Acids, Bases & Salts

1. What is an acid? How are acids formed?

A) i. Substance which produces H^+ (hydrogen ion) ions in aqueous solution is called an acid.

ii. Substance which is sour in taste and turn blue litmus into red is called an acid.

iii. Generally acids are formed by the reaction between non- metal oxide and water.

iv. Non- metal + Oxygen ----------> Non- metal oxide

Non- metal oxide + water ------> Acid

v. Example:

a) $S + O_2$ ----------> SO_2

$SO_2 + H_2O$ ------> H_2SO_3 (Sulphurus acid)

b) $C + O_2$ ---------> CO_2

$CO_2 + H_2O$ ----> H_2CO_3 (Carbonic acid)

NOTE: Non- metal oxides are acidic in nature.

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2. What is a base? How bases are formed?

A) i. A substance which produces OH^- (hydroxide ion) in aqueous solution is called a base.

ii. Substance which is bitter in taste and soapy to touch is called a base.

iii. Generally bases are formed by reaction between metal oxide and water

iv. Metal + Oxygen --------> Metal oxide

Metal oxide + water ------> Base

v. EXAMPLE:

a) $4\ Na + O_2$ ----> $2\ Na_2O$

$Na_2O + H_2O$ -----> $2\ NaOH$ (Sodium hydroxide)

b) $2\ Mg + H_2O$ -----> $2MgO$

$MgO + H_2O$ ----> $Mg(OH)_2$ (Magnesium hydroxide)

NOTE:

1.Metal oxides are basic in nature

2. Water soluble bases are called alkali

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3. Write a short note on indicators.

A) i. Substances which are used to determine the given solution is an acid or a base by change in their colours or change in their smell.

ii. Generally indicators are natural and artificial

iii. Indicators are obtained from the plants and trees are called natural indicators.

Ex: Litmus, turmeric, clove oil, onion, extract of red cabbage and beetroot etc

iv. Manmade indicators by using chemicals in laboratory are called synthetic or artificial indicators.

Ex: phenolphthalein, methyl orange and pH paper etc

v. Substances which are using to determine the given solution is an acid or a base by change in their smell are called olfactory indicators.

Ex: Onion, clove oil and vanilla extract.

4. Prepare a table of indicators to determine acids and bases.

A)

Sl. No	Indicator	Acid	Base	Neutral Substance
1.	Blue Litmus	Red	No change in colour	No change in colour
2.	Red Litmus	No change in colour	Blue	No change in colour
3.	Phenolphthalein (Colour less solution)	No change in colour	Pink	No change in colour
4.	Methyl Orange solution (Orange colour)	Red	Yellow	No change in colour
5.	pH paper (Green)	Red	Violet	No change in colour

5. Why do curry stains on table cloth become red when they are washed with soaps?

A) i. Turmeric is a natural indicator which turns red in the presence of base.

ii. Soap is a basic salt

iii. A curry stain turns red when washing with soap because of the turmeric present in curry.

6. You have been provided three test tubes one of them contains distilled water and the other two contain acidic and basic solution respectively. If you are given only red litmus, how can you identify the contents in the given test tubes?

A) i. We know that red litmus turns into blue in base, that's why initially to identify the base by dipping red litmus in the solutions in three test tubes.

ii. In which test tube red litmus turns into the blue, that is a base.

iii. Now red litmus which is turned into blue behaves as blue litmus, with this identify the acid by dipping solutions into another two test tubes.

iv. In which test tube blue litmus turns into red is acid.

v. The solution in the other test tube is neutral like distilled water.

7. Explain the reaction between metals and acids with an activity.

A) **Aim**: To study the reaction between metals and acids

Apparatus: Stand, test tube, one holed rubber stopper, gas delivery tube, glass trough, soap water, burning splinter, zinc granules, hydro chloric acid

Diagram:

