

Edexcel Chemistry A-level

Topic 11 - Equilibrium II

Flashcards

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What is partial pressure?



What is partial pressure?

Each gas's contribution to the total pressure



How would you calculate
the partial pressure of a
gas?



How would you calculate the partial pressure of a gas?

Partial pressure $p = \text{mole fraction} \times \text{total pressure}$



What is the mole fraction?



What is the mole fraction?

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



A reaction is represented by

$$aA (g) + bB (g) \rightleftharpoons cC (g) + dD (g),$$

what K_p for the system?



A reaction is represented by $aA(g) + bB(g) \rightleftharpoons cC(g) + dD(g)$, what K_p for the system?

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 K_p and K_c ?



How do you calculate the units for K_p ?

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

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

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



What is the effect of increasing temperature on K_p/K_c for an endothermic reaction?



What is the effect of increasing temperature on K_p for an endothermic reaction?

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



What is the effect of increasing temperature on K_p/K_c for an exothermic reaction?



What is the effect of increasing temperature on K_p/K_c for an endothermic reaction?

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



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

$$K_p = \frac{p_C^c p_D^d}{p_A^a p_B^b}$$



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

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

Pressure does not affect K_p as, if moles of gas are not the same on each side), either top or bottom of K_p 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?



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

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?



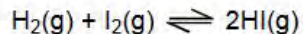
What is the effect of changing concentration or pressure or by the addition of a catalyst on the value of equilibrium constant?

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.



- (a) Write the expression for K_c for this equilibrium.
- (b) A student mixed together 0.30 mol $\text{H}_2(\text{g})$ with 0.20 mol $\text{I}_2(\text{g})$ and the mixture was allowed to reach equilibrium. At equilibrium, 0.14 mol $\text{H}_2(\text{g})$ was present.
- (i) Complete the table below to show the amount of each component in the equilibrium mixture.

component	$\text{H}_2(\text{g})$	$\text{I}_2(\text{g})$	$\text{HI}(\text{g})$
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) $K_c = \frac{[\text{HI}]^2}{[\text{H}_2][\text{I}_2]}$ (1) 1

(b) (i)

H ₂	I ₂	HI	
0.30	0.20	0	
0.14	0.04	0.32	
	(1)	(1)	2

(ii) $K_c = \frac{0.32^2}{0.14 \times 0.04} = 18.28571429$ (1)
 $= 18$ (to 2 sig figs) (1)
 no units (1)
 (or ecf based on answers to (i) and/or (a)) 3

