SAI International School
Lesson Notes
Subject - Chemistry
Ch-Acids, Bases & Salts
Topic-Properties of Acids & Bases
Module -9 Dt_/04/2020

Suggested Videos-

1.https://youtu.be/QZfgg4MrnRw
-- Physical properties, Strong & weak acids & bases.

To be done in CW Copy-

A. Properties of Acids and Bases may be studied under two categories:

PHYSICAL PROPERTIES CHEMICAL PROPERTIES

1. **Taste**
2. **Touch**
3. **Effect on litmus**

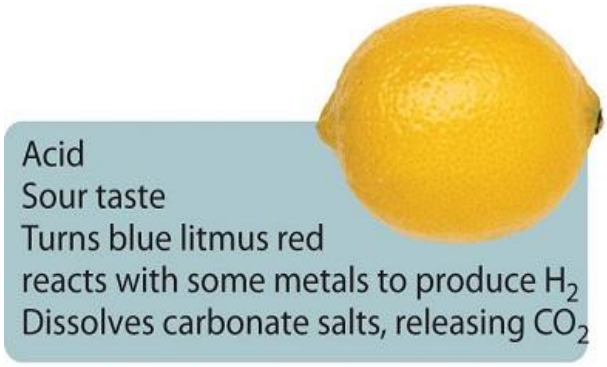
1. Reaction with –
a. Metals
b. Metal oxides
c. Bases/Acids
d. Metal carbonates/Bicarbonates
e. Non-metallic oxides

PHYSICAL PROPERTIES

ACIDS BASES

1. Sour to taste
2. Corrosive to touch
3. Turns litmus RED

1. Bitter to taste
2. Slippery to touch
3. Turns Litmus BLUE



CHEMICAL PROPERTIES

ACIDS BASES

Reaction with-	Acids (Dilute)	Bases
1.Metals (M)	Acid + Metal → Salt + H_2 Exception- Metals below Hydrogen in the reactivity series do not react with Acids to liberate H_2 gas.	Base + Metal → no reaction Exception- Metals like Zn, Al & Pb react with Bases to liberate H_2 gas.
2. Metal Oxides (MO)	Acid + MO → Salt + H_2O	Base + MO → no reaction Exception- Metals like ZnO, Al_2O_3&PbO react with Bases to liberate H_2O.
3.Base/Acid	Acid + Base → Salt + H_2O	Base + Acid → Salt + H_2O
4.Metal-Carbonate (MCO_3)	Acid + MCO_3 → Salt + H_2O + CO_2	Base + MCO_3 → no reaction.
5.Metal Bi Carbonate ($MHCO_3$)	Acid + $MHCO_3$ → Salt + H_2O + CO_2	Base + $MHCO_3$ → no reaction.
6.Non-Metallic Oxide (NMO)	Acid + NMO → no reaction	Base + NMO → Salt + H_2O

EXAMPLES-

1. **Reactions of ACIDS-**

Reaction with-	REACTIONS -
1.Metals (M)	1. $2HCl + Mg \rightarrow MgCl_2 + H_2$ 2. $H_2SO_4 + Zn \rightarrow ZnSO_4 + H_2$ 3. $CH_3COOH + Na \rightarrow CH_3COONa + H_2$ 4. $Cu + H_2SO_4 \rightarrow$ No reaction (Cu<H)
2. Metal Oxides (MO)	1. $HCl + CaO \rightarrow CaCl_2 + H_2O$ 2. $H_2SO_4 + CuO \rightarrow CuSO_4 + H_2O$ 3. $HNO_3 + ZnO \rightarrow Zn(NO_3)_2 + H_2O$
3.Base-**Neutralisation Reaction**	1. $HCl + NaOH \rightarrow NaCl + H_2O$ 2. $H_2SO_4 + KOH \rightarrow K_2SO_4 + H2O$ 3. $CH_3COOH + Ca(OH)_2 \rightarrow (CH_3COO)_2Ca + H_2O$
4.Metal-Carbonate (MCO_3)	1. $HCl + Na_2CO_3 \rightarrow NaCl + H_2O + CO_2$ 2. $H_2SO_4 + MgCO_3 \rightarrow MgSO_4 + H_2O + CO_2$ 3. $HNO_3 + ZnCO_3 \rightarrow Zn(NO_3)_2 + H_2O\ CO_2$
5.Metal Bi Carbonate ($MHCO_3$)	1. $HCl + NaHCO_3 \rightarrow NaCl + H_2O + CO_2$ 2. $H_2SO_4 + Mg(HCO_3)_2 \rightarrow MgSO_4 + H_2O + CO_2$ 3. $HNO_3 + Zn(HCO_3)_2 \rightarrow Zn(NO_3)_2 + H_2O\ CO_2$
6.Non-Metallic	1. HCl + CO2 → No reaction.

