Do Now ...April 24, 2017

Obj: Observe and describe neutralization reactions.

Copy: Neutralization is when an acid and base react to product a salt and water.

e.g. $HCl + NaOH \rightarrow NaCl + H_2O$

acid base salt water

Monday, April 24, 2017

Today:

W-Up, Notes & Practice: Neutralization Reactions

HW: Review Notes

Warm-Up: Acids & Bases

Write the name of each acid or base.

HCl Hydrochloric acid

$NaOH$ Sodium hydroxide

H_2SO_4 Sulfuric acid

KOH Potassium hydroxide

HNO_3 Nitric acid

Note: SO_4^{2-}=sulfate, NO_3^- = nitrate

Naming Acids & Bases: Practice

H_2SO_3 sulfurous acid

HNO_2 nitrous acid

magnesium hydroxide $Mg(OH)_2$

HBr hydrobromic acid

H_2CO_3 carbonic acid

$Ca(OH)_2$ calcium hydroxide

hydroiodic acid HI

HNO_3 nitric acid

chlorous acid $HClO_2$

iron (II) hydroxide $Fe(OH)_2$

Neutralization Reactions

strong acid + strong base → salt + water

$HCl + NaOH \rightarrow NaCl + H_2O$

$HCl\ (aq) + NaOH\ (aq) \rightarrow NaCl\ (aq) + H_2O\ (l)$

Neutralization Reactions

Indicators are chemicals that have different colors at different pH levels.

strong acid + strong base → salt + water

BTB
is yellow.

BTB
is blue.

BTB
is green.

Neutralization Reactions

When a **strong** acid and **strong** base react the products are a salt and water.

$HCl\ (aq) + NaOH\ (aq) \rightarrow NaCl\ (aq) + H_2O\ (\ell)$

If I add one mole of HCl to one mole of NaOH, how many moles of H_2O are formed?

Neutralization Reactions

When a **strong** acid and **strong** base react the products are a salt and water.

$$H_2SO_{4(aq)} + Mg(OH)_{2(aq)} \rightarrow 2H_2O_{(l)} + MgSO_{4(aq)}$$

If I add one mole of H_2SO_4 to one mole of $Mg(OH)_2$, how many moles of $MgSO_4$ are formed?

Neutralization Reactions

What are several ways you can tell that a neutralization reaction has occurred?

Practice

Write the balanced chemical equation for the neutralization of HCl with KOH.

$$HCl + KOH \rightarrow KCl_{(aq)} + H_2O_{(l)}$$

Write the balanced chemical equation for the neutralization of CH_3COOH with KOH.

$$CH_3COOH + KOH \rightleftharpoons CH_3COOK_{(aq)} + H_2O_{(l)}$$

Activity (to be collected)

You've found a spill in chemistry lab and don't know if it is dangerous. Using pH paper determine if it is an acid or a base. Then decide how you will neutralize the solution using household chemicals (baking soda or vinegar).

On your own paper (this is the BCR):

- Describe how you determined if the spill was dangerous.
- You plan for neutralizing the spill.
- How you know it is now safe.

Do Now ...April 25, 2017

Obj: Test pH using acid/base indicators.

Copy:

Acid/Base **indicators** are chemical compounds that change color depending on the pH.

pH describes the amount of H_3O^+ ions (hydronium ions). The more H_3O^+ the lower the pH.

Tuesday, April 25, 2017

Today:

Lab: Acid/Base Indicators

HW: Google Form, Work on Lab

Do Now on back of pH worksheet ...

Match the formula to the name for the following acids and bases:

hydrochloric acid:

sodium hydroxide:

sulfuric acid:

potassium hydroxide:

nitric acid:

phosphoric acid:

H_3PO_4 $NaOH$

H_2SO_4 HNO_3

HCl KOH

Check your work ...

