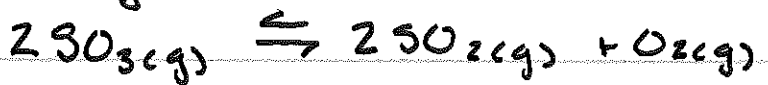


AP Chemistry - Unit 9 - NMRX Super Problem



Initial	5.00 mol	0	0	in 5.00 L Rxn Vessel
Equil		3.00 mol		

@ 400K

A) Equilibrium Constant, K_c

$$K_c = \frac{[\text{SO}_2]^2 [\text{O}_2]}{[\text{SO}_3]^2}$$

B) initial molar concentration SO_3

$$[\text{SO}_3] = \frac{5.00 \text{ mol}}{5.00 \text{ L}} = 1.00 \text{ M}$$

C) Equilibrium [] of $\text{O}_2, \text{SO}_2, \text{SO}_3$

$$[\text{SO}_2]_{\text{eg}} = \frac{3.00 \text{ mol}}{5.00 \text{ L}} = 0.600 \text{ M}$$

	2SO_3	\rightleftharpoons	2SO_2	O_2	
I	1.00		0	0	
C	-2x		2x	x	
E			.600M		$\rightarrow \therefore x = .300$

Solve E

-2(.300)	.300 M
-.600	
1.00 - .600	
.400	

$[\text{SO}_3]_{\text{eg}} = .400 \text{ M}$	$[\text{SO}_2]_{\text{eg}} = .600 \text{ M}$	$[\text{O}_2]_{\text{eg}} = .300 \text{ M}$
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AP Chem - Unit 9 - NMSI Super Problem

1)

$$c) K_c = ?$$

$$K_c = \frac{[SO_2]^2 [O_2]}{[SO_3]^2} = \frac{[.600]^2 [.300]}{[.400]^2}$$

$$K_c = .675$$

d) $K_p = ?$

$$K_p = K_c (RT)^{\Delta n}$$

$$= (.675) [(0.0821)(400)]^1$$

$$K_p = 22.2$$

$$\Delta n = \text{product g mole} - \text{R g mole}$$

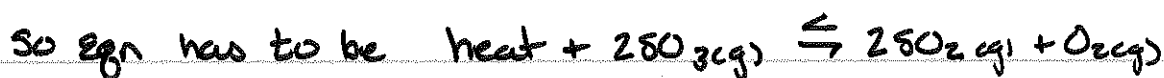
$$= 3 - 2$$

$$\Delta n = 1$$

$$T = 400 K$$

e) Rxn vessel is cooled from 400K to 298K

Result: shift to left \therefore more reactants & fewer products



\therefore Reaction is Endothermic

h) moles of SO_3 Δ ?i) temp \downarrow

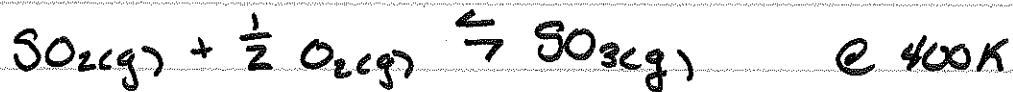
since eqn/rxn is endothermic a decrease in temp will cause shift to left \therefore increase in SO_3

ii) Volume in Rxn container \uparrow

2 moles gas \rightleftharpoons 3 moles gas Result of $V \uparrow$, pressure \downarrow

\therefore shift to Right + decrease in SO_3

AP Chem - Unit 9 - NMSI - SP



i) $K_c = ?$
(K_2)

$$K_2 = \frac{1}{K_1} \leftarrow \begin{array}{l} \text{original} \\ \text{value} \end{array} \quad \text{since rxn reversed}$$

coeff are mult by $\frac{1}{2}$ $\therefore K_c$ raised to $\frac{1}{2}$

$$K_2 = \frac{1}{K_c^{1/2}}$$

$$K_2 = \frac{1}{(.675)^{1/2}}$$

$$K_2 = 1.22$$