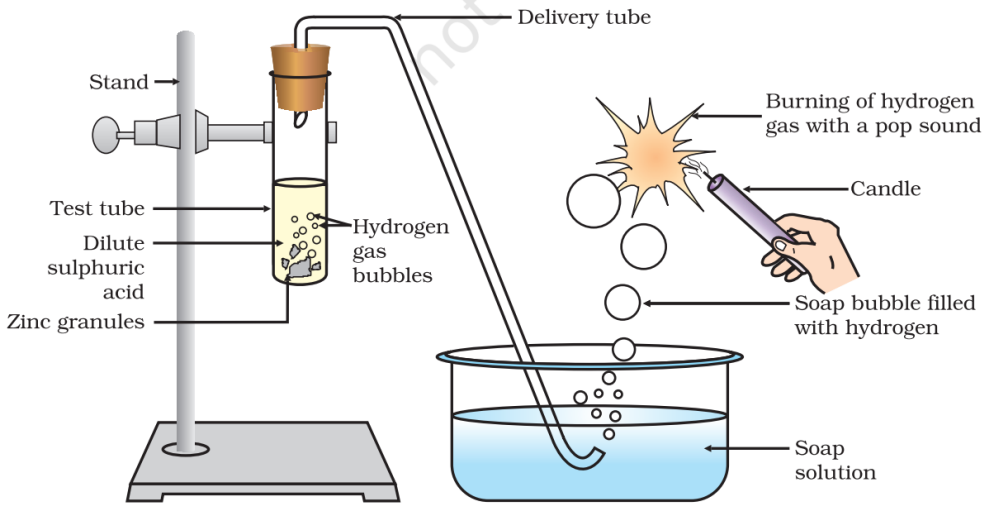

Figure 2.1 *Reaction of zinc granules with dilute sulphuric acid and testing hydrogen gas by burning*

Procedure:

i. Now take some zinc granules in a test tube and add 5ml of hydro chloric acid then close it with a single holed rubber stopper.

ii. Then arrange the apparatus as shown in the figure.

Observation:

After a few minutes some gas bubbles are raised into the air by liberation of a gas due to a chemical reaction.

Test of liberated gas:

i. Place a burning splinter near the soap bubble, we are observed that the burning splinter is put off with a pop sound.

ii. Therefore, the evolved gas is hydrogen gas.

Chemical Equation:

$Zn + 2\ HCl$ -------> $ZnCl_2 + H_2$

Conclusion:

Hydrogen gas is liberated due to the reaction between metals and acids

METAL + ACID ---------> SALT + HYDROGEN GAS

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8. Why don't we prefer to store pickle and sour like substances in metal containers?

A) i. Pickles and sour substances are not stored in metal containers

ii. Because the acids present in them react with the metal, and produce harmful compounds that can contaminate the food and pose a health risk.

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9. Do metals react with bases? Explain

A. i. Very few of the metals like zinc, aluminium etc. are react with bases called as amphoteric metals

ii. Example:

$2NaOH(aq) + Zn(s) \text{ -----> } Na_2ZnO_2$ (sodium zincate) $+ H_2$

NOTE:

BASE + METAL ---------> SALT + HYDROGEN GAS

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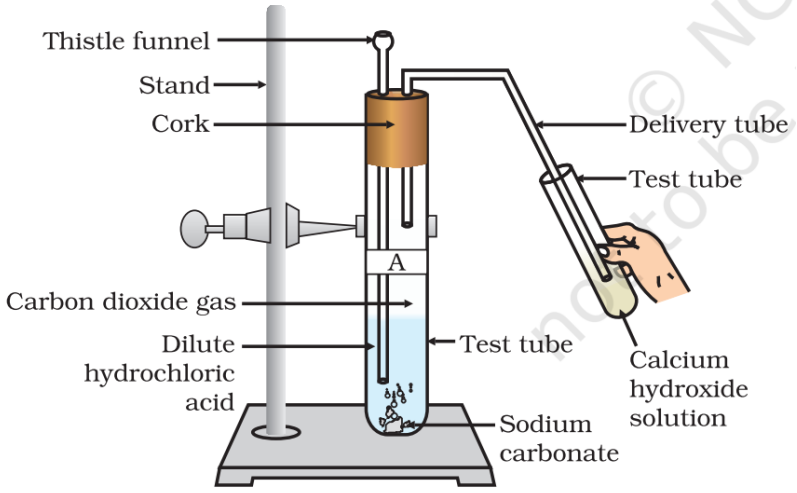
10. Explain the chemical reaction between acids and carbonates

A) **Aim:** To study the reaction between acids and carbonates

Apparatus: Test tubes, stands, double holed rubber stoppers, gas delivery tubes, thistle funnels

Chemicals: Sulphuric acid (H_2SO_4), sodium carbonate (Na_2CO_3), sodium hydrogen carbonate ($NaHCO_3$)

Diagram:



Passing Carbon dioxide gas through Calcium hydroxide solution

Procedure:

i. Take two test tubes and label them as A and B

ii. Take about 0.5g of sodium carbonate in test tube A and 0.5g of sodium hydrogen carbonate in test tube B

iii. Now arrange the apparatus as shown in the figure.

iv. Add about 2ml of dilute Sulphuric acid to both the test tubes.

v. Now place second end of gas delivery tubes into the two test tubes containing lime water

Observation:

We are observed that lime water turns into milky, that is in this reaction the liberated gas is carbon dioxide.