Oxide (NMO)	2. H_2SO_4 + NO_2 → No reaction.

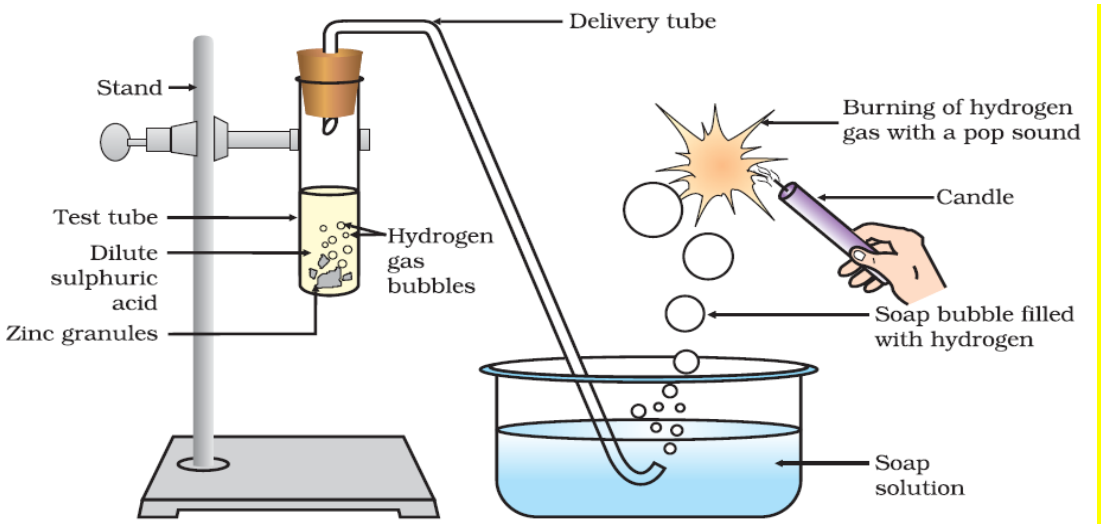


Figure 2.1 *Reaction of zinc granules with dilute sulphuric acid and testing hydrogen gas by burning*

Table 4.6 Activity Series of the Elements

React vigorously with acidic solutions and water to give H_2	Li, K, Ba, Ca, Na
React with acids to give H_2	Mg, Al, Zn, Cr, Fe, Cd, Co, Ni, Sn, Pb
Do not react with acids to give H_2*	H_2, Cu, Hg, Ag, Au

