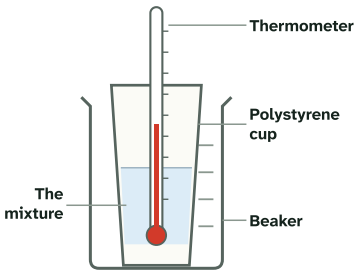
Hotter or colder? A temperature record and graph

Name: Class: Date:

Page 1 is a record sheet for measuring the temperature of three mixtures every 30 seconds for 3 minutes. Page 2 has a grid to graph your results, and questions about energy and new substances.

PRACTICAL Hotter or colder?

Each group needs: a polystyrene cup standing in a 250 cm^3 beaker, a thermometer, a 10 cm^3 measuring cylinder, a spatula and a stopclock (or a temperature sensor and data logger), 0.4 M sodium hydroxide solution, 0.4 M hydrochloric acid, 0.4 M sodium hydrogencarbonate solution, citric acid, anhydrous calcium chloride, water and safety glasses.



Safety. Wear safety glasses throughout, because sodium hydroxide, citric acid and calcium chloride irritate the eyes and skin. If a solution splashes on your skin, wash it at once with lots of water and tell your teacher. Wipe up small spills, and tell your teacher about bigger ones or any breakage. Wash your hands afterwards. Never eat or drink anything in the laboratory.

My predictions, before the practical: will each mixture get warmer, get colder or stay the same?

1. Sodium hydroxide and hydrochloric acid:

2. Sodium hydrogencarbonate and citric acid:

3. Calcium chloride and water:

What to do

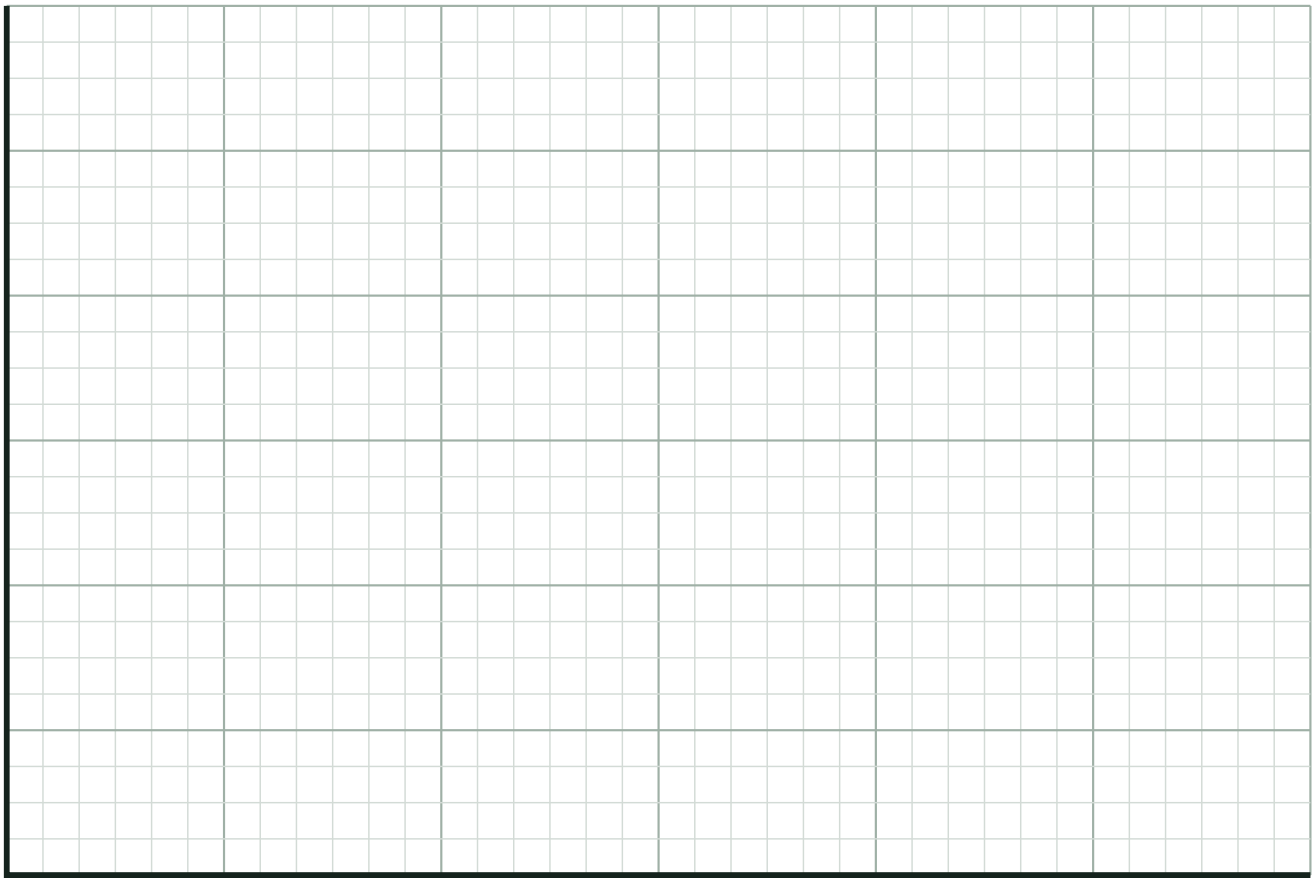
1. Put 10 cm^3 of sodium hydroxide solution in the cup. Record its temperature in the 0 seconds row.
2. Add 10 cm^3 of hydrochloric acid and start the stopclock. Stir gently with the thermometer, and record the temperature every 30 seconds for 3 minutes.
3. Empty the cup as your teacher tells you, and rinse it. Repeat with 10 cm^3 of sodium hydrogencarbonate solution and four small spatula measures of citric acid.
4. Empty and rinse the cup again. Repeat with 10 cm^3 of water and one spatula measure of anhydrous calcium chloride.
5. In the last row, write down any other signs you saw, such as fizzing or a change of colour.

Time (s)	1. Sodium hydroxide and hydrochloric acid (°C)	2. Sodium hydrogencarbonate and citric acid (°C)	3. Calcium chloride and water (°C)
0			
30			
60			
90			
120			
150			
180			
Other signs you saw			

GRAPH Graph your results

1. Draw a temperature–time graph for all three mixtures on the grid. Put time on the horizontal axis and temperature on the vertical axis.
2. Choose a scale for each axis, and label both axes with their units. Draw a line for each mixture, and add a key and a title.

Title:



1. Which mixtures were exothermic, and which were endothermic? Use the shape of your graph to explain.

2. Mixture 2 fizzed. What was the gas, and how could you test for it?

3. The temperature changed when calcium chloride dissolved. Does that prove a chemical change happened? Explain.

4. After its highest or lowest point, each temperature slowly moved back towards room temperature. Why?