**Name of the Student**:_____
**Max. Marks : 21 Marks** **Time : 21 Minutes**

Mark Schemes

**Q1.**

| Question Number | Answer | | Mark |
|---|---|---|---|
| **(a)** | Temperature (of gas) [treat references to oil/room as neutral] | (1) | **2** |
| | Mass of air/gas **Or** number of atoms/molecules/moles of air/gas [accept amount of air/gas, number of particles of air/gas] | (1) | |
| **(b)** | Assumption: idea that volume occupied by trapped air ∝ length of air in tube [e.g. volume = cross-sectional area × length] | (1) | **4** |
| | $pL$ = a constant [accept $pV$ = a constant] **Or** if p doubles, L halves | (1) | |
| | At least 2 pairs of $p$, $L$ values correctly read from graph | (1) | |
| | Readings show that $pL$ = 4500 (kPa cm) [± 100 kPa cm] | | |
| | **Or** Readings show that $p$ doubles when $L$ is halved [Accept references to $V$ instead of $L$] | (1) | |
| | Example of calculation<br>$p$ = 400 kPa, $L$ = 11.0 cm $pL$=400 × 11.0 = 4400<br>$p$ = 200 kPa, $L$ = 23.0 cm $pL$=200 × 23.0 = 4600 | | |
| **(c)** | Use of $pV=NkT$ [Allow use of pV=nRT **and** N=n.$N_A$] | (1) | **3** |
| | Conversion of temperature to kelvin | (1) | |
| | $N = 8.4 \times 10^{20}$ [Accept answers in range $8.1 \times 10^{20}$ to $8.4 \times 10^{20}$] | (1) | |
| | [Answer in range but with an incorrect temperature conversion score max 2] | | |
| | Example of calculation<br>$N = \frac{450\times10^{3}\,\text{Pa}\times0.10\,\text{m}\times7.5\times10^{-5}\,\text{m}^2}{1.38\times10^{-23}\,\text{JK}^{-1}\times(273+20)\,\text{K}} = 8.35\times10^{20}$ | | |

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| | | | |
|---|---|---|---|
| (d)(i) | No change | (1) | 1 |
| (d)(ii) | Similar curve<br>Shifted higher **Or** shifted to the right<br>[an annotated diagram can score full marks] | (1)<br>(1) | 2 |
| | **Total for question** | | 12 |

**Q2.**

| Question Number | Answer | | Mark |
|---|---|---|---|
| (a) | Use of $pV = NkT$<br>Pressure difference **Or** temperature conversion<br>$\Delta N = 5.0 \times 10^{21}$<br><br>Example of calculation:<br><br>$\Delta N = \frac{\Delta pV}{kT} = \frac{(6.5\times10^5 - 5.8\times10^5)\text{Pa} \times 2.9\times10^{-4}\text{m}^3}{1.38\times10^{-23}\text{JK}^{-1} \times (273+20)\text{K}} = 5.0\times10^{21}$ | (1)<br>(1)<br>(1) | 3 |
| (b) | Use of $pV = NkT$<br>$T_2 = 307$ (K) stated or implied **Or** 293( K) subtracted<br>$\Delta T = 14$ K<br><br>Example of calculation:<br><br>$\frac{p_1}{T_1} = \frac{p_2}{T_2}$<br><br>$T_2 = \frac{6.8\times10^5\text{Pa}}{6.5\times10^5\text{Pa}} \times 293\text{K} = 307\text{K}$<br>$\Delta T = (307 - 293)\text{ K} = 14\text{ K}$ | (1)<br>(1)<br>(1) | 3 |
| (c) | **Max 3**<br>(Average) kinetic energy of molecules/atoms is greater **Or** molecules/atoms move faster<br><br>Collision rate with walls of container is greater<br><br>There is more momentum (exchanged) per collision **Or** the rate of change of momentum is greater<br><br>Therefore a greater force on the container walls<br>(dependent upon mp2 or mp3) | (1)<br><br>(1)<br><br>(1)<br><br>(1) | 3 |
| | **Total for question** | | 9 |

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