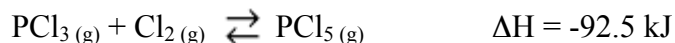


CHEMISTRY 12 – LE CHÂTELIER'S PRINCIPLE WORKSHEET #1

1) State *Le Châtelier's Principle*. (2 marks)

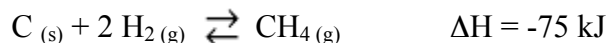
2) For the reaction:



predict the effect on the position of equilibrium that results from: (6 marks)

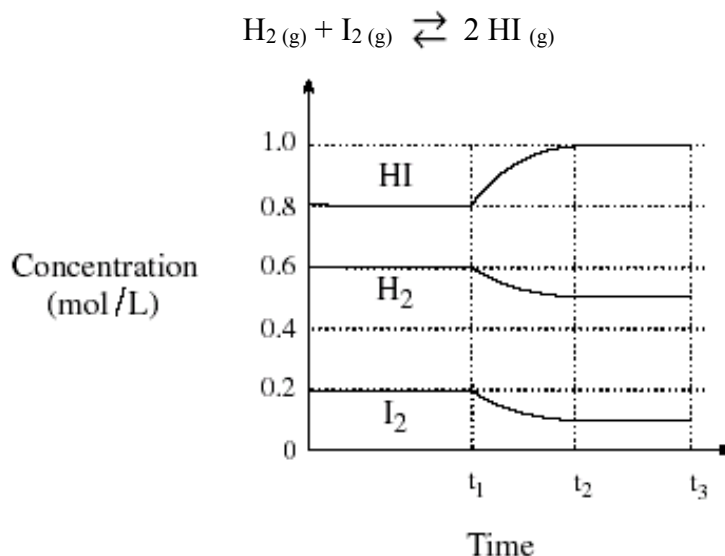
Stress	Shift	Stress	Shift
a) Decreasing the volume		b) Removing some PCl_5	
c) Injecting more Cl_2 gas		d) Increasing the volume of the container	
e) Increasing the temperature		f) Addition of Ne, an inert gas	

3) Consider the following equilibrium system:



State **four** different ways to make more C react. (4 marks)

4) Consider the following graph for the reaction:

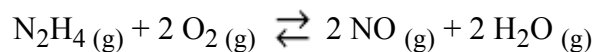


The temperature is increased at t_1 and equilibrium is re-established at t_2 .

a) On the above graph, sketch the line representing the $[\text{HI}]$ between time t_1 and t_3 . (1 mark)

b) Is the above equilibrium exothermic or endothermic? (1 mark)

5) Consider the following equilibrium:

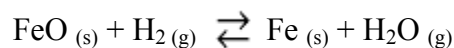


More oxygen is added to the above equilibrium. After the system re-establishes equilibrium, identify the substance(s), if any, which have a net **(2 marks)**

a) increase in concentration.

b) decrease in concentration.

6) Consider the following equilibrium system:



Describe the effect that a decrease in volume would have on the position of equilibrium and the $[\text{H}_2]$ in the above system? **(1 mark)**

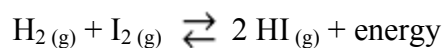
7) For the reaction:



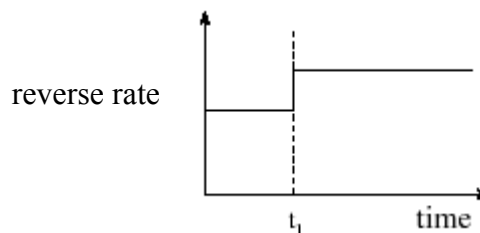
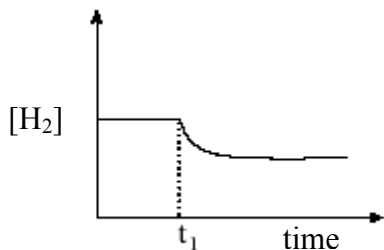
predict the effect on the position of equilibrium that results from: **(6 marks)**

Stress	Shift	Stress	Shift
a) The pressure is increased		b) The temperature is increased	
c) An inert gas is injected into the system		d) CO is added	
e) H_2 is removed		f) A catalyst is added	

