5.1 Density pressure and change of state

Name: _____ Class: _____ Date: _____ **Total: 21 marks**

Objective

Cover density, pressure and (P) change of state (5.3–5.14P): $\rho = \mathrm{m/V}$, $\mathrm{p} = \mathrm{F/A}$, pressure difference $\mathrm{p} = \mathrm{h}\rho\mathrm{g}$, heating curves, particle models and specific heat capacity. Original IGCSE-level practice.

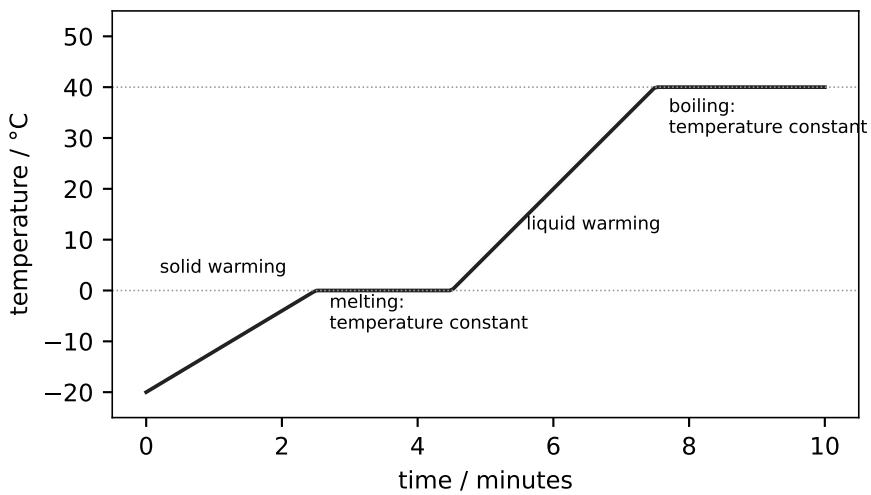
1 Key knowledge and worked examples

- **Three equations**

$$\rho = m/V \qquad p = F/A \qquad p = h\rho g$$

Worked check. A 96 g cube of side 2 cm: $V = 8 \times 10^{-6}$ m^3, $\rho = 0.096/8 \times 10^{-6} = 12\,000$ kg/m^3.

- **The heating curve's flat parts**



(P) $\Delta Q = mc\Delta T$ – and at a phase change, $\Delta T = 0$: the energy breaks bonds instead.

2 Practice

2.1 A stone of mass 150 g displaces 50 cm^3 of water. Calculate its density in g/cm^3 and kg/m^3. [3]

2.2 Calculate the pressure of a 60 N force on 0.2 m^2. [2]

2.3 Calculate the pressure difference 5 m deep in water ($\rho = 1000$ kg/m^3, g = 10 N/kg). [2]

2.4 (P) State what happens to the temperature while a pure substance boils. [1]

2.5 (P) Calculate the energy needed to heat 4 kg of water (c = 4200 J/(kg °C)) by 15 °C. [3]

3 Exam-style questions

3.1 Describe how to find the density of an irregular stone, naming the measuring instruments. [4]

3.2 Explain, using the particle model, why the temperature stops rising while ice melts. [3]

3.3 (P) A 2 kg metal block (c = 500 J/(kg °C)) is heated from 20 °C with 60 000 J of energy. Calculate its final temperature. [3]