Daily Tutorial Sheet-13	Level-3

147.(A) $\Delta U = W$

$\Rightarrow \quad nC_{V,m}\,\Delta T = -75$

$\Rightarrow \quad 0.1 \times \frac{3R}{2} \times \Delta T = -75 \quad \Rightarrow \quad \Delta T = -250$

$\therefore \quad T_2 = 500 - 250 = 250\,K$

148.(C) $\Delta U = w = -P_{ext}\left(V_2 - V_1\right) = -P_0\left(4V_0 - V_0\right) = -3P_0V_0$

Now $\Delta H = \Delta U + \Delta\left(PV\right) = -3P_0V_0 + \left(P_2V_2 - P_1V_1\right)$

$= -3P_0V_0 + \left(P_0 \times 4V_0 - 2P_0 \times V_0\right) = -P_0V_0$

149.(C) $\int dw = \int -P.\,dV$

$\Rightarrow \quad w = -\int 20 \,.\frac{dV}{V} = -20\,\ln\frac{V_2}{V_1}$

$w = -46.06\ L-atm = -4665.8\ J$

$\Delta U = q + w \Rightarrow 400 = q - 4665.8$

$q = 5065.8\ J$

150. **(A→ p, q ; B→ p, q; C→ p, q; D→ r)**

$C_P = \frac{7R}{2},\ C_v = \frac{5R}{2},\ \gamma = \frac{7}{5}$

For diatomic gas (N_2 and O_2) and for triatomic linear gas like CO_2

For (1 mole O_2 + 2 mole O_3)

$C_p = \frac{1 \times \frac{7R}{2} + 2 \times 4R}{3} = \frac{23R}{6}$

$C_v = \frac{17R}{6},\ \gamma = \frac{23}{17}$

151.(BC) For a cyclic process, $\Delta U = 0$, $dU \neq 0$

$\therefore \quad q = \Delta U + (-w) \Rightarrow q = -w$

Also, $|w|$ = Area covered by sphere

$= \pi r^2 = \pi \times \left[\frac{(V_2 - V_1)}{2}\right]^2 = \frac{\pi \times (20)^2}{2^2} = 100\pi = 100 \times 3.14 = 314\ J$

$W = -314\ J$

152.(A) $\Delta E = q + w$

$W_{BC} = \frac{1}{2}(2V^o - V^o)(P^o - 3P^o) + (2V^o - V^o)(0 - P^o) = -2P^oV^o$

$\Delta E = nC_V\Delta T = 1 \times \frac{3}{2}R\left(\frac{P^o2V^o}{R} - \frac{3P^oV^o}{R}\right) = -\frac{3}{2}P^oV^o$

$q_{BC} = \Delta E - W = -\frac{3}{2}P^oV^o + 2P^oV^o = \frac{1}{2}P^oV^o$