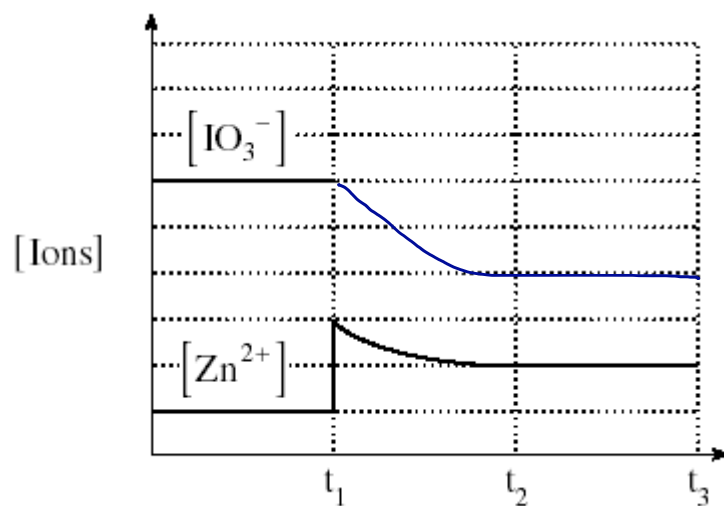
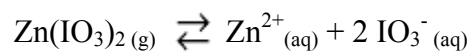
8) Consider the following equilibrium:



Identify the possible stresses applied at time t_1 for the following diagrams: **(3 marks)**



9) Consider the following equilibrium and accompanying graph:



a) Identify the stress applied at t_1 . **(1 mark)**

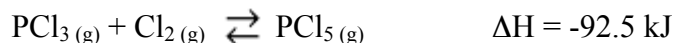
b) Complete the above graph from t_1 to t_3 for the $[\text{IO}_3^-]$. **(1 mark)**

CHEMISTRY 12 – LE CHÂTELIER’S PRINCIPLE WORKSHEET #1

1) State *Le Châtelier’s Principle*. (2 marks)

When a stress is imposed to a system at equilibrium, the system will shift to oppose the stress and re-establish equilibrium

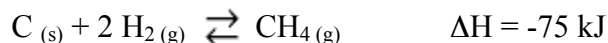
2) For the reaction:



predict the effect on the position of equilibrium that results from: (6 marks)

Stress	Shift	Stress	Shift
a) Decreasing the volume	Right	b) Removing some PCl_5	Right
c) Injecting more Cl_2 gas	Right	d) Increasing the volume of the container	Left
e) Increasing the temperature	Left	f) Addition of Ne, an inert gas	None

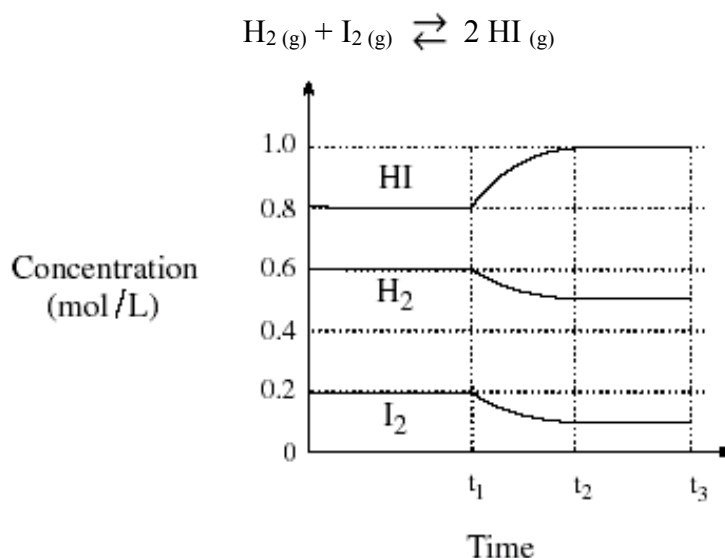
3) Consider the following equilibrium system:



State **four** different ways to make more C react. (4 marks)

To make more C react means that you want to shift the equilibrium to the right, therefore you need to add H_2 , remove CH_4 , decrease the temperature or increase pressure/decrease volume

4) Consider the following graph for the reaction:



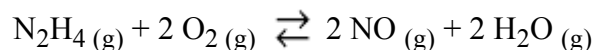
The temperature is increased at t_1 and equilibrium is re-established at t_2 .

a) On the above graph, sketch the line representing the $[\text{HI}]$ between time t_1 and t_3 . (1 mark)

b) Is the above equilibrium exothermic or endothermic? (1 mark)

Since the $[\text{H}_2]$ and $[\text{I}_2]$ both decreased during the shift, the equilibrium must have shifted to the right. Increasing the temperature always shifts the equilibrium in the endothermic direction, therefore the forward direction is **endothermic**.

