Take notes while watching the following video tutorials to prepare for the "Acids & Bases Part 1 Activity".

Acids & Bases Part 1: Introduction with Predicting the Products

Arrhenius Definition

Acids: substances that produce hydrogen ions (protons) when dissolved in H_2O

Bases: substances that produce hydroxide ions when dissolved in H_2O

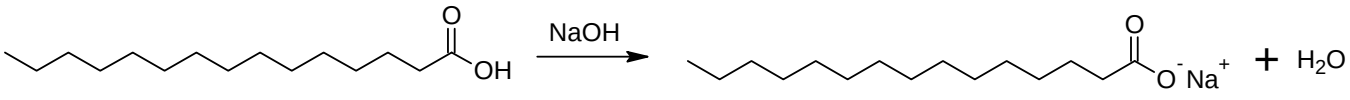
Bronsted-Lowry Definition

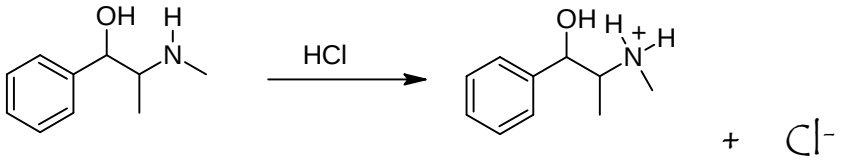
Acid:

Base:

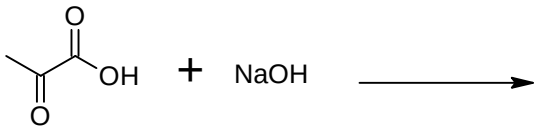
Label the reactants as "acid" or "base".

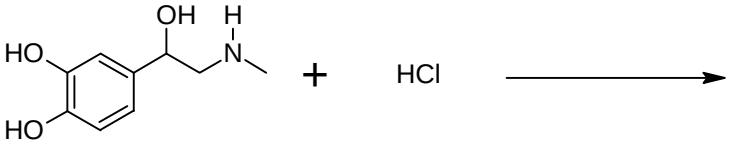
Look at the products and describe how they are different from the reactants.





Complete the acid-base reactions below.





Acids & Bases Part 2: Inorganic and Organic Acid Nomenclature

Naming Inorganic Acids

All acids have H^+ ions in common. It is the anions that differ.

Acid names are derived from the suffix of the anion name.
Look at the anions you have memorized.

Anion Name		Acid Name
_____ide anions	⇒	hydro_____ic acid
_____ate anions	⇒	_____ic acid
_____ite anions	⇒	_____ous acid

Exceptions:

H_2SO_4

H_3PO_4

Naming Organic Acids

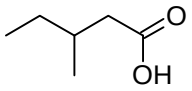
Rule 1: Assign the root by finding the longest continuous carbon chain that contains the functional group.

Rule 2: Assign the suffix by replacing "–ane" from homologous series with "–anoic acid".

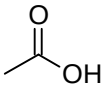
Rule 3: The locator number is NOT needed because the carboxylic acid is always at the end of the carbon chain.

Rule 4: Assign a prefix if the main chain contains substituents.

Example:

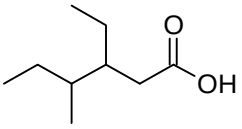


What is the common name of the following carboxylic acid?

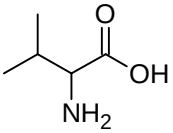


Give the IUPAC name for the following compounds.

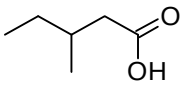
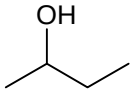
a)



b)



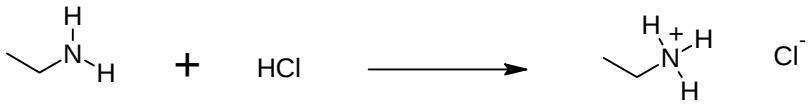
Name the following compounds and identify them as acidic, basic or neutral.