Write the formula for the following acids and bases:

hydrochloric acid: HCl

sodium hydroxide: NaOH

sulfuric acid: H_2SO_4

potassium hydroxide: KOH

nitric acid: HNO_3

phosphoric acid: H_3PO_4

Wednesday, April 26, 2017

Today:

Warm-Up: Naming Acids and Bases

Notes: pH of Acids and Bases

Practice: Calculating pH

Homework: Prepare for Quiz on Friday

pH

pH is a measure of the acidity of a solution.

A pH meter can be used to measure acidity.

pH

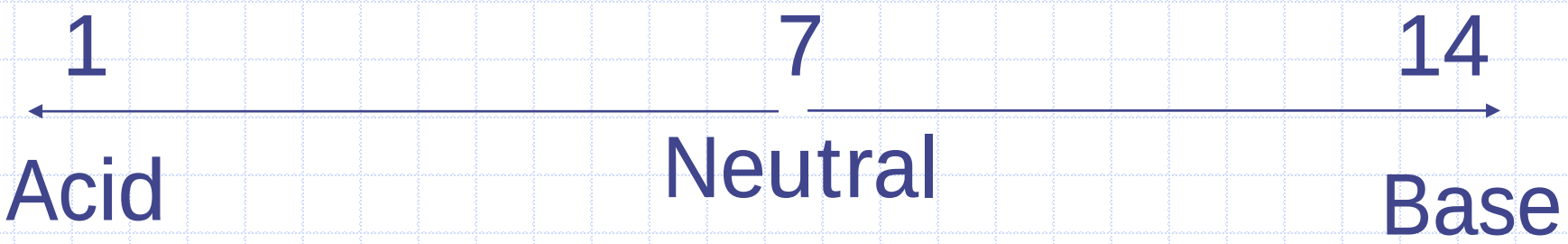
H is for H^+ ions

pH Scale

The lower the pH the more acidic.

The higher the pH the more basic.

A pH of 7 is neutral.



pH Scale Practice

What are the approximate pH values for:

Water:

Citric Acid:

Sodium Hydroxide:

Hydrochloric Acid:

Ammonia:

pH Scale

Acids react with water to produce hydrogen ions.

$$HCl_{(g)} \rightarrow H^+_{(aq)} + Cl^-_{(aq)}$$

We use the pH scale to describe the concentration of H^+ ions in a solution.

$$pH = - \log [H^+]$$

pH Scale

For example, a neutral solution contains equal concentrations of H^+ ions and OH^- ions. In water $[H^+] = 10^{-7}$ M.

The pH of the solution is obtained by:

$$pH = - \log 10^{-7} = 7$$

pH Scale

What is the concentration (molarity) of H^+ in water?

In water $[H^+] = 10^{-7}$ M.

pH Scale: Practice

The hydrogen ion concentration of a solution is 1×10^{-10} M. $[H^+] = 10^{-10}$ M What is the pH of the solution?

Determine pH if $[H^+] = 10^{-4}$ M .

pOH Scale

Bases react with water to produce hydroxide ions.

$NaOH_{(aq)} \rightarrow Na^{+}_{(aq)} + OH^{-}_{(aq)}$

We use the pOH scale to describe the concentration of OH^- ions in a solution.

$$pOH = - \log [OH^-]$$

pOH Scale

The hydroxide ion concentration of a solution is 1×10^{-2} M. $[OH^-] = 10^{-2}$ M

What is the pOH of the solution?

pH + pOH = 14

pH + pOH = 14

For example if pH= 7, then 7 + pOH = 14

Calculate pOH if the pH is 12.

Calculate the pH if the pOH is 2.

Practice

$pOH = - \log [OH^-]$

$pH + pOH = 14$

$pH = - \log [H^+]$

What is the pH if the H^+ concentration is .0021 M?

What is the pOH?

What is the pH if the H^+ concentration is .00032 M?

What is the pOH?

Practice

What is the H^+ concentration is the pH is 3.4?

Remember, a $[H^+]$ of 10^{-7} has a pH of 7.

So, a pH of 3.2 has a $[H^+]$ of $10^{-3.2}$

What is the $[H^+]$ of a solution with a pH of 4.3?

