Class 34 TS

M6 — $\frac{dp}{dt} = 20\,m/s \; .001\,kg \; 300\,/s = 6\,N$

$P = \frac{F}{A} = \frac{6}{2 \cdot 1.5} = 2\,Pa$ <<< air pressure ~ $10^5\,Pa$

M8 $U = \frac{3}{2} N k T$ what is N for $1L = 10^{-3} m^3$ of STP He?

$$N = \frac{PV}{kT}$$

I find this question ambiguous — to increase internal energy by 100 J you will have to add more than 100 J as the gas will do work in expanding. I understand this question

initial state $P_0 V_0 U_0$

final state $P_0 V_1 (U_0 + 100J)$

this requires a $\Delta T = \frac{2}{3} \frac{\Delta U}{kN}$

$= \frac{2}{3} \frac{\Delta U T}{PV}$

$= \frac{2}{3} \frac{100J \cdot 293}{10^5 \; 10^{-3}}$

$= 195\,K$

$\frac{V_1}{V_0} = \frac{T_1}{T_0} = 1 + \frac{195}{293} = 1.666$

M7 $\Delta T = \frac{2}{3} \frac{250 \quad 293}{10^5 \; 10^{-3}} = 293$

$\frac{P_1}{P_0} = \frac{T_1}{T_0} = \frac{293}{293} + 1 = 2$

D5 $z = 2\int_0^\infty e^{-\epsilon q/kT} dq = \frac{2kT}{\epsilon} = \frac{2}{\epsilon\beta}$

$\ln z = -\ln\beta + const$

$\bar{E} = -\frac{d}{d\beta} \ln z = \frac{1}{\beta} = kT$