Compound	Name	Acid, Base or Neutral
$FeCl_3$		
		
$BaBr_2$		
H_2CO_3		
KOH		
		
$CH_3CH(NH_2)CH_3$		

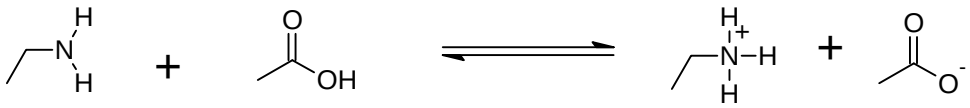
Memorize the following five strong acids. What are their names?

Chemical Formula	Anion Name	Chemical Name
HCl		
HBr		
HI		
HNO_3		
H_2SO_4		
$HClO_4$	perchlorate	

Strong Acids react completely.



ALL other acids are weak acids.
Weak Acids do NOT react completely.



Acids & Bases Part 3: The Bronsted-Lowry Definition & Conjugate Acid-Base Pairs

Bronsted-Lowry Definition

Acid:

Base:

Implications of the Bronsted-Lowry definition:

1) Free H^+ does not actually exist in H_2O

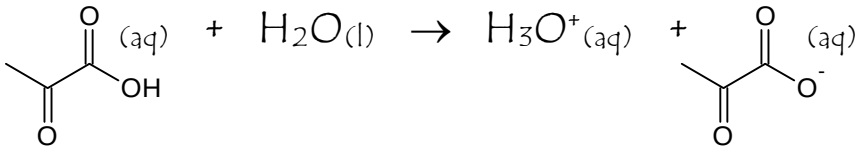
2) Reactions between an acid and base involve proton transfer.

Write the conjugate base for H_2CO_3.

Write the conjugate acid for HS^-.

For each of the reactions below:

1. Label each reactant as an "acid" or "base".
2. Label each product as "conjugate base" or "conjugate acid".
3. Draw arrows to connect the conjugate acid-base pairs.



$HCO_3^-(aq) + H_2O(l) \rightleftharpoons H_3O^+(aq) + CO_3^{2-}(aq)$

$NH_{3(aq)} + H_2O(l) \rightleftharpoons NH_4^+(aq) + OH^-(aq)$

Acids & Bases Part 4: Equilibrium Reactions and Le Chatlier's Principle

Equilibrium:

when the forward and reverse reactions proceed at the same rate, the concentration of reactants and products no longer changes and the reaction has reached a state of equilibrium

Reaction Rates & Equilibrium

For the reaction $HA \rightleftharpoons H^+ + A^-$, plot the relative reaction rates of the forward and reverse reactions over time and label where the state of equilibrium begins.

Reactant and Product Concentrations & Equilibrium

For the reaction $HA \rightleftharpoons H^+ + A^-$, plot the [HA] and [H+] over time and label where the state of equilibrium begins.

What general statement can we make about the concentration of reactants and products at equilibrium?

At equilibrium, have the reactions stopped?

The state of equilibrium is often called "dynamic equilibrium".
Explain the meaning of the term "dynamic" in relationship to the reaction rates.

Most exothermic reactions are considered spontaneous, meaning the products are more stable (have lower energy) than the reactants. However, SPONTANEOUS does NOT necessarily equate to FAST.
Draw a reaction energy diagram to explain this scenario. ———
Overlay a second curve when a catalyst is present. - - - - -

