Qu.2 (cont.)

(a) $T_2 = T_1 \quad \therefore \quad T_2 = 15°C$

$Q + W = \Delta U \quad$ but $\quad \Delta U = \phi \quad \therefore \quad Q = -W$

i.e. $Q = \underline{-208.09\ kJ}$

(b) We may find T_2 from $\frac{p_1 V_1}{T_1} = \frac{p_2 V_2}{T_2}$

or $\frac{T_2}{T_1} = \left(\frac{p_2}{p_1}\right)^{\frac{n-1}{n}}$

$\therefore \quad T_2 = (15+273)\left(\frac{790}{101.325}\right)^{\frac{1.27-1}{1.27}} = 445.7K$

or $\underline{172.7°C}$

$Q + W = \Delta U \quad \therefore Q = -W + \Delta U$

$= -205.45 + m C_v (T_2 - T_1)$

$= -205.45 + \frac{p_1 V_1}{R T_1} \cdot C_v (T_2 - T_1)$

$= -205.45 + \left(\frac{101325 \times 1}{287 \times 288}\right) \times 0.72 (172.7 - 15)$

$= \underline{-66.26\ kJ}$

(c) $\frac{T_2}{T_1} = \left(\frac{p_2}{p_1}\right)^{\frac{\gamma-1}{\gamma}} = \left(\frac{790}{101.325}\right)^{\frac{1.4-1}{1.4}} \quad \therefore T_2 = 517.9\ K$

or $\underline{244.9°C}$

$(T_1 = 288\ K)$

For an adiabatic process $\underline{Q = \phi}$ (by definition)