




### Components

	NAME	DESCRIPTION	AUDIENCE
	<i>Specific heat capacity</i> teachers guide	This guide contains notes about a practical procedure to measure specific heat capacity	teachers
	<i>Comparing specific heat capacity</i> procedure sheet	This procedure compares the specific heat capacity of water with another liquid.	students
	<i>Specific heat</i> worksheet	This student worksheet poses questions about the use of geothermal water to transfer energy.	students

### Purpose

To introduce students to the concept of specific heat capacity and provide a context to introduce the relationship  $Q = m c \Delta T$ .

### Outcomes

Students:

- perform an experiment to explore the concept of specific heat capacity;
- compare specific heat capacities of different substances;
- recognise that the specific heat capacity of water is significantly higher than most other materials;
- understand that water is a useful substance for transferring heat, due to its high specific heat capacity and other properties;
- recognise that geothermal hot water can be used as a source of energy, due to its relatively high specific heat capacity; and
- use the relationship  $Q = m c \Delta T$  in calculations.

### Activity summary

ACTIVITY	POSSIBLE STRATEGY
Teacher provides resources for the practical activity.	small groups
Students complete the worksheet. Teacher introduces the relationship $Q = m c \Delta T$	individually or in pairs

### Teacher notes

Hot plates should be operated at a setting that allows students enough time to take at least ten readings as water heats to its boiling point. The main purpose of this procedure is for students to compare specific heat capacity of water with a second liquid. This is done through a graph of results and does not require overly complicated calorimetry. For this exercise, heat absorbed by the beakers can be ignored.

If teachers prefer to measure an actual value for the specific heat capacity of water then a standard experiment converting electrical energy into heat energy could be undertaken. Students will need an understanding of quantitative aspects of electrical and heat energy, as suggested below.

Use an electrical heating element to heat water in a calorimeter, or styrofoam cup.

Use the equivalence

$E = I V t = m c \Delta T$  to determine the value of  $c$ .

## Associated SPICE resources

*Geothermal energy 2: Specific heat capacity* may be used in conjunction with related SPICE resources to investigate specific heat and latent heat.

DESCRIPTION	LEARNING PURPOSE
<p><i>Geothermal energy (overview)</i></p> <p>This learning pathway shows how a number of SPICE resources can be combined to assist with teaching the topics of specific heat and latent heat.</p>	
<p><i>Geothermal energy 1: Heat beneath your feet</i></p> <p>A video engages student interest in recent developments and future possibilities for the use of geothermal energy.</p>	Engage
<p><i>Geothermal energy 2: Specific heat capacity</i></p> <p>Students investigate the specific heat capacity of water in laboratory and problem-solving activities.</p>	Explore
<p><i>Geothermal energy 3: Heating a pool</i></p> <p>Students' understanding of specific heat is developed through data analysis in the context of heating swimming pools using geothermal energy.</p>	Explain
<p><i>Geothermal energy 4: Sustainable energy sources</i></p> <p>Students reinforce and deepen their understanding of specific heat and geothermal energy through problem-solving activities.</p>	Elaborate
<p><i>Geothermal energy 5: Latent heat</i></p> <p>Students investigate latent heat through practical and problem-solving activities.</p>	Explore
<p><i>Geothermal energy 6: Using geothermal energy</i></p> <p>Students use an interactive learning object to develop an understanding of how latent heat is used in a number of devices.</p>	Explain
<p><i>Geothermal energy 7: The geothermal alternative</i></p> <p>Students use concepts developed throughout this sequence to analyse two case studies that involve use of geothermal energy.</p>	Elaborate

## Technical requirements

The guide, procedure sheet and worksheet require Adobe Reader (version 5 or later), which is a free download from [adobe.com](http://adobe.com). The procedure sheet and worksheet are also provided in Microsoft Word format.

## Acknowledgements

Designed and developed by the Centre for Learning Technology, The University of Western Australia.  
 Production team: Leanne Bartoll, Alwyn Evans, Bob Fitzpatrick, Dan Hutton, Gary Thomas and Michael Wheatley, with thanks to Pauline Charman, Jenny Gull, Wendy Sanderson and Charmaine White.

## SPICE resources and copyright

All SPICE resources are available from the Centre for Learning Technology at The University of Western Australia ("UWA"). Selected SPICE resources are available through the websites of Australian State and Territory Education Authorities.

Copyright of SPICE Resources belongs to The University of Western Australia unless otherwise indicated.

Teachers and students at Australian schools are granted permission to reproduce, edit, recompile and include in derivative works the resources subject to conditions detailed at [spice.wa.edu.au/usage](http://spice.wa.edu.au/usage).

All questions involving copyright and use should be directed to SPICE at UWA.

Web: [spice.wa.edu.au](http://spice.wa.edu.au)  
 Email: [spice@uwa.edu.au](mailto:spice@uwa.edu.au)  
 Phone: (08) 6488 3917

Centre for Learning Technology (M016)  
 The University of Western Australia  
 35 Stirling Highway  
 Crawley WA 6009