Heat capacity practical.

Name: Class: Date:

The oceans take in a great deal of the Sun's energy while warming only slowly, because water has a high specific heat capacity. In this practical you measure the specific heat capacity of water and of one other material, then use your results to explain why the oceans and coasts change temperature more slowly than the land.

YOU NEED

- Two identical beakers or insulated cups, and an electronic balance
- Water, and dry sand or another material your teacher provides
- An electric immersion heater with a joulemeter, or a heater of known power
- A thermometer or temperature probe, a stirring rod and a stopwatch

SAFETY

- Switch the immersion heater on only when it is fully covered, and switch it off before you take it out.
- Hot water and hot sand can scald. Let them cool before you handle the beaker.
- Keep water away from the heater's power supply and leads.

Predict

P **Which material do you think will warm faster with the same heater? Give a reason.**

Method

1. Measure the mass of the empty beaker, then add about 0.5 kg of water and measure the mass again. Record the mass of the water.
2. Put the heater and the thermometer into the water. Stir gently and record the starting temperature.
3. Switch on the heater and start the stopwatch. Every 2 minutes for 10 minutes, stir and record the temperature. Record the energy from the joulemeter at the end, or work it out as power × time.
4. Repeat steps 1 to 3 with the same mass of the second material. With sand, push the heater and thermometer well in, and stir it before each reading.

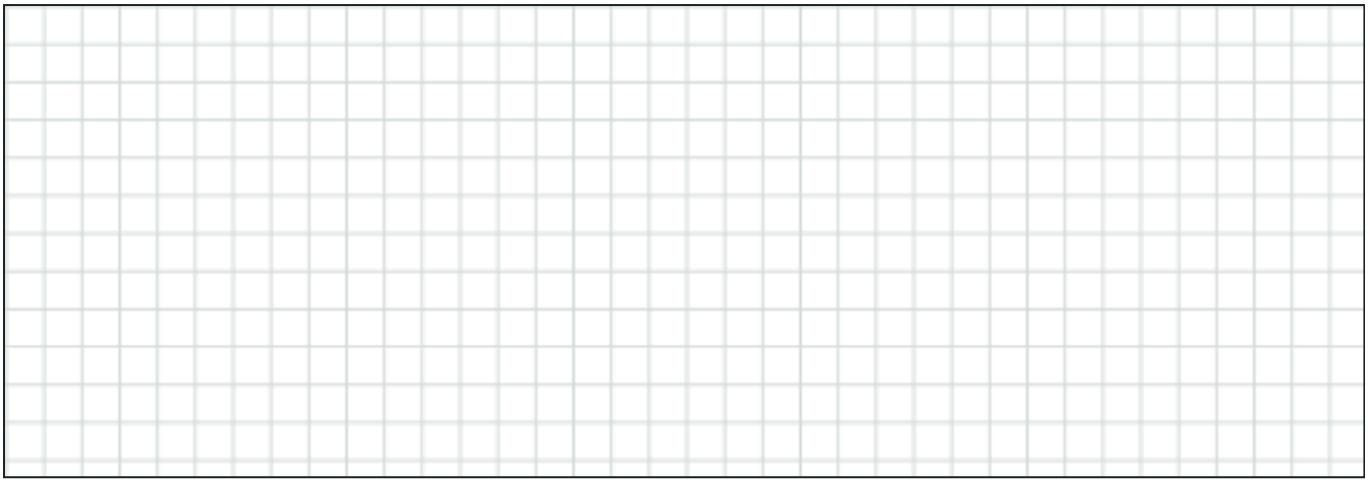
Results

TIME (MIN)	0	2	4	6	8	10
WATER (°C)						
_____ (°C)						

MATERIAL	MASS (KG)	ENERGY IN (J)	TEMPERATURE RISE (°C)	SPECIFIC HEAT CAPACITY (J/KG °C)
WATER				
_____				

specific heat capacity = energy ÷ (mass × temperature rise)
$c = E \div (m \times \Delta T)$

Graph temperature against time for both materials, on the same axes



Questions

1. **Which material warmed faster? Was your prediction right? Use your values of specific heat capacity to explain why.**

2. **Compare your value for water with the value your teacher gives you. Give two reasons your value is different.**

3. **How could you change the method to make your results more accurate? Explain how each change would help.**

4. **Use your results to explain why the ocean's surface temperature changes much more slowly than the temperature of the land beside it.**

5. **Coastal towns usually have a smaller range of temperature between day and night than inland towns. Explain why, using the idea of specific heat capacity.**