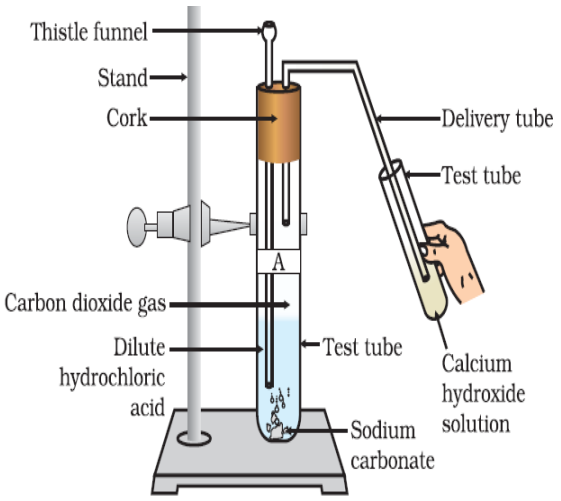


Figure 2.2
Passing carbon dioxide gas through calcium hydroxide solution

The reactions occurr

Reaction of dil. Acids with metals as per reactivity series of Metals

Reaction of Sodium Carbonate with dil.acid & test for CO2 gas.

2. https://youtu.be/2dwQu32Pq3Q **-MCO3 + A → CO2 (lime water)**

TEST FOR THE PRESENCE OF -

1. **Hydrogen Gas**- When a **burning splinter** is brought near the **mouth** of the **tube liberating Hydrogen gas**, it **burns with a pop sound** and the **flame gets extinguished.**

2. **Carbon-dioxide gas-**When the gas is passed through **lime water, it turns milky** due to the formation **insoluble calcium carbonate.**

   On passing **excess of CO2** through **lime water, the milky ness disappears** due to the formationof **soluble Calcium bi carbonate.**

$$\underset{\text{Calcium hydroxide}}{Ca(OH)_2(aq)} + \underset{\text{Carbon dioxide}}{CO_2(g)} \longrightarrow \underset{\text{(Milky)}}{\underset{\text{Calcium carbonate}}{CaCO_3(aq)}} + \underset{\text{Water}}{H_2O(g)}$$

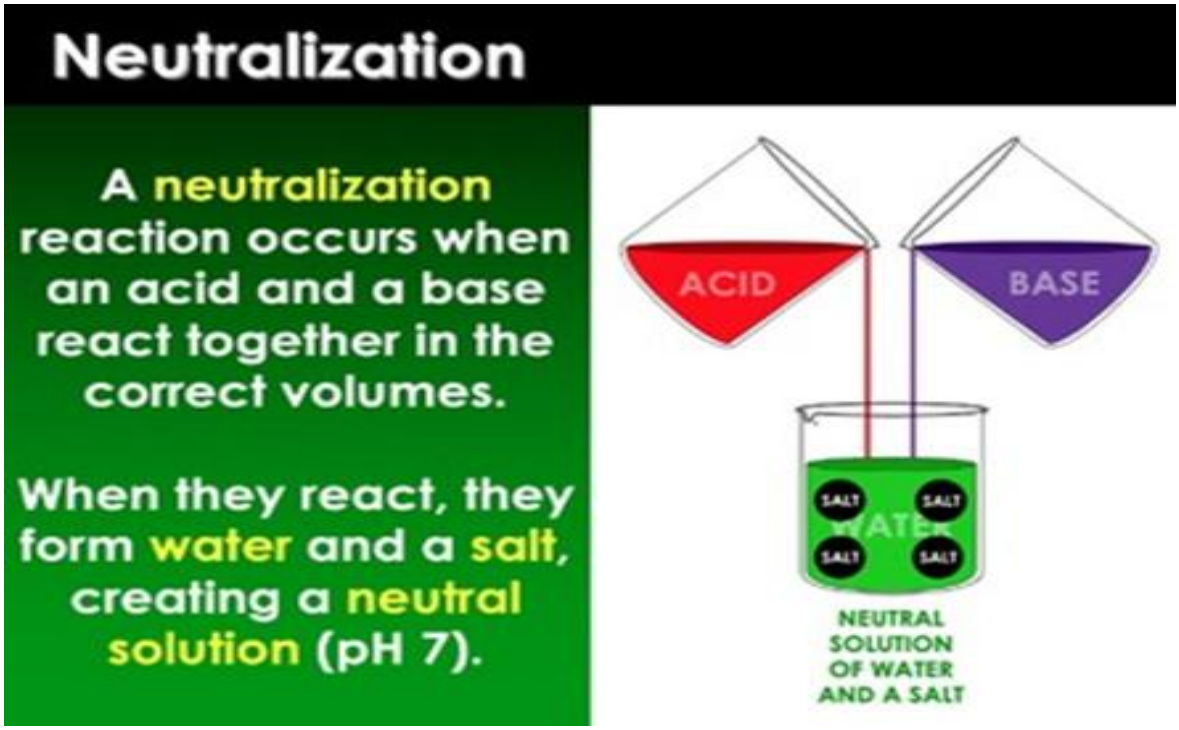
$$\underset{\text{Calcium carbonate}}{CaCO_3(s)} + \underset{\text{Carbon dioxide}}{CO_2(g)} + \underset{\text{Water}}{H_2O(l)} \longrightarrow \underset{\text{carbonate}}{\underset{\text{Calcium hydrogen}}{Ca(HCO_3)_2(aq)}}$$

