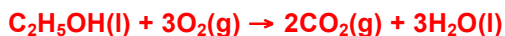




ENERGETICS (A)

- 1 a Write an equation for the reaction that represents the enthalpy change of combustion of ethanol ($\text{C}_2\text{H}_5\text{OH}$).



- b 1.24 g of ethanol was burned in a spirit burner and used to heat 50.0 g of water in a copper calorimeter. The temperature of the water rose by 38°C . Calculate the enthalpy of combustion of ethanol determined by this experiment. The specific heat capacity of the solution is $4.18 \text{ J K}^{-1} \text{ g}^{-1}$.

$$q = mc\Delta T = 50 \times 4.18 \times 38 = 7942 \text{ J} = 7.942 \text{ kJ}$$

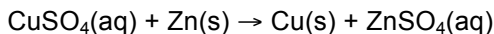
$$\text{moles} = \frac{1.24}{46.0} = 0.02696$$

$$\Delta H = -\frac{q}{\text{mol}} = -\frac{7.942}{0.02696} = -295 \text{ kJ mol}^{-1}$$

- c Suggest three reasons why the value obtained in the experiment is less exothermic than a data book value.

- 1 heat loss
- 2 incomplete combustion
- 3 some ethanol evaporate

- 2 A student reacted 1.15 g of zinc powder with 50.0 cm^3 of 0.500 copper sulfate solution in a polystyrene cup. The temperature rose by 17.0°C . Determine which is the limiting reagent and then find the enthalpy change for this reaction. Assume that the density of the solution is 1.00 g cm^{-3} and the specific heat capacity of the solution is $4.18 \text{ J K}^{-1} \text{ g}^{-1}$.



$$\text{moles Zn} = \frac{1.15}{65.4} = 0.01758$$

$$\text{moles CuSO}_4 = 0.500 \times \frac{50.0}{1000} = 0.0250$$

zinc is limiting reagent

$$q = mc\Delta T = 50.0 \times 4.18 \times 17.0 = 3553 \text{ J} = 3.553 \text{ kJ}$$

$$\Delta H = -\frac{q}{\text{mol}} = -\frac{3.553}{0.01758} = -202 \text{ kJ mol}^{-1}$$