Chemical Equations:

Test Tube – A:

$H_2SO_4 + Na_2CO_3$ ----------> $Na_2SO_4 + H_2O + CO_2$

Test Tube - B:

$H_2SO_4 + 2\ NaHCO_3$ ---------> $Na_2SO_4 + 2H_2O + 2CO_2$

Conclusion:

ACID + CARBONATE ----------> SALT + WATER + CARBON DIOXIDE

ACID + HYDROGEN CARBONATE ------> SALT + WATER + CARBON DIOXIDE

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11. Why does lime water turn into milky while allowing the carbon dioxide gas?

A) The carbon dioxide reacts with the calcium hydroxide in the lime water, forming a white precipitate of calcium carbonate, which makes the solution appear milky.

$Ca(OH)_2 + CO_2$ ----------> $CaCO_3$ (white ppt) + H_2O

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12. What happens if you allow the excess of carbon dioxide gas into lime water?

A) i. Initially lime water turns into milky due to the following reaction

$Ca(OH)_2 + CO_2$ ----------> $CaCO_3$ (white ppt) + H_2O

ii. When an excess of CO_2 is passed through this solution, however, the milky disappears due to the formation of colourless calcium bicarbonate ($Ca(HCO_3)_2$), which is water soluble

$CaCO_3 + H_2O + CO_2$ ----------> $Ca(HCO_3)_2$

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13. Why surface of wall tum into white while applying lime water (white wash)?

A) i. A solution of slaked lime is used for whitewashing walls.

ii. Calcium hydroxide reacts slowly with the carbon dioxide in the air to form a thin layer of calcium carbonate on the walls after two to three days of whitewashing and gives a shiny finish to the walls.

$Ca(OH)_2 + CO_2$ ----------> $CaCO_3$ (white ppt) + H_2O

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14. What is neutralisation reaction? Give examples

A) A chemical reaction between acid and base then produce salt and water is called neutralisation reaction.

ACID + BASE ---------> SALT + WATER

Example:

1. HCl + NaOH ----------> NaCl + H_2O
2. $H_2SO4 + Mg(OH)_2$ --------> $MgSO_4$ + 2 H_2O

NOTE: Neutralisation reaction is an example of exothermic reaction and double displacement reaction also

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15. What is heat of neutralisation?

A) The amount of heat released when an acid and a base react to form water and salt is called heat of neutralisation.

NOTE:

i. ACID + METAL OXIDE ---------> SALT + WATER

Ex: $2HCl + CuO \text{ --------> } CuCl_2 + H_2O$

Metal oxides are basic in nature

ii. BASE + NON- METAL OXIDE ---------> SALT + WATER

$Ca(OH)_2 + CO_2 \text{ ----------> } CaCO_3 + H_2O$

Non- metal oxides are acidic in nature

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16. Why do all acids possess similar chemical properties? Explain with an activity **(OR)**
Explain electrical conductivity of acidic solutions with an activity.

A) **Aim:** To study about the electrical conductivity of acidic solutions

Apparatus: Glass beaker, rubber cork, graphite rods, 9v cell, connecting wires, switch,bulb, distilled water, different acids like HCl, H2SO4, HNO3 etc

Diagram:

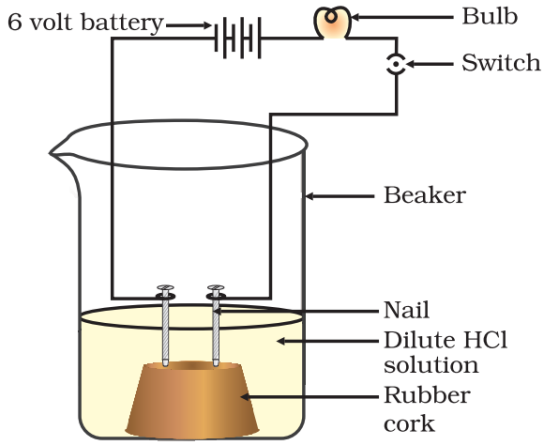

Figure 2.3
Acid solution in water conducts electricity

Procedure:

i. Take a glass beaker and arrange the circuit as shown in the figure with above listed apparatus.

ii. Now pour some distilled water in the beaker then switch on the circuit.

iii. We know that distilled water is a bad conductor of electricity, hence the bulb in the circuit doesn't glow.

iv. Now add some hydro chloric acid (HCl) to the distilled water then observe the circuit.

v. Repeat the experiment with some other acids.

Observation:

We are observed that the bulb glow in all aqueous solution of acids

Explanation:

1. Distilled water has no ions so it doesn't conduct electricity.
2. Acidic solutions conduct electricity because they possess ions in aqueous solutions.
3. The ions produced by some acids in aqueous solutions as follows

A) HCl --------> $H^+ + Cl^-$

B) H_2SO_4 -------> $2\ H^+ + SO_4^{2-}$

4. All acids possess H^+ ions in their aqueous solutions

Conclusion:

All acids show similar chemical properties due to presence of H^+ ions.