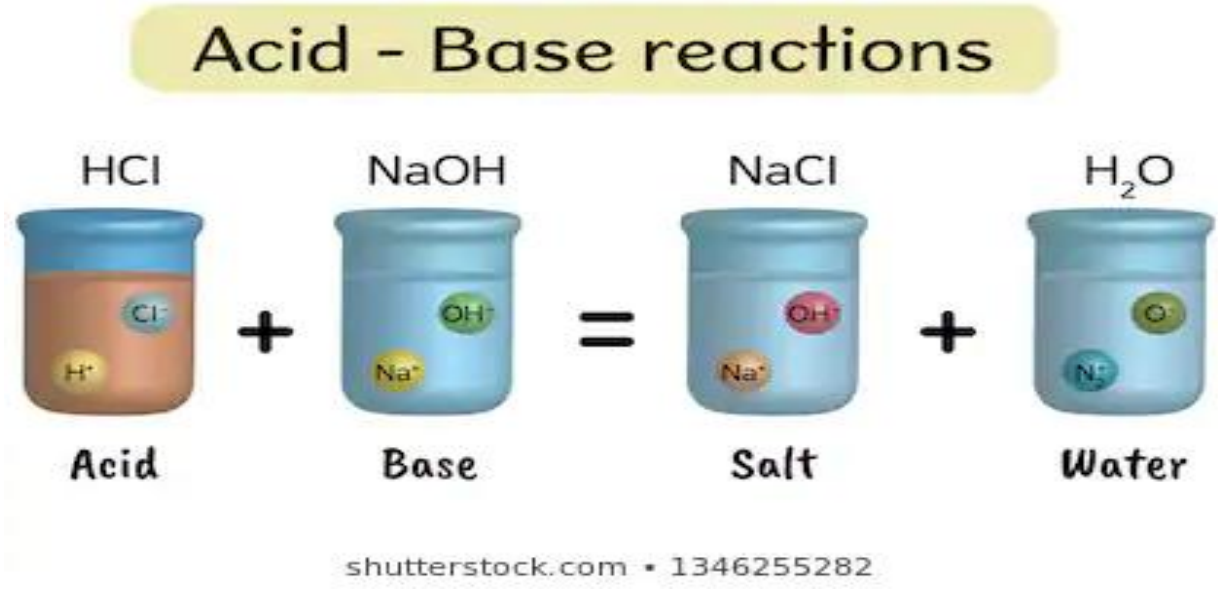
1. **Reactions of BASES-**

Reaction with-	**REACTIONS**
1.Metals (M)	1. $2NaOH + Zn \rightarrow \underset{\text{(sodium zincate)}}{Na_2ZnO_2} + H_2$ 2. $2NaOH + 2Al + 2H_2O \rightarrow \underset{\text{(sodium aluminate)}}{2NaAlO_2} + 3H_2$
2. Metal Oxides (MO)	1. $2NaOH + ZnO \rightarrow \underset{\text{(sodium zincate)}}{Na_2ZnO_2} + H_2O$ 2. $2NaOH + Al_2O_3 \rightarrow \underset{\text{(sodium aluminate)}}{2NaAlO_2} + H_2O$
3. Acid- **Neutralisation Reaction**	1. $HCl + NaOH \rightarrow NaCl + H_2O$ 2. $H_2SO_4 + KOH \rightarrow K_2SO_4 + H2O$ 3. $CH_3COOH + Ca(OH)_2 \rightarrow \underset{\text{(Ca-acetate)}}{(CH_3COO)_2Ca} + H_2O$
4.Non-Metallic Oxide (NMO)	1. $NaOH + SO_2 \rightarrow \underset{\text{(Na-sulphite)}}{Na_2SO_3} + H_2O$ 2. $Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$

2. https://youtu.be/VIe3zbV1Gck

Practical Chemical properties of Acids & bases.





Assessment

MCQs

Q.1	If a few drops of a concentrated acid accidentally spills over the hand of a student, what should be done? (a) Wash the hand with saline solution (b) Wash the hand immediately with plenty of water and apply a paste of sodium hydrogen carbonate

	(c) After washing with plenty of water apply solution of sodium hydroxide on the hand (d) Neutralise the acid with a strong alkali
Q.2	Which of the following phenomena occur, when a small amount of acid is added to water? (i) Ionisation (ii) Neutralisation (iii) Dilution (iv) Salt formation
Q.3	A solution reacts with crushed egg-shells to give a gas that turns lime-water milky. The solution contains (a) NaCl (b) HCl (c) LiCl (d) KCl

- For Assertion& Reason question follow the following directions.

DIRECTION: Each of these questions contains an Assertion followed by Reason. Read them carefully and answer the question on the basis of following options. You have to select the one that best describes the two statements.

(a) If both Assertion and Reason are correct and Reason is the correct explanation of Assertion.

