

SAI International School
Lesson Notes
Subject - Chemistry
Ch-Acids, Bases & Salts
Topic-Presence of Hydrogen in Acids & Bases
Module - 10 Dt_/04/2020

Suggested Videos- 1. <https://youtu.be/t5eUOXm-wiE>
Hydronium & Hydroxyl ions & pH

To be done in CW Copy-

➤ **WHAT DO ALL ACIDS AND ALL BASES HAVE IN COMMON-**

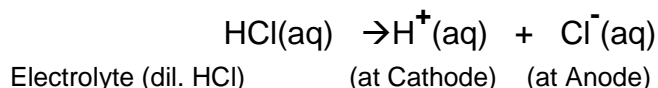
- Every **Acid** liberates H_3O^+ (**Hydronium**) **ion** in aqueous medium.
- Every **Base** liberates $(\text{OH})^-$ (**Hydroxyl**) **ions** in aqueous medium.

as per Arrhenius concept.

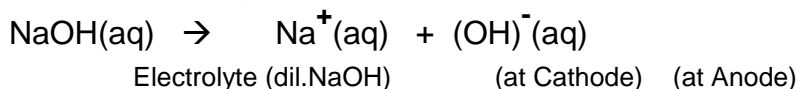
Hence **all Acids and Bases** have **Hydrogen atoms in common.**

Activity to show the presence of hydrogen in Acids & Bases-
(Refer to Activity 2.8, figure- 2.3, page-22& Video number 4)

Reactions during electrolysis of dil. HCl-



Reactions during electrolysis of dil. NaOH-



In both the cases, **acids & bases** act as **electrolytes** and **liberation of ions** [H^+ & $(\text{OH})^-$] takes place.

Thus, in the above activity, it is observed that the **bulb glows in both the cases.**

This shows the presence of **Hydrogen** in both – **Dilute HCl as H^+ ion &**

– Dilute NaOH as $(\text{OH})^-$ ion.