Do Now ...April 27, 2017

Obj: Calculate pH base on the amount of H_3O^+ (hydronium ions) present in solution.

Copy and Solve:

pH= -log[pH] [pH] is the molarity

What is the pH and pOH of a 0.001 M solution of HCl?

Note: 0.001 = 1×10^{-3} or 10^{-3}

Thursday, April 27, 2017

Today

W-up, Notes & Practice

HW: Google Form

Practice

$pH = -\log [H^+]$

1. Which has a lower pH, 0.1M HNO_3 or 0.001 M HNO_3?

2. Which solution has the higher pH value: 0.1M HCl or 0.1M NaOH?

3. Calculate the pH of the following solutions:

   $[H^+] = 0.1M$

   0.010M HCl

   0.000158M HCl

pOH

pH tells us the concentration of H^+ ions.

pOH tells us the concentration of OH^- ions.

pOH Scale

Bases react with water to produce hydroxide ions.

$NaOH_{(aq)} \rightarrow Na^{+}_{(aq)} + OH^{-}_{(aq)}$

We use the pOH scale to describe the concentration of OH^- ions in a solution.

$$pOH = - \log [OH^-]$$

pOH Scale

The hydroxide ion concentration of a solution is 1×10^{-2} M. $[OH^-] = 10^{-2}$ M

What is the pOH of the solution?

pH + pOH = 14

pH + pOH = 14

For example if pH= 7, then 7 + pOH = 14

Calculate pOH if the pH is 6.

Calculate the pH if the pOH is 11.

Practice

$pOH = - \log [OH^-]$

$pH + pOH = 14$

$pH = - \log [H^+]$

What is the pH if the H^+ concentration is .0021 M?

What is the pOH?

What is the pH if the H^+ concentration is .00032 M?

What is the pOH?

Practice

What is the H^+ concentration is the pH is 3.4?

Remember, a $[H^+]$ of 10^{-7} has a pH of 7.

So, a pH of 3.2 has a $[H^+]$ of $10^{-3.2}$

What is the $[H^+]$ of a solution with a pH of 4.3?

Warm-Up

1. What is the pH of a 10^{-6} M solution of HCl? What is the pOH?

2. What is the pH of a 0.001 M solution of HNO_3?

3. Complete the reaction below:

   HCl + KOH → _____ + _____

Friday, April 28, 2017

Today:

W-up, Notes & Practice, Quiz

HW:

Neutralization

Alka-Seltzer -- What does it do?

Alkali (meaning an ionic salt of an alkali metal or alkaline earth metal element – e.g NaOH).

Check out Alka-Seltzer in water at zero-G.

Practice

What happens when you mix an acid and a base?

Demo

$$HC_2H_3O_2(aq) + NaHCO_3(aq) \rightarrow NaC_2H_3O_2(aq) + H_2CO_3(aq)$$

And then…

$$H_2CO_3(aq) \rightarrow CO_2(aq) + H_2O(l)$$

Neutralization Reactions

When a **strong** acid and **strong** base react the products are a salt and water.

$$HCl_{(aq)} + NaOH_{(aq)} \rightarrow H_2O_{(l)} + NaCl_{(aq)}$$

If I add one mole of HCl to one mole of NaOH, how many moles of H_2O are formed?

Neutralization Reactions

When a **strong** acid and **strong** base react the products are a salt and water.

$$H_2SO_{4(aq)} + Mg(OH)_{2(aq)} \rightarrow 2H_2O_{(l)} + MgSO_{4(aq)}$$

If I add one mole of H_2SO_4 to one mole of $Mg(OH)_2$, how many moles of $MgSO_4$ are formed?

Neutralization Reactions

What are several ways you can tell that a neutralization reaction has occurred?

