IB · DP · Chemistry

5 mins 5 questions

Multiple Choice: Paper 1

17.1 The Equilibrium Law

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Total Marks /5

1 Which is the correct K_c expression for the reaction between hydrogen and fluorine?

$$H_2\,(g) + F_2\,(g) \rightleftharpoons 2HF\,(g)$$

A. $\frac{[HF]^2}{[H_2]\,[F_2]}$

B. $\frac{[HF]}{[H_2]\,[F_2]}$

C. $\frac{2\,[HF]}{[H_2]\,[F_2]}$

D. $\frac{[H_2]\,[F_2]}{[HF]^2}$

(1 mark)

2 The K_c expression for the following reaction between hydrogen and iodine is shown

$$H_2\,(g) + I_2\,(g) \rightleftharpoons 2HI\,(g)$$

$$K_C = \frac{[HI]^2}{[H_2]\,[I_2]}$$

At equilibrium there were 0.234 moles of HI, 0.150 moles of H_2 and 0.025 moles of I_2.

Which is the correct K_c expression for the reaction between hydrogen and fluorine?

A. $\frac{[0.234]^2}{[0.15]\,[0.025]}$

B. $\frac{[0.234]}{[0.15]\,[0.025]}$

C. $\frac{[0.15]\,[0.025]}{[0.234]^2}$

D. $\frac{[0.15]\,[0.025]}{[0.234]}$

(1 mark)

3 Nitrosyl chloride decomposes into nitrogen monoxide and chlorine according to the following equation. The forward reaction is endothermic

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

Which change in condition would change the value for K_c?

A. Decreasing the pressure

B. Adding a catalyst

C. Increasing the temperature

D. Increasing the pressure

(1 mark)

4 Which of the following rows correctly describes K_c and ΔG for a reaction where the products are favoured?

	K_c	ΔG
A.	> 1	< 1
B.	> 1	< 0
C.	> 0	> 0
D.	> 0	> 1

(1 mark)

5 At 300 K, iron oxidises according to the following equation:

$$2Fe\ (s) + \frac{3}{2}O_2\ (g) \rightleftharpoons Fe_2O_3\ (s)$$

The standard Gibbs free energy change for this reaction is -743.05 kJ mol^{-1}.

The quantitative relationship between the standard Gibbs free energy change, temperature and the equilibrium constant is:

$$\Delta G = -RT \ln K$$

Which expression is a correct step towards calculating the value of the equilibrium constant? (R = 8.31 J K^{-1} mol^{-1})

A. $\ln K = \frac{8.31 \times 573}{-743.05 \times 10^3}$

B. $\ln K = \frac{8.31 \times 300}{-743.05 \times 10^3}$

C. $\ln K = \frac{-743.05}{8.31 \times 300}$

D. $\ln K = \frac{-743.05 \times 10^3}{8.31 \times 300}$

(1 mark)