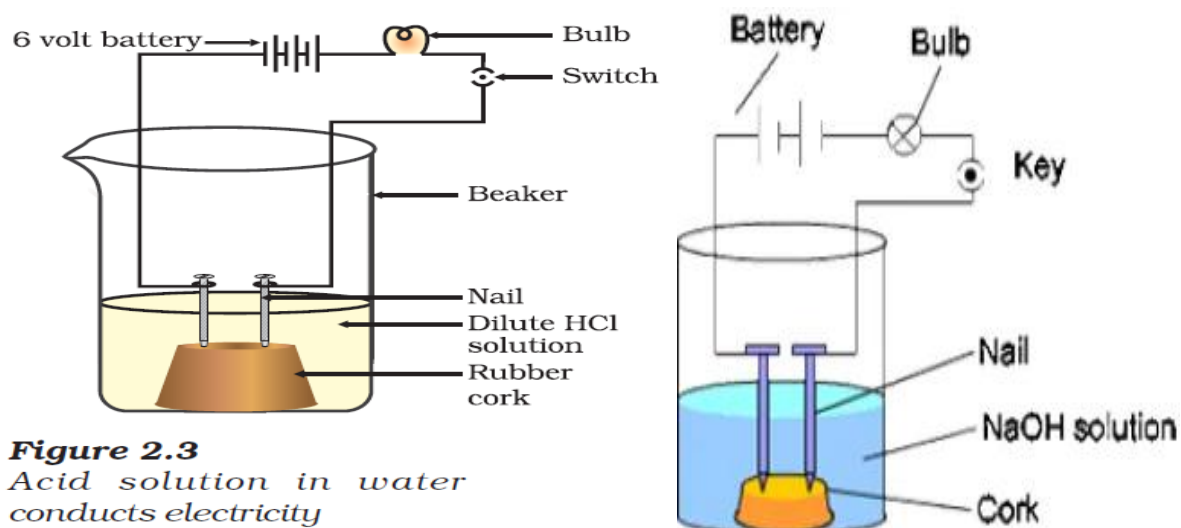
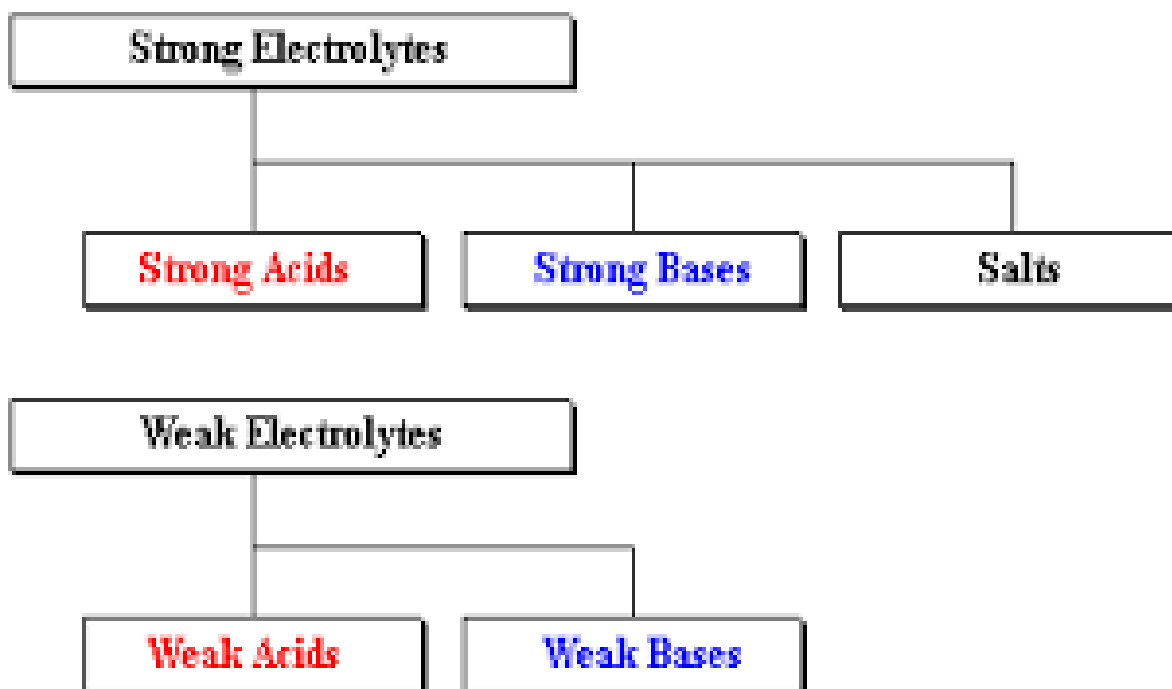


Figure 2.3
*Acid solution in water
 conducts electricity*

Electrolysis of dil. HCl Electrolysis of dil. NaOH

2. <https://youtu.be/hcCPUA5In8>

- Electrolysis of Dilute Acids & Bases.



➤ What Happens to an Acid or a Base in a Water Solution?

- As discussed earlier, Acids and Bases liberate $H^+/(OH)^-$ in their aqueous medium. Hence they show their acidic/ basic properties.
- On the contrary, in their dehydrated conditions, acids/bases do not liberate any $H^+/(OH)^-$ ions. Hence they do not behave as acids/bases respectively.

In Acids-Example :

Activity to show the absence of H^+ ions in absence of moisture-

(Refer to Activity 2.9, figure- 2.4, page-23)

