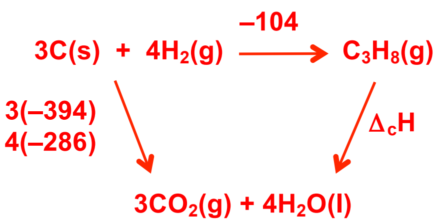
# ENERGETICS (B)

**1** Calculate the enthalpy of combustion of propane, $C_3H_8(g)$, given the following data.

$\Delta_fH$ $C_3H_8(g) = -104$ kJ mol$^{-1}$ $\Delta_cH$ $C(s) = -394$ kJ mol$^{-1}$ $\Delta_cH$ $H_2(g) = -286$ kJ mol$^{-1}$




**$-104 + \Delta_cH = 3(-394) + 4(-286)$**

**$\Delta_cH = 3(-394) + 4(-286) + 104$**

**$\Delta_cH = -2222$ kJ mol$^{-1}$**

**2** Pentane is a good fuel that burns well in oxygen. $C_5H_{12}(l) + 8O_2(g) \rightarrow 5CO_2(g) + 6H_2O(l)$

**a** Calculate the enthalpy change for this reaction given the following enthalpies of formation:

$\Delta_fH$ / kJ mol$^{-1}$ $C_5H_{12}(l) = -147$ $CO_2(g) = -394$ $H_2O(l) = -286$

**$\Delta H$ = [Sum $\Delta_fH$ products] – [Sum $\Delta_fH$ reactants]**

**$\Delta H = [5(-394) + 6(-286)] - [-147 + 0]$**

**$\Delta H = -3539$ kJ mol$^{-1}$**

**b** 1.56 g of pentane was burned in a spirit burner and used to heat 100.0 g of water in a copper calorimeter. The temperature of the water rose by 28°C. Calculate the enthalpy of combustion of pentane determined by this experiment. The specific heat capacity of the solution is 4.18 J K$^{-1}$ g$^{-1}$.

$q = mc\Delta T = 100 \times 4.18 \times 28 =$ **11704 J = 11.704 kJ**

$moles = \frac{1.56}{72.0} =$ **0.02167**

$\Delta H = -\frac{q}{mol} = -\frac{11.704}{0.02167} =$ **–540 kJ mol$^{-1}$**

**c** Suggest two reasons why the values obtained in **a** and **b** differ, and which is the correct value.

Correct value: **a**

**Any 2 of: heat loss, incomplete combustion, some fuel evaporate**