Checking Heat From Two Temperatures in One Cup

Base your answers on the information provided and your knowledge of chemistry. Use the 2025 Chemistry Reference Tables as needed.

An insulated model cup receives two portions of the same liquid. The cup takes up no energy, and the liquid does not evaporate. In the model the energy needed to warm any portion by one degree is proportional to its mass. Before stirring, the portions are mostly separate and a probe near the top reads the warmer portion.

Portion	**Mass (g)**	**Temperature before mixing (°C)**
Warm portion	4.0	60
Cool portion	6.0	20

1 Which portion needs more energy to rise by the same number of degrees?

(1) The warm portion

(2) The cool portion

(3) They need the same energy.

(4) The initial temperatures alone decide.

2 A student averages 60 and 20 °C and predicts a final temperature of 40 °C. Use both masses to explain why the prediction is too high. [1]

Answer and work

After stirring, the two portions reach one temperature. In this model the warm portion’s mass times its temperature drop equals the cool portion’s mass times its temperature rise.

3 Find the common final temperature. Show a calculation or check that uses both portions. [1]

Answer and work

4 Describe a measurement that would check whether the probe near the top represents the whole liquid before stirring. [1]

Answer and work