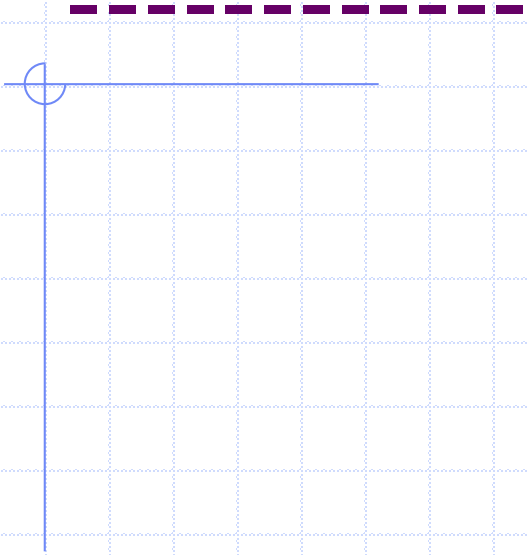
Practice

Write the balanced chemical equation for the neutralization of HCl with KOH.

$$HCl + KOH \rightarrow KCl_{(aq)} + H_2O_{(l)}$$

Write the balanced chemical equation for the neutralization of CH_3COOH with KOH.

$$CH_3COOH + KOH \rightleftharpoons CH_3COOK_{(aq)} + H_2O_{(l)}$$



Titration

A technique used to determine the concentration of a solute in a solution.

With acid-base titrations we are trying to determine the molarity of an unknown acid or base solution.

Neutralization Reactions

When a **strong** acid and **strong** base react the products are a salt and water.

$$HCl_{(aq)} + NaOH_{(aq)} \rightarrow H_2O_{(l)} + NaCl_{(aq)}$$

It takes 50mL of a 0.1 M HCl solution to neutralize a NaOH solution.

How many moles of NaOH are present?

Neutralization Reactions

When a **strong** acid and **strong** base react the products are a salt and water.

$$HCl_{(aq)} + NaOH_{(aq)} \rightarrow H_2O_{(l)} + NaCl_{(aq)}$$

It takes 50mL a 0.1 M HCl solution to neutralize a 100mL NaOH solution.

What is the molarity of the NaOH solution?

Neutralization Reactions: Practice

When 42.5mL of 1.03M NaOH is added to 50.0mL of vinegar (acetic acid), the indicator changes color.

$CH_3COOH_{(aq)} + NaOH_{(aq)} \rightarrow H_2O_{(l)} + CH_3COONa_{(aq)}$

What is the concentration of acetic acid in vinegar?

(Hint: find the moles NaOH added, use the balanced equation to find moles CH_3COOH, find molarity.)

Answer: 0.876 M

Neutralization Reactions: Practice

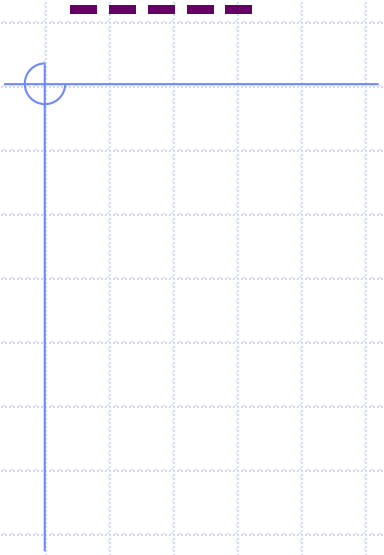
1. It takes 11.1 mL of 0.748M NaOH to neutralize a 10.0 mL sample of vinegar. What is the concentration of the vinegar?

$CH_3COOH_{(aq)} + NaOH_{(aq)} \rightarrow H_2O_{(l)} + CH_3COONa_{(aq)}$

Answer: 0.830 M

2. What is the concentration of NH_3 in household ammonia if 48.25mL of 0.5284M HCl is needed to neutralize 22.00mL of the ammonia?

Answer: 1.151 M



Titration

Key terms:

Burette

Equivalence point

Indicator

Neutralization

Titration

Known and Unknown Solutions

$M_1V_1=M_2V_2$

Titration

As I perform the titration, write down each of the main steps in your notes.

Titration

Data Table

Trial #	0.1M HCl (mL)	NaOH (mL)
1		10.0 mL
2		10.0 mL
Average		10.0 mL

What is the molarity of the NaOH solution?