Edexcel Chemistry A-level

Topic 11 - Equilibrium II

Flashcards

What is partial pressure?

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Each gas's contribution to the total pressure

How would you calculate the partial pressure of a gas?

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Partial pressure p = mole fraction x total pressure

What is the mole fraction?

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Mole fraction of gas X = number of moles of gas X in the mixture ÷ total number of moles of gas in the mixture

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For the reaction: $aA + bB \rightleftharpoons cC + dD$

$$K_p = \frac{pC^c\ pD^d}{pA^a\ pB^b}$$

Where pA = partial pressure of A

and a = number of moles of A

How do you calculate the units for Kp and Kc?

How do you calculate the units for Kp?

Write out the units for the partial pressures/ concentrations in the same arrangement as the Kp/Kc equation and cancel out/multiply together.

For Kp usually in Pa, kPa, atm etc. DO NOT CHANGE UNITS

For Kc units for concentration is mol dm^{-3}

What is the effect of increasing temperature on Kp/Kc for an endothermic reaction?

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Equilibrium shifts to the right, so partial pressures of products increase, so Kp increases

What is the effect of increasing temperature on Kp/Kc for an exothermic reaction?

What is the effect of increasing temperature on Kp/Kc for an endothermic reaction?

Equilibrium shifts to the left, so partial pressures/concentration of reactants increase, so Kp decreases

What is the effect of increasing the overall pressure on Kp for this reaction?

$$K_p = \frac{pC^c\ pD^d}{pA^a\ pB^b}$$

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$$K_p = \frac{pC^c\ pD^d}{pA^a\ pB^b}$$

Pressure does not affect Kp as, if moles of gas are not the same on each side), either top or bottom of Kp expression will have a total pressure term that does not cancel.

What will be the kinetic effect of increasing the temperature and pressure for any reaction?

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Increasing both will increase the rate of reaction as:

Temperature - many more particles have energy greater than or equal to the activation energy → more successful collisions per second

Pressure - more particles in the same volume → more successful collisions per second.

What is the effect of changing concentration or pressure or by the addition of a catalyst on the value of equilibrium constant?

What is the effect of changing concentration or pressure or by the addition of a catalyst on the value of equilibrium constant?

There is no effect

Complete this question:

The preparation of hydrogen iodide, HI(g), from hydrogen and iodine gases is a reversible reaction which reaches equilibrium at constant temperature.

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

(a) Write the expression for K_c for this equilibrium.

(b) A student mixed together 0.30 mol $H_2(g)$ with 0.20 mol $I_2(g)$ and the mixture was allowed to reach equilibrium. At equilibrium, 0.14 mol $H_2(g)$ was present.

(i) Complete the table below to show the amount of each component in the equilibrium mixture.

component	$H_2(g)$	$I_2(g)$	HI(g)
initial amount / mol	0.30	0.20	0
equilibrium amount / mol			

[2]

(ii) Calculate K_c to an appropriate number of significant figures. State the units, if any.

Answer to question.

(a) $K_c = \dfrac{[HI]^2}{[H_2][I_2]}$ **(1)** 1

(b) (i)

H_2	I_2	HI
0.30	0.20	0
0.14	0.04	0.32
	(1)	**(1)**

2

(ii) $K_c = \dfrac{0.32^2}{0.14 \times 0.04} = 18.28571429$ **(1)**

= 18 (to 2 sig figs) **(1)**

no units **(1)**

(or ecf based on answers to (i) and/or (a)) 3