5) Consider the following equilibrium:



More oxygen is added to the above equilibrium. After the system re-establishes equilibrium, identify the substance(s), if any, which have a net **(2 marks)**

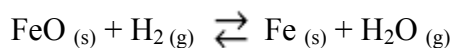
a) increase in concentration.

Increasing O_2 would cause a shift right therefore the $[\text{NO}]$, $[\text{H}_2\text{O}]$ would increase and the $[\text{O}_2]$ would increase immediately and then decrease during the shift, but still be greater than it was before

b) decrease in concentration.

$[\text{N}_2\text{H}_4]$

6) Consider the following equilibrium system:



Describe the effect that a decrease in volume would have on the position of equilibrium and the $[\text{H}_2]$ in the above system? **(1 mark)**

Since there are equal # of particles of gas on the reactants and products sides, there would be no shift to the equilibrium position. The $[\text{H}_2]$ would increase as a result of decreasing the volume.

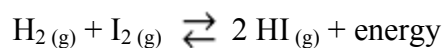
7) For the reaction:



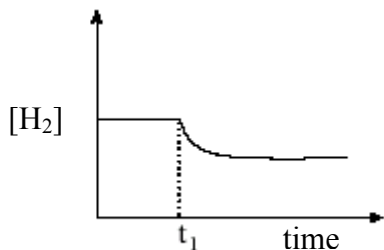
predict the effect on the position of equilibrium that results from: **(6 marks)**

Stress	Shift	Stress	Shift
a) The pressure is increased	Right	b) The temperature is increased	Left
c) An inert gas is injected into the system	None	d) CO is added	Right
e) H_2 is removed	Left	f) A catalyst is added	None

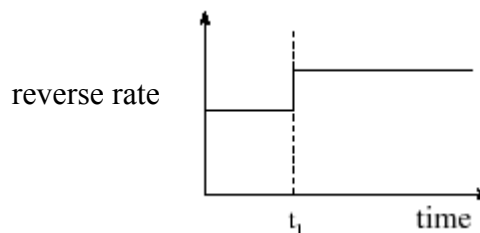
8) Consider the following equilibrium:



Identify the possible stresses applied at time t_1 for the following diagrams: **(3 marks)**

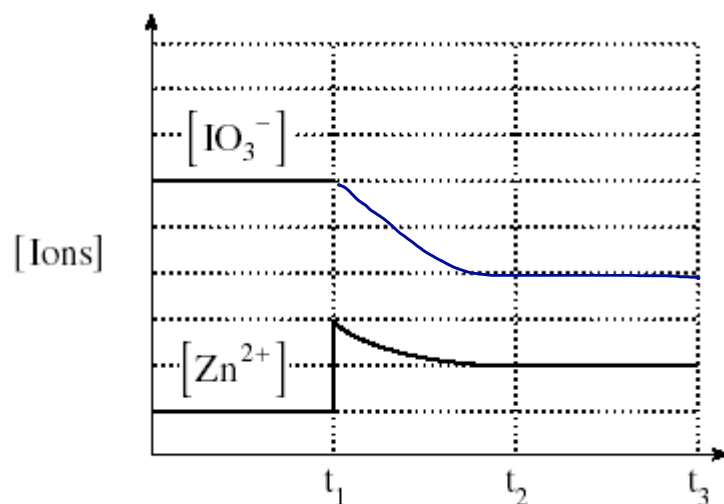
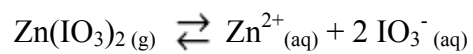


Adding I_2 , removing HI or decreasing the temperature



Increasing the pressure/decreasing the volume

9) Consider the following equilibrium and accompanying graph:



a) Identify the stress applied at t_1 . (1 mark)

Since the $[\text{Zn}^{2+}]$ increases instantaneously, Zn^{2+} must have been added to the system

b) Complete the above graph from t_1 to t_3 for the $[\text{IO}_3^-]$. (1 mark)