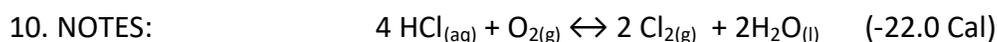
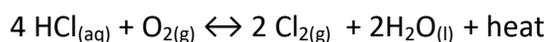


Introduction to Equilibrium Le Chatelier's Principle

1. The collision theory states:
2. The variables that will affect the rate of a reaction are:
3. The 2 main factors that influence the reaction rate are:
4. The reaction rate is expressed as:
5. Activation energy is:
6. A catalyst affects the reaction rate by:
7. Some examples of catalysts are :
5. A reversible reaction is:
6. Chemical equilibrium is:
7. Le Chatelier's Principle states:
8. The stresses that will affect the equilibrium of a reaction are :
9. The only type reactant or product that will be affected by a change in pressure is :



NOTE: Energy can be written independently as above or treated as a reactant or product and written as heat on that side of the equation like below .



What will happen when a stress is applied? Which direction will the equation shift/proceed?

Right or favor the products or **left or favor the reactants** [these brackets mean concentration or molarity]

A. Increase [HCl]

B. Decrease [Cl₂]

C. Increase temp/energy

d. Increase pressure*

Equilibrium expression: $K_{eq} = \text{concentration reactants} / \text{concentration products}$ or $[\text{Cl}]^2 / [\text{HCl}]^4 [\text{O}_2]$

Don't include liquids or solids in keq they can't be concentrated they will either not be in the equation or represented by a 1

You will need to be able to write the K_{eq} So, look at the example above.

See what happens to the subscripts in the formulas and the coefficients

Remember this is a closed system.



At equilibrium

This is the goal

If $K_{eq} = 1$ at equilibrium



A) to adjust equilibrium

Shift left, favor reactants

if $K_{eq} < 1$ favors products



B) to adjust equilibrium

Shift right, favor products

if $K_{eq} > 1$ favors products



Use the equation above to predict the direction that the applied stress will shift the reaction and what will happen to the reactants and products as a result.

Stress applied	$[\text{N}_2]$	$[\text{H}_2]$	Shift	$[\text{NH}_3]$	K_{eq}
1. inc N_2	inc	Dec used to make NH_3	Looks like B above →	Inc	No change
2. Inc H_2		inc			No change
3. inc NH_3				inc	No change
4. dec N_2	dec				No change
5. dec H_2		dec			No change
6. dec NH_3				dec	No change
7. inc temp.					* refer to video
8. dec temp					
9. inc pressure					No change
10. dec pressure					No change
11. add a catalyst					No change

11. Write the K_{eq} equilibrium expression for the reaction.

12. What affect will a solid or liquid have on a reaction?

13. What does a catalyst do for a reaction?

14. What is the only stress that will change the K_{eq} ?