results. Choose one, and draw it up.

GROUP B

1. Heat the water to approx. 85°C.
2. Measure 200 ml of water into each beaker and pour rapidly and simultaneously into each of the cups.
3. Replace the lids.
4. Insert a thermometer through the slot in each lid.

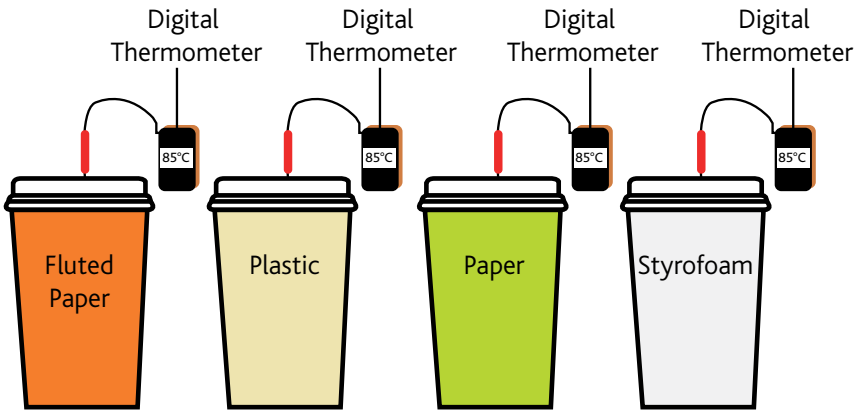

Figure 2

5. Read and record the temperature of the water in each cup.
6. Using the timer record the temperature every five minutes for a period of 40 minutes.
   ? ***What do you notice?***
   ? ***Why do you think this happened?***
7. Discuss what type of graph would be appropriate for showing your results. Choose one, and draw it up.

Resources:

- The SEAI website has a useful PDF on home insulation.

D1.1 DISCUSSION POINTS: INSULATION MATERIALS

1. In **D1 ACTIVITY 1: COMPARING COFFEE CUPS**, did using a sleeve help to retain the heat in the drink?
2. Houses lose their heat mainly through the walls and the roof. There are many ways heat loss can be reduced by treating the outside walls, from using pebble dash to stone cladding. Using the online resources in this section, investigate what is available and how effective each option is.