

Question	Answer	Marks
2(a)	0	B1
2(b)	$pV = nRT$	C1
	$(n =) 1.5 \times 10^5 \times 4.2 \times 10^{-3} / 8.31 \times 540$ $= 0.14 \text{ mol}$	
2(c)	missing pressure 1.5 ($\times 10^5$)	B1
	both missing volumes 1.8 ($\times 10^{-3}$)	B1
2(d)(i)	(ΔU): increase in internal energy (of the system)	B1
	(q): thermal energy supplied to the system	B1
	(W): work done on system	B1

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Question	Answer	Marks
2(d)(ii)	volume increases and work is done by the gas	B1
	temperature decreases and internal energy decreases	B1

Question	Answer	Marks
3(a)	p = pressure (of gas), V = volume (of gas) and k = Boltzmann constant	B1
	N = number of molecules	B1
	T = thermodynamic temperature	B1
3(b)	$(pV = NkT \text{ and } pV = \frac{1}{2}Nm\langle c^2 \rangle \text{ leading to } NkT = \frac{1}{2}Nm\langle c^2 \rangle)$	M1
	algebra leading to $(3/2)kT = \frac{1}{2}m\langle c^2 \rangle$ and use of $\frac{1}{2}m\langle c^2 \rangle = E_k$ leading to $(3/2)kT = E_k$	A1
3(c)(i)	$T = 296 \text{ K}$	C1
	$\frac{1}{2}m\langle c^2 \rangle = (3/2)kT$	C1
	$\frac{1}{2} \times 5.31 \times 10^{-26} \times u^2 = (3/2) \times 1.38 \times 10^{-23} \times 296$	
	$u = 480 \text{ m s}^{-1}$	A1
3(c)(ii)	line passing through (P, u)	B1
	horizontal straight line	B1