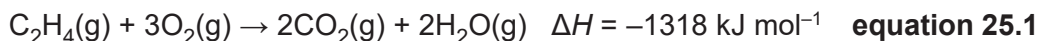


AS Level Chemistry A
H032/01 Breadth in chemistry

Question Set 12

1. This question is about alkenes.

(a) The combustion of ethene is shown in **equation 25.1** below.



- (i) Explain, in terms of bond breaking and bond forming, why a reaction can be exothermic. *more energy is released during bond forming than is taken in during bond breaking.* [1]
- (ii) Average bond enthalpies are shown in the table.

Bond	Average bond enthalpy /kJ mol ⁻¹
O-H	+464
O=O	+498
C-H	+413
C=O	+805

Calculate the average bond enthalpy, in kJ mol⁻¹, of the C=C bond.

Use the average bond enthalpies in the table and **equation 25.1**.

[3]

1. a) ii) $\Delta H = \text{bonds broken} - \text{bonds formed}$

$$\begin{aligned} -1318 &= [x + 4(413) + 3(498)] - [4(805) + 4(464)] \\ -1318 &= x + 1652 + 1494 - 3220 - 1856 \\ -1318 &= x - 1930 \\ x(\text{C}=\text{C}) &= \underline{\underline{+612 \text{ kJ mol}^{-1}}} \end{aligned}$$

(b) An alkene **D** is a liquid at room temperature and pressure but can easily be vaporised.

When vaporised, 0.1881 g of **D** produces 82.5 cm³ of gas at 101 kPa and 373 K.

Determine the molar mass and molecular formula of alkene **D**.

Show all your working.

[5]

$$\begin{aligned} pV &= nRT \\ n &= \frac{pV}{RT} \end{aligned}$$

$$n = \frac{101000 \times (82.5 \times 10^{-6})}{8.31 \times 373}$$

$$n = 2.6882 \times 10^{-3}$$

$$M_r = \frac{\text{mass}}{\text{moles}} = \frac{0.1881}{0.0026882} = 69.9$$

$$\begin{aligned} \text{C}_3\text{H}_6 &= 42 \\ \text{C}_4\text{H}_8 &= 56 \\ \text{C}_5\text{H}_{10} &= 70 \end{aligned}$$

hence the alkene is C₅H₁₀.

Total Marks for Question Set 12: 9

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