Question	Answer	Marks
2(a)	0	B1
2(b)	$pV = nRT$ $(n =)\ 1.5 \times 10^5 \times 4.2 \times 10^{-3} / 8.31 \times 540$	C1
	$= \mathbf{0.14}$ mol	A1
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)	($pV = NkT$ and $pV = \frac{1}{3}Nm\langle c^2\rangle$ leading to) $NkT = \frac{1}{3}Nm\langle c^2\rangle$	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)	$T = 296$ K	C1
	$\frac{1}{2}m\langle c^2\rangle = (3/2)kT$ $\frac{1}{2} \times 5.31 \times 10^{-26} \times u^2 = (3/2) \times 1.38 \times 10^{-23} \times 296$	C1
	$u = 480$ m s^{-1}	A1
3(c)(ii)	line passing through (P, u)	B1
	horizontal straight line	B1