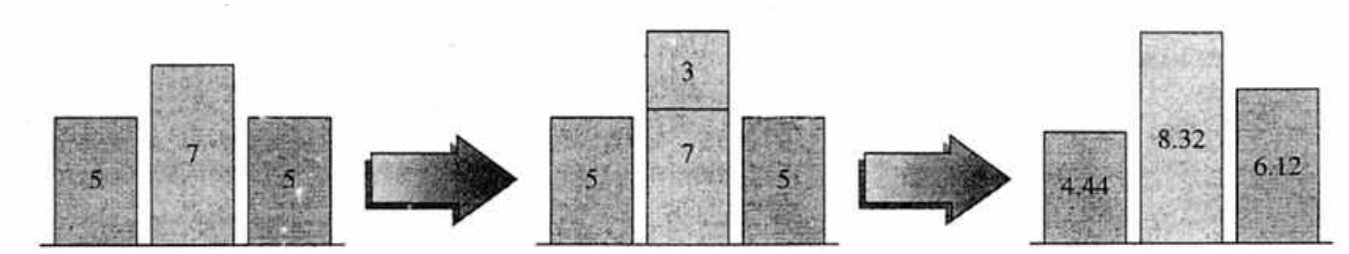
Changing Equilibrium Conditions

LeChatlier's Principle: When a "stress" is applied to a system at equilibrium, the equilibrium shifts to relieve the "stress."

What does "stress" mean?

Let's see what happens when we add "stress" to a system at equilibrium.

$PCl_{3(g)} + Cl_{2(g)} \rightleftharpoons PCl_{5(g)} + \text{heat}$



PCl_3 Cl_2 PCl_5 — Original equilibrium

PCl_3 Cl_2 PCl_5 — add $Cl_{2(g)}$

PCl_3 Cl_2 PCl_5 — new equilibrium

What stress was added?

At the new equilibrium, what happened to the $[PCl_3]$?

At the new equilibrium, what happened to the $[Cl_2]$?

At the new equilibrium, what happened to the $[PCl_5]$?

Which way did the equilibrium shift?

If we decrease the $[PCl_3]$, which way will the equilibrium shift?

What happens when we change the temperature?

$$PCl_{3(g)} + Cl_{2(g)} \rightleftharpoons PCl_{5(g)} + \text{heat}$$

Is the reaction above exothermic or endothermic?

If we increase the temperature, are we adding or removing heat?

If we increase the temperature, do we favor the forward or reverse reaction?

If we increase the temperature of the reaction, which way will the equilibrium shift?

If we decrease the temperature, do we favor the forward or reverse reaction?

If we decrease the temperature of the reaction, which way will the equilibrium shift?

Draw the reaction energy diagram.

What happens when we change the pressure?

$$PCl_{3(g)} + Cl_{2(g)} \rightleftharpoons PCl_{5(g)} + \text{heat}$$

How many moles of gas are present as reactants?

How many moles of gas are present as products?

If we increase the pressure, which way will the equilibrium shift?

Why?

Would a change in pressure affect the following reaction?

$$H_{2(g)} + Cl_{2(g)} \rightleftharpoons 2\,HCl_{(g)}$$

Why?

Adding a catalyst

Do catalysts change the position of equilibrium?

What do catalysts change?

Show the effect of a catalyst for an exothermic reaction on a reaction energy diagram.

Plot the reaction rate versus time for the exothermic reaction above overlaying the reaction rates with and without a catalyst.

The Bicarbonate Equilibrium System

$$CO_{2\,(g)} + H_2O_{(l)} \rightleftharpoons H_2CO_{3(aq)} \rightleftharpoons H^+_{(aq)} + HCO_3^-{}_{(aq)}$$

Hyperventilation is a condition where the breathing is too fast from anxiety, hysteria, altitude sickness, intense exercise.
Would you expect a patient's blood carbon dioxide concentration to increase or decrease with hyperventilation?

What happens to the $[H^+]$?

Phosphate Bufer System

$$H_2PO_4^-{}_{(aq)} \rightleftharpoons H^+_{(aq)} + HPO_4^{2-}{}_{(aq)} \rightleftharpoons H^+_{(aq)} + PO_4^{3-}{}_{(aq)}$$

$H_2PO_4^-$ passes from the body in our urine. Diurectics cause frequent urination.

What happens to the $[H^+]$ when a person takes diurectics?