

Problem of the Day 26 CHEM 1252

1. The following problems deal with Le Chatelier's Principle.

(a) Predict the effect of increasing the pressure on the following reactions at equilibrium.

Reaction	Effect			
$2 \text{SO}_3(\text{g}) + 2 \text{Cl}_2(\text{g}) \rightleftharpoons 2 \text{SO}_2\text{Cl}_2(\text{g}) + \text{O}_2(\text{g})$	Shift Right	Shift Left	No Effect	3
$\text{O}_2(\text{g}) + 2 \text{F}_2(\text{g}) \rightleftharpoons 2 \text{F}_2\text{O}(\text{g})$	Shift Right	Shift Left	No Effect	3
$2 \text{NO}(\text{g}) + \text{O}_2(\text{g}) \rightleftharpoons 2 \text{NO}_2(\text{g})$	Shift Right	Shift Left	No Effect	3

(b) Predict the effect of increasing the concentration of the reagent indicated in boldface on each of the following reactions at equilibrium. Temperature and pressure remain constant.

Reaction	Effect			
$2 \text{NO}_2(\text{g}) \rightleftharpoons \text{N}_2\text{O}_4(\text{g})$	Shift Right	Shift Left	No Effect	3
$2 \text{SO}_3(\text{g}) \rightleftharpoons 2 \text{SO}_2(\text{g}) + \mathbf{\text{O}_2(\text{g})}$	Shift Right	Shift Left	No Effect	3
$\mathbf{\text{PF}_5(\text{g})} \rightleftharpoons \text{PF}_3(\text{g}) + \text{F}_2(\text{g})$	Shift Right	Shift Left	No Effect	3

2. A mixture of 0.100 mol of NO, 0.050 mol of H₂, and 0.10 mol of H₂O is placed in a 1.0 L reaction vessel. The following equilibrium is established.



(a) Which direction did the reaction proceed to reach equilibrium? (Circle One.)

Right	Left	Reaction Started at Equilibrium	5
-------	------	---------------------------------	---

(b) Write the equilibrium constant expression for the above reaction.

$K_c =$	6
---------	---

2 cont'd.

(c) Given that at equilibrium $[\text{NO}] = 0.062 \text{ M}$, fill in the table below with appropriate concentrations.

$2 \text{NO}(\text{g}) + 2 \text{H}_2(\text{g}) \rightleftharpoons \text{N}_2(\text{g}) + 2 \text{H}_2\text{O}(\text{g})$					
initial					
	<input type="text" value="2"/>	<input type="text" value="2"/>		<input type="text" value="2"/>	<input type="text" value="2"/>
change					
	<input type="text" value="2"/>	<input type="text" value="2"/>		<input type="text" value="2"/>	<input type="text" value="2"/>
equil.					
	<input type="text" value="2"/>	<input type="text" value="2"/>		<input type="text" value="2"/>	<input type="text" value="2"/>

Use this area for calculations in part (c)

6

(d) Using your values from part (c), calculate K_c for the reaction.

6