

Name of the Student: _____

Max. Marks : 21 Marks

Time : 21 Minutes

Mark Schemes

Q1.

- (a) (i) $pV = nRT$ (1)
- (ii) all particles identical or have same mass (1)
 collisions of gas molecules are elastic (1)
 inter molecular forces are negligible (except during collisions) (1)
 volume of molecules is negligible (compared to volume of container) (1)
 time of collisions is negligible (1)
 motion of molecules is random (1)
 large number of molecules present
 (therefore statistical analysis applies) (1)
 monatomic gas (1)
 Newtonian mechanics applies (1)

max 4

(b) $E_k = \frac{3RT}{2N_A}$ or $\frac{3}{2}kT$ (1)

$$= \frac{3 \times 8.31 \times 293}{2 \times 6.02 \times 10^{23}} \quad (1)$$

$$= 6.1 \times 10^{-21} \text{ J} \quad (1) \quad (6.07 \times 10^{-21} \text{ J})$$

3

- (c) masses are different (1)
 hence because E_k is the same,
 mean square speeds must be different (1)

2

[9]**Q2.**

- (a) (i) (in 1 s), $E = 0.045 \times 4200 \times (47 - 15)$ (1)
 $= 6050 \text{ J}$

(ii) $P \left(= \frac{E}{t} \right) = 6.0 \text{ kW}$ (1)

3

- (b) (i) (use of $P = VI$ gives) $I = \left(= \frac{6050}{230} \right) = 26 \text{ A}$ (1) (26.3 A)

(allow C.E. for value of P from (a))

- (ii) radius = 1.2×10^{-3} (m) **(1)**
cross-sectional area = $\pi(1.2 \times 10^{-3})^2$ (or $4.5 \times 10^{-6}(\text{m}^2)$) **(1)**

$$\frac{R}{l} = \frac{\rho}{A} \quad \textbf{(1)}$$

$$= \frac{1.7 \times 10^{-8}}{4.5 \times 10^{-6}} \quad \textbf{(1)}$$

$$= 3.8 \times 10^{-3} \Omega \text{ m}^{-1}$$

(allow C.E. for value of A)

- (iii) $\frac{V}{l} \left(= \frac{IR}{l} = 26 \times 3.8 \times 10^{-3} \right) = 0.1 \text{ (V m}^{-1}\text{) (per wire)}$

two wires per cable gives pd per metre = 2×0.1 **(1)**
(= 0.20 V m^{-1}) **(1)**

- (iv) maximum length = $\left(= \frac{6}{0.2} \right) = 30 \text{ m}$ **(1)**