Name of the Student:_____
Max. Marks : 19 Marks **Time : 19 Minutes**

Mark Schemes

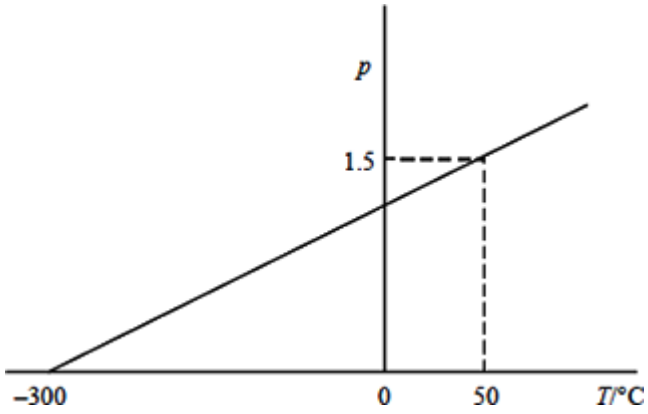
Q1.

(a) $n\left(=\frac{pV}{RT}\right) = \frac{1.5 \times 10^5 \times 1.2 \times 10^{-5}}{8.31 \times 323}$ **(1)** = (6.71 × 10^4 mol)

number of molecules = nN_A **(1)** = 6.71 × 10^{-4} × 6.02 × 10^{23}
= 4.04 × 10^{20} **(1)**
[or equivalent solution using $pv = NkT$]

(3)

(b)



straight line with positive gradient **(1)**
through (50, 1.5) **(1)**
crosses temperature axis between –250 and –300°C **(1)**

(3)

(c) number of moles left in container after valve opens

$n\left(=\frac{pV}{RT}\right) = \frac{2.0 \times 10^5 \times 1.2 \times 10^{-5}}{8.31 \times 573}$ **(1)** (= 5.04 × 10^{-4} mol)

∴ number of molecules left in container = 5.04 × 10^{-4} × 6.02 × 10^{23}
= 3.03 × 10^{20} **(1)**
∴ number of molecules that escape = 4.04 × 10^{20} – 3.03 × 10^{20}
= 1.01 × 10^{20} **(1)**

[*alternative (c)*
∴ number of moles that escape (= 6.71 × 10^{-4} – 5.04 × 10^{-4})
= 1.67 × 10^{-4}
∴ number of molecules that escape = 1.67 × 10^{-4} × N_A

$= 1.01 \times 10^{20}$ **(1)**]

(3)

[9]

Q2.

(a) (i) quantity of energy supplied to unit mass **(1)**

which raises temperature by 1°C [or 1K] **(1)**

(ii) quantity of energy required to change state of unit mass **(1)**

solid to liquid [or ice to water] **(1)**

without change of temperature **(1)**

(max 4)

(b) (i) Q (= $mc\Delta\theta$) = 0.15 × 1200 × (58 – 18) = 7200 (J) **(1)**

$P = \frac{7200}{5 \times 60}$ = 24 W **(1)**

(ii) Q = 24 × 7 × 60 = 10080 (J) **(1)**

$0.15l$ = 10080 gives l = 67200 J kg^{-1} **(1)**

(iii) 24 × 4 × 60 = 0.15 × s_L × (94 – 58) **(1)**

gives s_L = 1070 J kg^{-1} K^{-1} **(1)**

(6)

[10]