

Name of the Student: _____

Max. Marks : 18 Marks

Time : 18 Minutes

Q1.

The number of molecules in one cubic metre of air decreases as altitude increases. The table shows how the pressure and temperature of air compare at sea-level and at an altitude of 10 000 m.

altitude	pressure/Pa	temperature/K
sea-level	1.0×10^5	300
10 000 m	2.2×10^4	270

(a) Calculate the number of moles of air in a cubic metre of air at

(i) sea-level,

(ii) 10 000 m.

(3)

(b) In air, 23% of the molecules are oxygen molecules. Calculate the number of extra oxygen molecules there are per cubic metre at sea-level compared with a cubic metre of air at an altitude of 10 000 m.

(2)

(Total 5 marks)

Q2.

In an experiment to measure the temperature of the flame of a Bunsen burner, a lump of copper of mass 0.12 kg is heated in the flame for several minutes. The copper is then transferred quickly to a beaker, of negligible heat capacity, containing 0.45 kg of water, and the temperature rise of the water measured.

specific heat capacity of water = $4200 \text{ J kg}^{-1} \text{ K}^{-1}$
specific heat capacity of copper = $390 \text{ J kg}^{-1} \text{ K}^{-1}$

- (a) If the temperature of the water rises from $15 \text{ }^\circ\text{C}$ to $35 \text{ }^\circ\text{C}$, calculate the thermal energy gained by the water.

(2)

- (b) (i) State the thermal energy lost by the copper, assuming no heat is lost during its transfer.

- (ii) Calculate the fall in temperature of the copper.

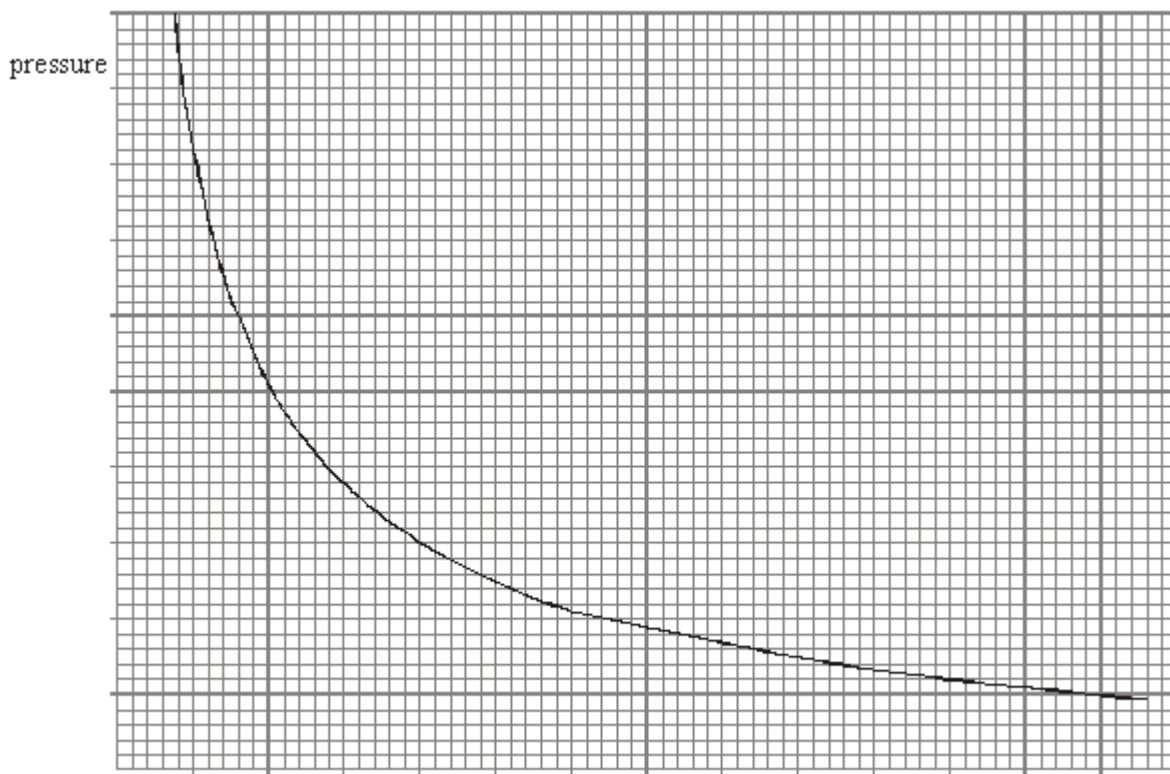
- (iii) Hence calculate the temperature reached by the copper while in the flame.

(4)

(Total 6 marks)

Q3.

The graph shows how the pressure of an ideal gas varies with its volume when the mass and temperature of the gas are constant.



(a) On the same axes, sketch **two** additional curves **A** and **B**, if the following changes are made.

- (i) The same mass of gas at a lower constant temperature (label this **A**).
- (ii) A greater mass of gas at the original constant temperature (label this **B**).

(2)

(b) A cylinder of volume 0.20 m^3 contains an ideal gas at a pressure of 130 kPa and a temperature of 290 K . Calculate

- (i) the amount of gas, in moles, in the cylinder,

- (ii) the average kinetic energy of a molecule of gas in the cylinder,

- (iii) the average kinetic energy of the molecules in the cylinder.

(5)

(Total 7 marks)