

Le Chantelier's Principle Practice Problems:

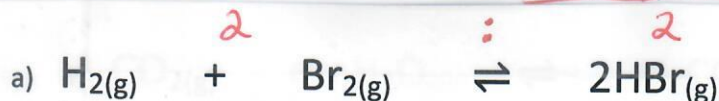
Name: Solutions

- 1) Study the following reaction. Fill in the table below using arrows to indicate which reaction would be favored (forward/reverse). Also use arrows to show increase or decrease in concentration of each substance.

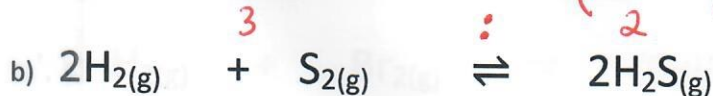


Change in Concentration	[COCl ₂]	Direction of Shift	[CO]	[Cl ₂]	Reaction Favored (forward or reverse)
Addition of COCl ₂	↓	→	↑	↑	F
Removal of COCl ₂	↑	←	↓	↓	R
Addition of CO	↑	←	↓	↓	R
Removal of CO	↓	→	↑	↑	F
Addition of Cl ₂	↑	←	↓	↓	R
Removal of Cl ₂	↓	→	↑	↑	F

- 2) The following 3 reactions involve the formation of acids. Indicate if the forward, reverse, or no reaction is favored in each situation if there is an increase in pressure. State reason for your answers.



No reaction favoured (same gas molecules on both sides)

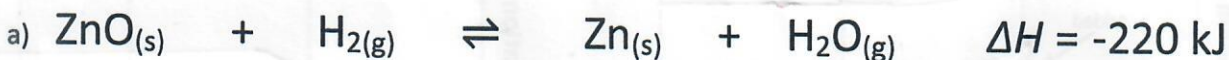


Forward Reaction (towards the production of least gas molecules)



Forward Reaction (towards the production of least gas molecules)
(In this case toward production of zero gas molecules)

- 3) Study the following reaction. Indicate if the forward, reverse, or no reaction is favored when the following temperature change is applied.



Increase in Heat: Reverse Decrease in Heat: Forward



Increase in Heat: Forward Decrease in Heat: Reverse

4) Study the following theoretical reaction: $X_{(g)} + Y_{(g)} \rightleftharpoons 4Z_{(g)} + 100kJ$

Using arrows (\rightarrow or \leftarrow) indicate which reaction would be favored when the following changes are made to the system at equilibrium.

- a) Concentration of Y is increased: \rightarrow
- b) Concentration of X is decreased: \leftarrow
- c) Concentration of X is increased: \rightarrow
- d) Increase in Pressure of the system: \leftarrow
- e) Decrease the Volume of the system: \leftarrow
- f) Increase the temperature of the system: \leftarrow
- g) Decrease the Pressure of the system: \rightarrow
- h) Concentration of Z is increased: \leftarrow
- i) Concentration of Z is decreased: \rightarrow
- j) Addition of a Catalyst to the system: *Nothing*
- k) Decrease the temperature of the system: \rightarrow

5) Study the following reaction: $A_{(s)} + 3B_{(g)} \rightleftharpoons 2C_{(g)}$

What affect would adding more of substance A have on the system? Explain.

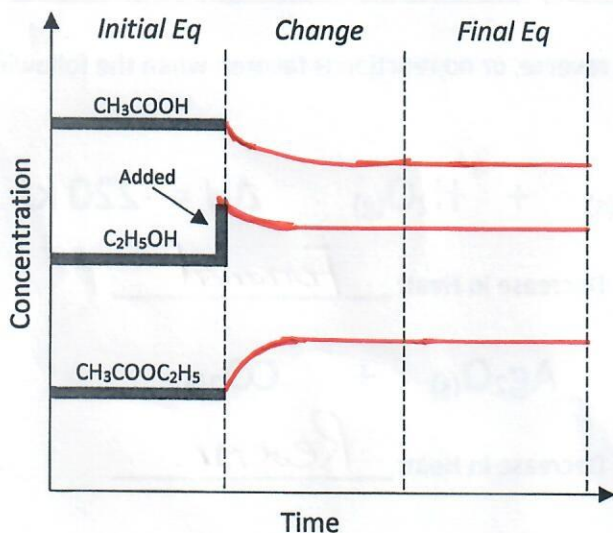
Substance A is a solid, adding it will not influence equilibrium. (No reaction favoured)

6) Observe the following reaction at equilibrium:



Using lines complete the concentrations of each substance on the diagrams below, indicating if it increases or decreases in concentration.

a) Increase in concentration of C_2H_5OH (added)



b) Increase in concentration of $CH_3COOC_2H_5$ (added)

