Practice Question Set For A-Level
Subject : Physics
Paper-3 Topic: Section A(Practical Skills Set-2)

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Name of the Student:_____
Max. Marks : 22 Marks **Time : 22 Minutes**

Mark Schemes

Q1.

(a) (i) Use of $V = \pi r^2 L$

3.47×10^{-2} or 3.5×10^{-2} (m)

Sub including V and L (condone L=18)
Or rearrangement to make r subject of correct equation
Condone power 10 error on L
1 mark for following answers
1.7×10^{-2}, 1.7×10^{-3}, 3.5×10^{-3} (m)

2

(ii) Use of $pV = NkT$ or $T = 19 + 273$ or $T = 292$ seen

Allow rearrangement making *N* subject $N = \frac{pV}{kT}$

Correct use of $pV = NkT$ substitution

4.26×10^{21} seen or 4.3×10^{21} seen

Condone sub of 19 for T for 1st mark in either method
Or (N =) $\frac{1.01 \times 10^5 \times 1.7 \times 10^{-4}}{1.38 \times 10^{-23} \times 292}$ *seen with pV = NkT seen*
*Alternative use of pV = nRT **and** N = nN_A in first and second marks*
First mark condone T = 19
Second mark pV = nRT seen with use of and $7(.08) \times 10^{-3} \times 6(.02) \times 10^{23}$ seen

3

(iii) (*NV*=)$1.7 \times 10^{-4} \times 7 \times 10^{-4}$ or 1.19×10^{-7} seen

2.76×10^{-29} to 3.0×10^{-29} (m3) condone 1 sf here

Penalise where product does not equal 1.19×10^{-7}

2

(iv)
- the volume of molecule(s) is negligible **compared to** volume occupied by gas
- the particles are far apart / large spaces between particles (compared to their diameter)
- **Therefore** Time during collisions is negligible compared to time between collision
- **Therefore** intermolecular forces are negligible

Allow volume of one molecule is negligible compared to total volume

Max 3

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(b) Use of ½ $m\langle c^2\rangle$ =3/2 kT sub or rearrangement
Condone c_{rms} as subject for 1 mark
Condone power 10 error
Condone T = 19 in 1st MP
Correct sub with $\langle c^2\rangle$ as subject including correct power 10
2.57×10^5 or 2.6×10^5 (on answer line)
m2 s^{-2}

Alternatively:
use of $pV=1/3\ Nm\langle c^2\rangle$ sub or rearrangement
Condone c_{rms} as subject for 1 mark
Condone power 10 error
Condone T = 19 in 1st MP
Correct sub with $\langle c^2\rangle$ as subject including correct power 10
$2.7(4) \times 10^5$ (from $N = 4 \times 10^{21}$) (on answer line)
2.57×10^5 for $N = 4.26 \times 10^{21}$
$2.5(48) \times 10^5$ for $N = 4.3 \times 10^{21}$
$m^2\ s^{-2}$
condone alternative units where correct:
Pa m^3 kg^{-1}
J kg^{-1}

4

(c) (i) $p_1L_1 = k_1$ and $p_2L_2=k_2$

(consistent power 10)

i.e. 2 sets of **correct** data
seen in sub
allow incomplete sub with 2
similar k (18×10^3) values seen

$p_1L_1 = k_1$, $p_2L_2 = k_2$ *and* $p_3L_3 = k_3$

(consistent power 10)

i.e. 3 sets of **correct data**
seen in sub

Comparison of k values followed by conclusion

Presents a factorial of L leading to an inverse of the factorial change in P (correct data)

*Repeats this process for **second** data set for same factorial change (correct data)*

***States** the relationship seen and **states** the conclusion*

3

(ii) Temperature or internal energy

Allow mass / number of particles / mean square speed (of molecules)

1

(d) L decreases then volume decreases (therefore more particles in any given volume) / V = πr^2 L
/ V is (directly) proportional to L
Decreased volume Increases number of collisions (with walls every second)
Decreased volume causes Rate of change of momentum to increase

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Increased <u>rate of change</u> of momentum causes <u>force</u> (exerted on walls) to <u>increase</u> (causing an increase in pressure)

Allow converse argument but must be consistent

$p = \frac{\frac{1}{3}Nm\overline{c^2}}{\pi r^2 L}$ *or equivalent*

must be correct equation with V in terms of L

with p as subject

4

[22]

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