POPPY SCHOLARS · PHYSICS OF THE UNIVERSE

Home lab 6 · Unit 6 · about 45 minutes

How much energy does it take to melt 1 gram of ice, with no change in temperature?

Name _____ Date _____

MATERIALS

You supply everything. Tick each item as you gather it.

- ☐ A foam or insulated cup that holds 400 mL (a coffee cup with a lid)
- ☐ Ice cubes from the freezer, and a paper towel to dry them
- ☐ Warm tap water at about 45 °C (no hotter than the tap), a thermometer that reads to 1 °C, and a kitchen scale (grams)
- ☐ A timer, paper and a calculator

SAFETY

Hot tap water only, no hotter than about 50 °C. Do not use boiling water. Dry the ice quickly, and wipe up spills so that nobody slips.

PROCEDURE

1. Weigh the empty cup. Add about 200 g of warm water at about 45 °C and weigh again to find the mass of the water. Measure its temperature just before the next step.
2. Take 4 or 5 ice cubes from the freezer, dry them thoroughly with the paper towel to remove the film of water, and weigh about 40 g of ice.
3. Put the ice into the water, put on the lid, and stir gently with the thermometer. Watch the temperature fall.
4. When the ice has fully melted, read the lowest temperature. This is the final temperature.
5. Use the principle that the heat lost by the warm water equals the heat gained by the ice, first to melt ($m \times L$) and then to warm from 0 °C to the final temperature ($m \times c \times T_f$): $m_w\, c\, (T_i - T_f) = m_{ice}\, L + m_{ice}\, c\, T_f$.
6. Solve for L, the latent heat of fusion, in J/g. Repeat for 3 trials and compare the mean with the accepted value, 334 J/g.

RECORD YOUR DATA

Trial	Mass of water (g)	Start temperature (°C)	Mass of ice (g)	Final temperature (°C)	L (J/g)
1					
2					
3					
Mean					

LAB REPORT

Write a report that gives your table, shows the energy-balance equation and your calculation of L for one trial, finds the percent error against 334 J/g, and explains why melting needs energy even though the temperature

does not change. Say in which direction the heat flowed and why that direction is the only one that happens by itself.

Report the numbers you actually got, even when they disagree with the lesson. Write on the lines, or type your report on the website and send it to a teacher there.

Question and hypothesis *State the question in your own words, what you expect to happen, and why you expect it.*

Method *What you changed, what you measured, what you kept the same, and how many trials you ran.*

Observations *Describe what you saw, including anything unexpected. Your data tables are added to the report automatically.*

Calculations *Show each calculation step by step, with units.*

Claim and reasoning *Answer the question using your numbers, then explain why, using the science from the unit.*

Limits and next step *What could have affected your results, and one change you would make next time.*