Unit 10 Outcomes

LPT

Identify properties of the following: acids & bases

Property	Acid	Base
Taste	Sour	Bitter
Feel	None	Slippery
Litmus	B→R	R→B
Phenolphthalein	Colorless	Magenta
With Carbonate	CO_2 evolution	None
With “active” Metals	H_2 evolution	None
With most metals	None	Water Insoluble

LPT

Identify ion that is present in solutions commonly identified as:

a) Acids = H^+ H_3O^+ (AH)

b) Base = OH^- (B^-)

Write equations for simple acid – base reactions.

$$HA_{(aq)} \rightarrow H^+_{(aq)} + A^-_{(aq)}$$

$$H_3O^+_{(aq)} + OH^-_{(aq)} \rightarrow 2\,H_2O_{(l)}$$

$$AH + B \rightarrow BH^+ + A^-$$

Define

	Arrehnius	Bronstead
an acid =	Proton (as H_3O^+) Donor	Proton Donor
a base =	Hydroxide (OH^-)Donor	Proton Acceptor

LPT

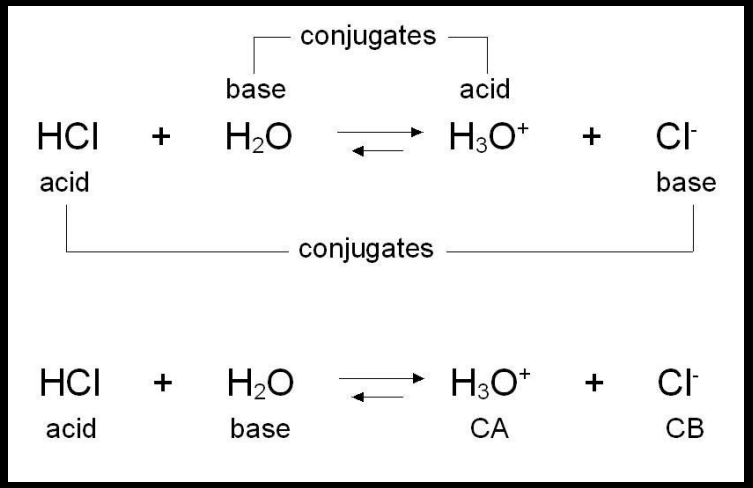
Write the equation for hydronium ion formation in water

$$H^+ + H_2O \rightarrow H_3O^+ \text{ (Hydronium Ion)}$$

Given a Bronsted – Lowry acid – base reaction, identify: the acid , the base, and the conjugate pairs

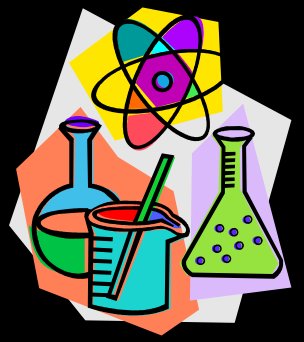
$$AH + B \rightleftharpoons BH^+ + A^-$$

A = Acid (H donor) in forward reaction
B = Base (H acceptor) in forward reaction
BH^+ = Conjugate Acid (H honor in reverse reaction)
A^- = Conjugate Base (H Acceptor in reverse reaction)



LPT

Identify the Lowry-Bronstead components:



$$HC_4H_5O_3 + PO_4^{3-} \rightleftharpoons HPO_4^{2-} + C_4H_5O_3^-$$

Acid = $HC_4H_5O_3$
Base = PO_4^{3-}
Conjugate Acid = HPO_4^{2-}
Conjugate Base = $C_4H_5O_3^-$

Lines identify conjugate pairs

LPT

Describe the properties of an amphoteric substance

amphoteric = substance that can act as an acid or as a base

$HCl + H_2O \rightarrow H_3O^+ + Cl^-$ (water a base)

$NH_3 + H_2O \rightarrow NH_4^+ + OH^-$ (water an acid)

Distinguish between the following terms:

a) strong acid – weak acid

b) strong base – weak base

"strong" acid or base: 100 % completely ionized

"weak" acid or base: < 100 % ionized, partially ionized

Strong Acids: pH < 4 **Strong Bases: > pH 11**

Weak Acids: pH 4-6 **Weak Bases: pH 8-11**

LPT

Recognize the pH scale is a measure of relative acidity & basicity.

Recognize that the pH of a solution is determined by its hydrogen ion concentration.

pH: negative logarithm of hydrogen ion molar concentration

Given the pH of a solution, classify it as acidic, basic, or neutral.

pH < 7 → acidic
pH = 7 → neutral
pH > 7 → basic (alkaline)

LPT

Describe two methods of determining pH:
Indicators – either papers or solutions
pH meters

Given the volumes of two solutions that react with each other in a titration, the molarity of one solution, and the equation for the reaction, calculate the molarity of the second solution.

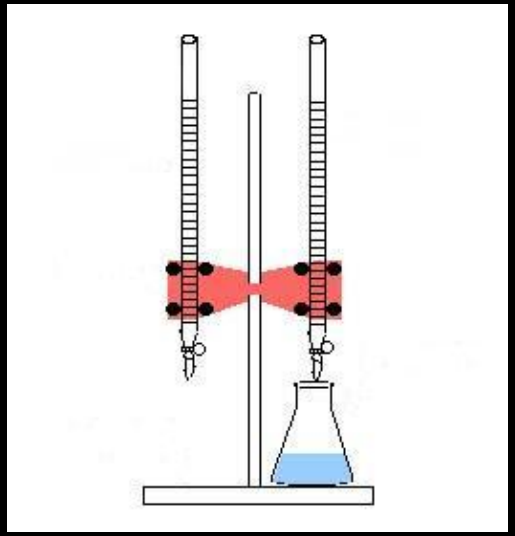
Determine moles present in given solution
Use reaction coefficients (“per expression”) to get moles wanted
Convert moles wanted to solution concentration

LPT

25.00 mL of 0.254 M H_2SO_4 are required to neutralize a 30.02 mL sample of a certain NaOH solution. What is the molarity of the NaOH solution?

$$H_2SO_4 + 2\,NaOH \rightarrow Na_2SO_4 + 2\,H_2O$$

$$\frac{0.254 \text{ moles } H_2SO_4}{1000 \text{ mL}} \times 25.00 \text{ mL} \times \frac{2 \text{ mole NaOH}}{1 \text{ mole } H_2SO_4} \times \frac{1}{0.03002 \text{ L}} = 0.423 \text{ M}$$



LPT