14. Temperature

14.2 Temperature scales

Paper 4

Question Paper

1 **(a)** **(i)** State the magnitude and unit of absolute zero on the thermodynamic temperature scale.

..... [1]

(ii) Explain why temperature measured using a laboratory liquid-in-glass thermometer does **not** give a measurement of thermodynamic temperature.

.....

..... [1]

(b) Fig. 2.1 shows a simplified diagram of a type of thermometer called a platinum resistance thermometer.

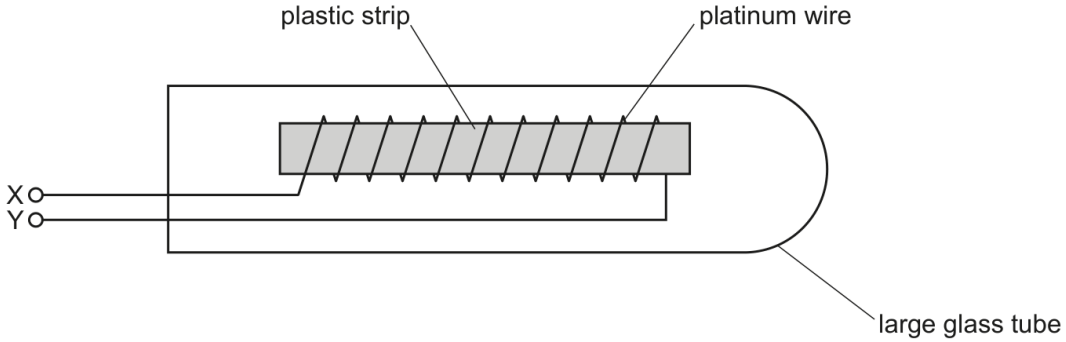


Fig. 2.1

The glass tube is immersed in the environment for which the temperature is to be determined. The resistance between the terminals X and Y is measured.

Fig. 2.2 shows the variation of the resistivity ρ of platinum with thermodynamic temperature T.

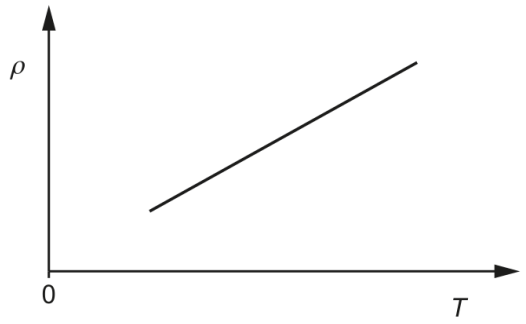


Fig. 2.2

(i) Explain how Fig. 2.2 shows that platinum is a suitable metal for use in a resistance thermometer.

.....

.....

..... [2]

(ii) Suggest a reason why a platinum resistance thermometer is **not** suitable for measuring a rapidly changing temperature.

.....

.....

..... [1]

(iii) Suggest a type of thermometer that is suitable for measuring a rapidly changing temperature.

..... [1]

(c) A negative temperature coefficient thermistor may be used as a type of resistance thermometer.

State **one** way in which the variation with temperature of the resistance of a thermistor differs from that of a platinum wire.

.....

..... [1]

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

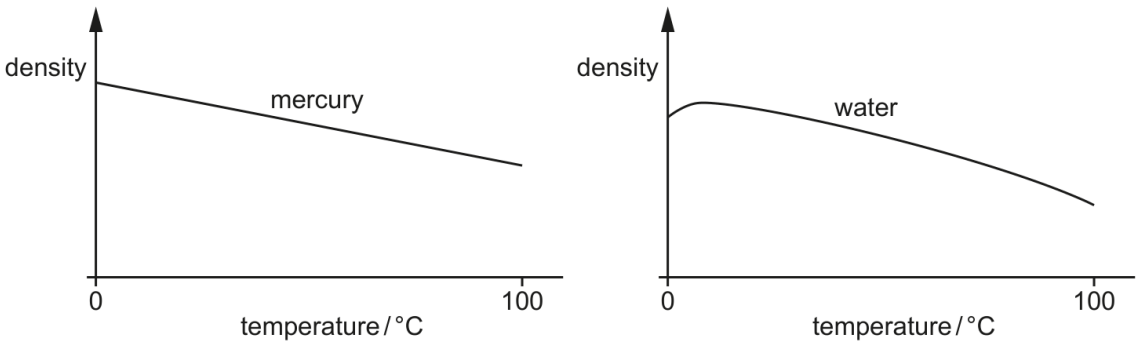


Fig. 3.1

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

.....

..... [1]

(ii) water is not a suitable liquid.

.....

.....

..... [2]

3 (a) (ii) State the temperature, in degrees Celsius, of absolute zero.

temperature = ... °C [1]

4 Fig. 2.1 shows a laboratory thermometer that is calibrated to measure temperature in degrees Celsius.

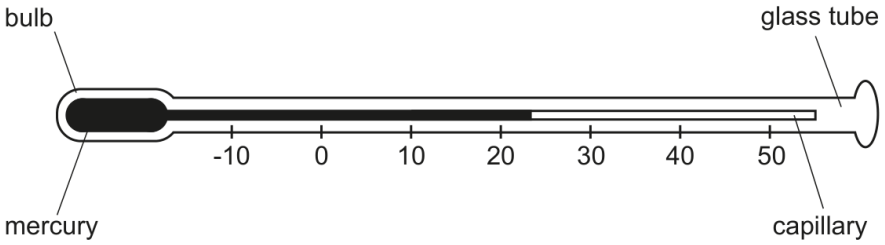


Fig. 2.1

The thermometer makes use of the fact that the density of mercury varies with temperature.

(a) State **two** other physical properties of materials, apart from the density of a liquid, that can be used for measuring temperature.

1 .....

2 .....
[2]

(c) **(i)** Explain why the thermometer in Fig. 2.1 does **not** provide a direct measurement of thermodynamic temperature.

.....

.....

..... [2]

(ii) Thermodynamic temperature T may be determined by the behaviour of a type of substance for which T is proportional to the product of pressure and volume.

State the name of this type of substance.

..... [1]