(b) If both Assertion and Reason are correct, but Reason is not the correct explanation of Assertion.

(c) If Assertion is correct but Reason is incorrect.

(d) If Assertion is incorrect but Reason is correct.

(e) If Assertion & Reason both are incorrect.

Q.4	Assertion: Sodium hydroxide reacts with zinc to produce hydrogen gas. Reason: Acids reacts with active metals to produce hydrogen gas.
Q.5	Assertion: Salts are the products of an acid-base reaction. Reason : Salt may be acidic or basic.

Home assignment

S.L No.	Questions	Mark	Skill
Q.1	What happens when basic oxides, like, Na2O or K2O are dissolved in water ? Write balanced chemical equation.	1	R
Q.2	State T/F: When a base reacts with a metal, along with the evolution of hydrogen gas a salt is formed which has a positive ion composed of the metal and oxygen.	1	u
Q.3	(i)Name the gas which is liberated when an acid reacts with a metal? How will	3	R+A

	you test the presence of this gas ? (ii) Write the chemical equation for the reaction of zinc metal with (a) hydrochloric acid and (b) with sodium hydroxide. Write the chemical name of salt obtained in each case. (iii)Identify the acid and base for ammonium chloride salt. What would be the nature of this salt ? Mention the pH range of this salt.		
Q.4	State reason for the following : (i) Acids do not show acidic behaviour in the absence of water but aqueous solution of an acid conducts electricity. (ii) Distilled water does not conduct electricity whereas rain water does. (iii) Pickles and other sour food stuffs should not be kept in copper and brass vessels.	3	U+A
Q.5	In an activity to investigate whether all compounds containing hydrogen are acidic. (a) Draw a well labelled experimental set – up for the activity – (b) State what is observed giving reasons for the following when : (i) Current is passed through dilute hydrochloric acid in the beaker. (ii) Current is passed through glucose and alcohol solutions in the beaker.	5	HOT