Unit 9 · Heat and Temperature

HARDER PRACTICE QUESTIONS

Full marks 25

Write your answers on separate paper. Show your working. $T = \theta + 273.15$; $C/5 = (F - 32)/9$.

1 Spot the error [3]

Find the mistake and correct it.

The temperature of a pot of water rises by 20 °C. Nabin writes:
"In Fahrenheit, $F = 9C/5 + 32 = 9 \times 20 \div 5 + 32 =$ **68 °F**, so the water rose by 68 °F."

2 Predict, then explain [4]

Write your prediction first, then explain it.

i. Predict: can a thermometer on the Kelvin scale and one on the Fahrenheit scale ever show the same number?
ii. Find the temperature, if any.
iii. Can the Kelvin and Celsius scales ever show the same number? Why?

3 Read the data [4]

Answer from the table.

Sushant uses a constant-volume gas thermometer, whose thermometric property is the pressure of the gas:

Temperature (°C)	0	100
Pressure (kPa)	100.0	136.6

i. Find the temperature when the pressure is 120.0 kPa.
ii. Draw the straight line on paper, or work it out: at what temperature would the pressure become zero?
iii. What is the name of this temperature, and why can't a gas actually be cooled below it?

4 Calibrated in Bhaktapur [3]

Bimal marks a thermometer in Bhaktapur: 0 in melting ice and "100" in boiling water, which there is really at 95 °C. He divides the stem into 100 equal parts.

i. What will his thermometer read in water that is really at 50 °C?
ii. Is his thermometer's error the same all along the scale?

5 Two thermometers that disagree [3]

A mercury thermometer and a platinum resistance thermometer are both calibrated at 0 °C and 100 °C. In warm water the mercury one reads 40.0 °C and the platinum one 40.2 °C. Is one of them faulty? Explain.

6 Correct the misconceptions [3]

The paragraph has three mistakes. Write each mistake and correct it.

Puja wrote: "When I hold an ice cube, cold flows from the ice into my hand. A big iceberg has more heat in it than a cup of hot tea. Temperature measures the total thermal energy of a body."

7 Think [3]

Without the zeroth law, could we trust a thermometer at all? Explain what the thermometer does, and which bodies A, B and C stand for.

8 Make your own [2]

Design a temperature scale on which melting ice reads 0 and a healthy person's body (37 °C) reads 100. What would boiling water read on it? Show that it works.