Exam skills 4

Maths skills

1 NOCl decomposes to form nitrogen monoxide and chlorine. $K_c = 1.6 \times 10^{-5}\,\text{mol dm}^{-3}$.

$2NOCl(g) \rightleftharpoons 2NO(g) + Cl_2(g)$

(a) (i) Calculate the enthalpy change of reaction given the following enthalpy of formation data.

	$\Delta_f H^\ominus$ / kJ mol^{-1}
NOCl	51.2
NO	90.3

.....

..... $\Delta_r H^\ominus$ = ...kJ mol^{-1} **(3 marks)**

(ii) Why is the enthalpy of formation of $Cl_2(g)$ zero?

..... **(1 mark)**

(b) Calculate the enthalpy change of reaction given the following bond enthalpies. Assume that the bonding is O=N–Cl in NOCl and N=O in NO.

	Bond enthalpy/ kJ mol^{-1}
N=O	481
N–Cl	159
Cl–Cl	243

.....

.....

..... $\Delta_r H^\ominus$ = ...kJ mol^{-1} **(3 marks)**

(c) Complete the table with 'increased', 'decreased' or 'unchanged' to give the effect of the change given on the **rate of attainment of equilibrium** and on the **yield of chlorine.** **(3 marks)**

Change	Effect on rate of attainment of equilibrium	Effect on yield of chlorine
increase of temperature		
increase of pressure		
addition of a catalyst		

(d) The value of K_c for $2NO(g) + Cl_2(g) \rightleftharpoons 2NOCl(g)$ is

☐ A $1.6 \times 10^{-5}\,\text{mol}^{-1}\,\text{dm}^3$

☐ B $1.6 \times 10^{-5}\,\text{mol dm}^{-3}$

☐ C $62\,500\,\text{mol}^{-1}\,\text{dm}^3$

☐ D $62\,500\,\text{mol dm}^{-3}$

The reaction has been reversed, so the values of the concentrations in K_c will now be inverted.

(1 mark)