

- 3 (a) State the reason why two objects that are at the same temperature are described as being in thermal equilibrium.
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.....

[1]

- (b) Fig. 3.1 shows the variations with temperature of the densities of mercury and of water between 0 °C and 100 °C.

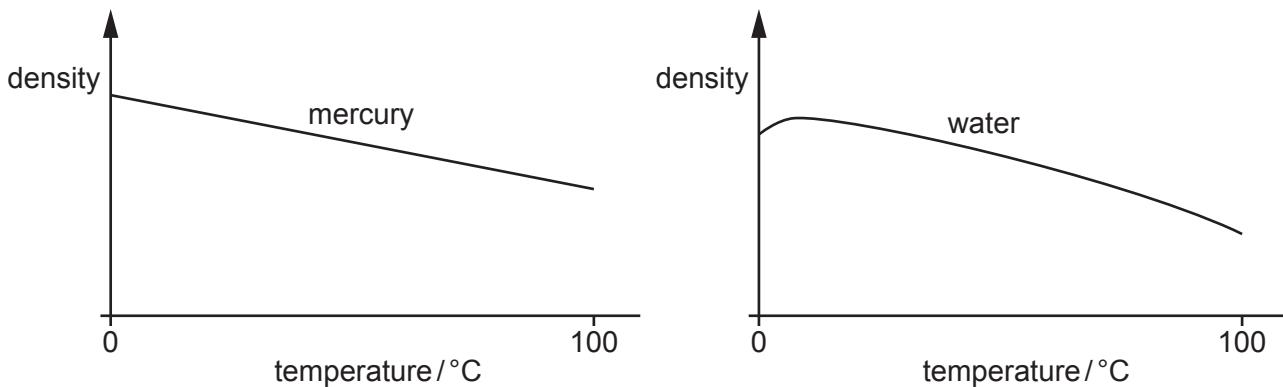


Fig. 3.1

Temperature may be measured using the variation with temperature of the density of a liquid.

Suggest why, for measuring temperature over this temperature range:

- (i) mercury is a suitable liquid
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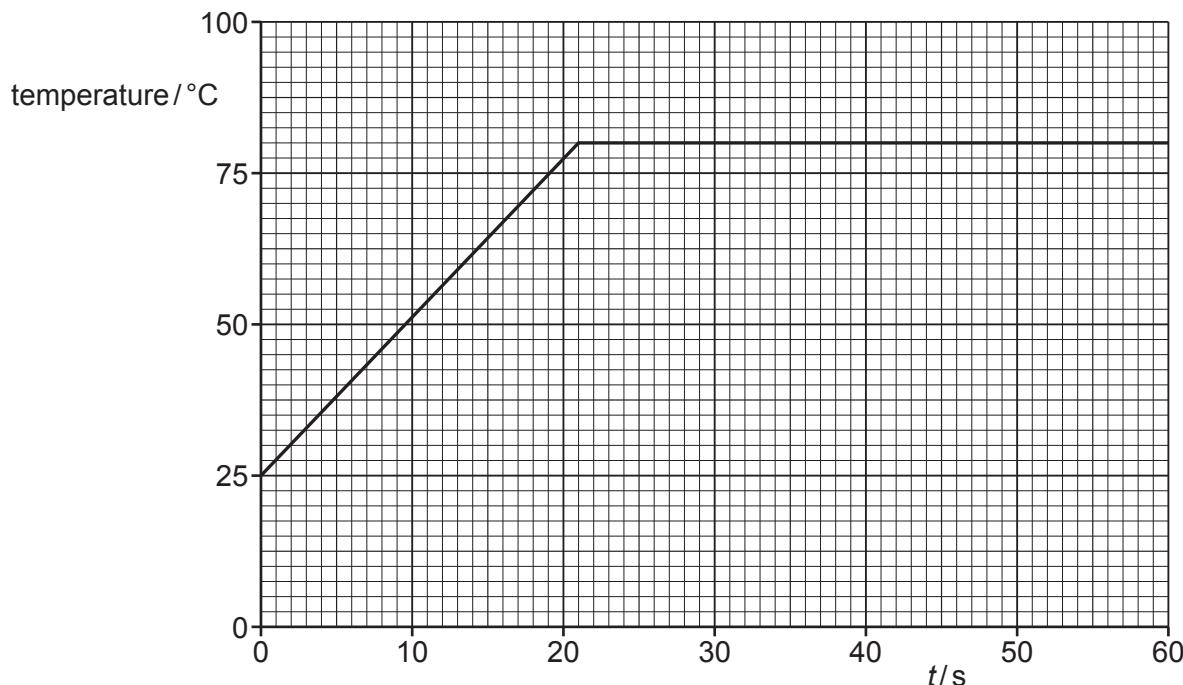
[1]

- (ii) water is not a suitable liquid.
-
.....

[2]

- (c) A beaker contains a liquid of mass 120 g. The liquid is supplied with thermal energy at a rate of 810 W. The beaker has a mass of 42 g and a specific heat capacity of $0.84 \text{ J g}^{-1} \text{ K}^{-1}$. The beaker and the liquid are in thermal equilibrium with each other at all times and are insulated from the surroundings.

Fig. 3.2 shows the variation with time t of the temperature of the liquid.

**Fig. 3.2**

- (i) State the boiling temperature, in °C, of the liquid.

$$\text{temperature} = \dots \text{ °C} \quad [1]$$

- (ii) Determine the specific heat capacity, in $\text{J g}^{-1} \text{K}^{-1}$, of the liquid.

$$\text{specific heat capacity} = \dots \text{ J g}^{-1} \text{K}^{-1} \quad [4]$$

- (d) The experiment in (c) is repeated using water instead of the liquid in (c). The mass of liquid used, the power supplied, and the initial temperature are all unchanged.
 The specific heat capacity of water is approximately twice that of the liquid in (c).
 The boiling temperature of water is 100 °C.

On Fig. 3.2, sketch the variation with time t of the temperature of the water between $t = 0$ and $t = 60$ s. Numerical calculations are not required. [2]