Practice Question Set For A-Level
Subject : Physics
Paper-2 Topic: Thermal Physics

Name of the Student:_____
Max. Marks : 23 Marks **Time : 23 Minutes**

Mark Schemes

Q1.

(a) (i) pressure **(1)**

(ii) (average) kinetic energy
[or rms speed] **(1)**

(2)

(b) (i) $pV = nRT$ **(1)**

$$n = \frac{1.0 \times 10^{-2} \times 300 \times 10^{3}}{8.31 \times 290}$$ **(1)**

= 1.20 (mol) **(1)** (1.24 mol)

(ii) mass of air = $1.24 \times 29 \times 10^{-3} = 0.036$ kg **(1)**
(allow e.c.f from(i))

(iii) $\rho = \frac{0.0360}{1 \times 10^{-2}} = 3.6\ \text{kg m}^{-3}$ (allow e.c.f. from (ii))

(5)

(c) (i) same **(1)**
because the temperature is the same **(1)**

The Quality of Written Communication marks were awarded primarily for the quality of answers to this part.

(ii) different **(1)**
because the mass of the molecules are different **(1)**

(4)

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Q2.

(a) (i) graph:

scales (points spread over at least half graph paper, each) **(1)**
correct points (plotted within ½ square) **(1)**
best fit line (if origin shown, line must pass through it) **(1)**

E_k at 350 K = 7.22×10^{-21}J (accept 7.23 to 7.27) **(1)**

(ii) gradient (= $\frac{(8.28 \times 6.21)10^{-21}}{\quad}$

= 2.07×10^{-23}(JK^{-1}) (accept 2.00 to 2.15)

(use of $\frac{3}{2}\ kT = E_k$ gives) gradient = $\frac{3}{2}\ k$ **(1)** (accept C.E for gradient)

k = $(\frac{2 \times 2.07 \times 10^{-23}}{3})$ = 1.38×10^{-23} **(1)** J K^{-1} **(1)**

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(b) (i) kinetic energy is conserved **(1)**

(ii) time of collision is negligible (compared to time between collisions)
[or large number of molecules,
volume negligible (compared to volume of container),
no intermolecular forces,
rapid random motion] **(1)**

(iii) temperature proportional to E_k **(1)**
at 0 K, E_k would be zero **(1)**
[or sketch graph of E_k vs T / K to give straight line through origin **(1)**
graph explained **(1)**]

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