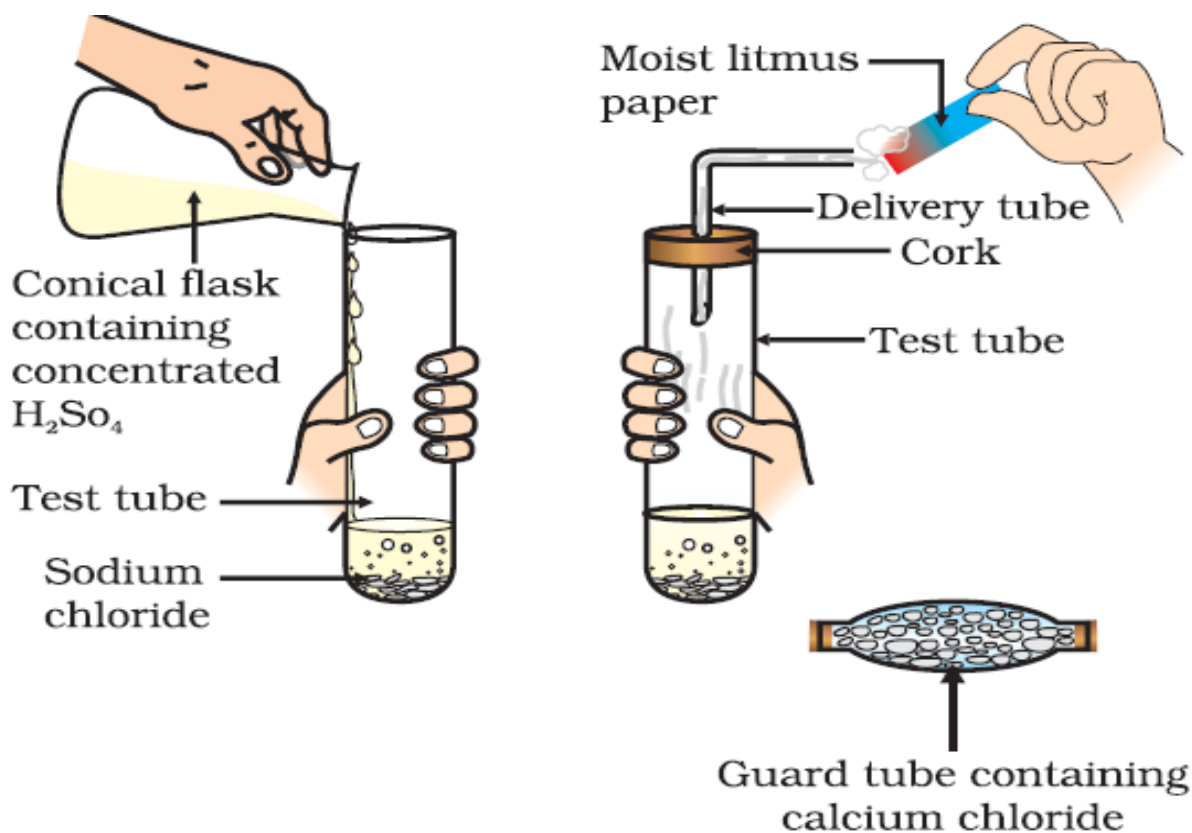
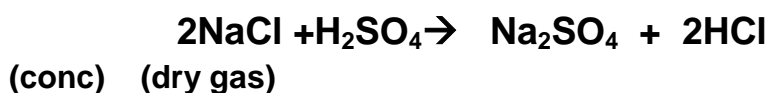


Figure 2.4 Preparation of HCl gas



HCl (dry) + Dry Blue litmus \rightarrow No colour change.

HCl (dry) + Moist Blue litmus \rightarrow Colour changes to Red.

1. The HCl gas liberated here is in its **dehydrated (dry) form** and **does not have H^+ ions**. So it **does not show any acidic behavior**.
Hence the **colour of dry blue litmus paper does not change**.
2. In presence of **moist blue litmus paper**, the dry HCl gas **dissolves in the moisture present in litmus paper to form aqueous HCl and liberate H^+ ion**.
Hence the **colour of the moist blue litmus paper changes to red**.

In Bases- Example :

Let's take the example of aqueous ammonium hydroxide (NH₄OH)-

NH₃(dry)+ Dry Red litmus paper → No colour change.
(ammonia)

NH₃ (dry) + Moist Red litmus paper → Colour changes to Blue.
(ammonia)

NH₃(dry) + H₂O → NH₄OH(aq)
(ammonium) (base)

1. Dry ammonia does not have any (OH)⁻ ions and hence does not show any basic properties.

Hence dry ammonia does not change the colour of dry red litmus paper.

2. Dry ammonia reacts with moisture present in moist red litmus paper, to form Ammonium hydroxide, which contains (OH)⁻ ions and shows basic properties.

Hence the colour of moist red litmus paper changes to blue



Bases generate hydroxide (OH⁻) ions in water. Bases which are soluble in water are called alkalis.

All Alkalis are BASES but all bases are not ALKALIS

Assessment

MCQs

Q.1	<p>When NaOH and HCl are mixed in equal molar quantities, the result is</p> <p>(a) the formation of salt + H₂O (b) the formation of salt + H₂(g)</p> <p>(c) the formation of salt + O₂(g) (d) All above are correct</p> <p>Ans : (a) the formation of salt + H₂O</p> <p>When NaOH and HCl are mixed in equal molar quantities, acid-base reaction takes place and we get salt (NaCl) and water.</p> <p>$\text{NaOH} + \text{HCl} \longrightarrow \text{NaCl} + \text{H}_2\text{O}$</p>
Q.2	<p>Aqueous solution of copper sulphate reacts with aqueous ammonium hydroxide solution to give.</p> <p>(a) brown precipitate (b) pale blue precipitate (c) white precipitate (d) green precipitate</p> <p>Ans : (b) pale blue precipitate</p> <p>$\text{CuSO}_4(\text{aq}) + 2\text{NH}_4\text{OH}(\text{aq}) \longrightarrow \text{Cu}(\text{OH})_2(\text{s}) + (\text{NH}_4)_2\text{SO}_4(\text{s})$ When aqueous solution of copper sulphate react with aqueous ammonium hydroxide solution, then pale blue precipitate of Cu (OH)₂ are formed.</p>
Q.3	<p>Which of the following is acidic in nature-</p> <p>(a) apple juice (b) soap solution</p> <p>(c) slaked lime (d) lime</p> <p>Ans : (a) apple juice</p>
<p>➤ For Assertion & Reason question follow the following directions.</p> <p>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.</p> <p>(a) If both Assertion and Reason are correct and Reason is the correct explanation of Assertion.</p> <p>(b) If both Assertion and Reason are correct, but Reason is not the correct explanation of Assertion.</p> <p>(c) If Assertion is correct but Reason is incorrect.</p> <p>(d) If Assertion is incorrect but Reason is correct.</p> <p>(e) If Assertion & Reason both are incorrect.</p>	
Q.4	<p>The strength of acids and bases depends on the number of ions produced respectively when dissolved in water. Acids like HClO₄ which dissociate almost completely in water are called acids.</p>

	Ans : hydrogen, hydroxide, strong
Q.5	<p>Assertion: Weak acids have low electrical conductivity.</p> <p>Reason: Strong acids and weak acids have equal concentration of hydrogen ions in their solutions.</p> <p>Ans : (c) Assertion (A) is true but reason (R) is false.</p>

Home assignment

S.L No.	Questions	Mark	Skill
Q.1	<p>The strength of acids and bases depends on the number of ions and ions produced respectively when dissolved in water. Acids like HClO_4 which dissociate almost completely in water are called acids.</p> <p>Ans : hydrogen, hydroxide, strong</p>	1	R
Q.2	<p>..... is a natural indicator whereas is a synthetic indicator. A indicator is a mixture of several indicators.</p> <p>Ans : Litmus, phenolphthalein, universal</p>	1	u
Q.3	<p>A metal compound 'A' reacts with dilute hydrochloric acid to produce effervescence. The gas evolved extinguishes a burning candle. Write a balanced chemical equation for the reaction if one of the compound formed is magnesium chloride.</p>	3	R+A
Q.4	<p>Give reasons :</p> <ul style="list-style-type: none"> Acid must be added to water and not vice versa during dilution. Solution of sulphuric acid conducts electricity whereas alcohol does not. Dry ammonia gas has no action on litmus paper but a solution of ammonia in water turns red litmus paper blue. <p>Ans-(a) Mixing of acid and water during dilution is an exothermic reaction. So if water is added to acid, lots of heat energy is released which may cause accidents</p> <p>(b) Sulphuric acid dissociates into ions in the solution but alcohol does not</p> <p>(c) Solution of ammonia in water produces OH^- ions which makes the solution basic and turns red litmus blue.</p>	3	U+A
Q.5	<p>(a) Illustrate an activity to investigate whether all compounds containing hydrogen are acidic.</p> <p>(b) What happens when hydrochloric acid and sodium hydroxide are dissolved in water. Explain giving equation of each.</p> <p>Ans: (a) Take aqueous solutions of glucose ($\text{C}_6\text{H}_{12}\text{O}_6$) and ethyl alcohol ($\text{C}_2\text{H}_5\text{OH}$) and test for electrical conductivity. Both the solutions do not conduct electricity. Test with blue litmus paper</p>	5	HOT

	both of them will not turn blue litmus red.		
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