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17. What do all bases have common?

A) All bases have commonly OH^- ions in their aqueous solutions hence all bases possess similar chemical properties.

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18. Why do HCl, HNO_3 etc show acidic character in aqueous solutions, but aqueous solutions of compounds like glucose, alcohol etc doesn't show acidic character?

A) Aqueous solutions of acids produce H^+ ions whereas aqueous solutions of glucose, alcohol etc doesn't produce H^+ ions, so they don't show acidic character.

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19. What is an alkali? Give examples.

A) Water soluble base is called an alkali.

Ex: NaOH, KOH etc.

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20. How can you say H^+ ions are responsible for acidic nature of acids?

A) **Aim:** To study about H^+ ions are responsible for acidic nature of acids

Apparatus: Test tube, single holed rubber stopper, gas delivery tube, dry blue litmus paper, wet blue litmus paper.

Chemicals: Sodium Chloride (NaCl), Sulphuric Acid (H_2SO_4)

Diagram:

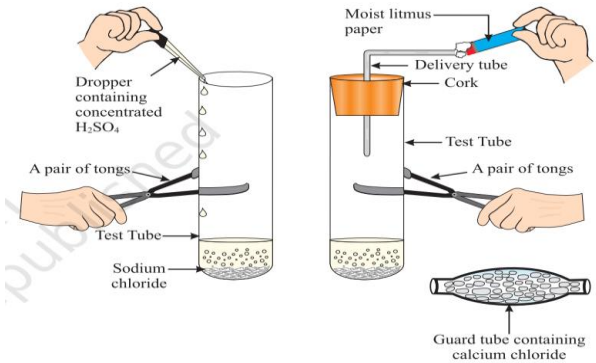

***Figure 2.4** Preparation of HCl gas*

Procedure:

i. Take 1 gram of common salt and some Sulphuric acid in a clean and dry test tube then close its open end with a single holed rubber stopper.

ii. Then place a gas delivery tube as shown in the figure.

iii. The following reaction existed in the test tube, then produce HCl gas.

$2\ NaCl + H_2SO_4 \text{ ----------> } Na_2SO_4 + 2HCl \uparrow$

Observation:

i. Expose HCl gas to the dry blue litmus paper. We are observed that no change in its colour.

ii. Now, Expose HCl gas to the wet blue litmus paper. We are observed that there is a change in blue litmus paper to red colour.

Explanation:

i. HCl gas doesn't change the colour of dry blue litmus paper to red colour, because of absence of H^+ ions in HCl gas.

ii. When HCl gas exposed to wet blue litmus paper, HCl gas dissolve water present in the litmus paper, then produce H^+ ions. That's why wet blue litmus turns into red.

Conclusion:

H^+ ions are responsible for acidic nature of acids

NOTE:

i. H^+ ion is also called a proton

ii. H^+ ions produce hydronium(H_3O^+) ions by reacting with water molecules

$H^+ + H_2O \text{ ----------> } H_3O^+$

iii. Actually hydronium ions are responsible for acidic nature of acids. Whereas conventionally says that H^+ ions are responsible for acidic nature.

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21. What is the use of guard tube using in experiments to produce gases like HCl?

A) The main use of a guard tube is to prevent moisture from entering the reaction vessel and to protect the chemicals involved in the experiment from being spoiled by air or water vapor.

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22. What is H^+ ion concentration

A) Number of H^+ ions present in unit volume of given solution is called H^+ ion concentration. Generally H^+ ion concentration is represented by $[H^+]$.

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23. What is dilution of acids and bases?

A) i. Decrease in H^+ ion concentration of an acid by adding water is called dilution of acids.

ii. Decrease in OH^- ion concentration of a base by adding water is called dilution of base.

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24. How can you dilute an acid? **(OR)** While diluting an acid, why is recommended that the acid should be added to water and not water to acid?

A) i. The process of dissolving an acid or a base in water is highly exothermic.

ii. Care must be taken while mixing concentrated acids with water.

iii. The acid must always be added slowly to water with constant stirring.

iv. If water is added to a concentrated acid the heat generated may cause the mixture to splash out and cause burns.

v. The glass container may also break due to excessive local heating.

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25. Why does an aqueous solution of an acid conducts electricity?

A) i. When an acid dissolves in water, produce H^+ ions and their corresponding negative ions.

ii. These ions are responsible for electrical conductivity of acidic solutions.

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26. Why does dry HCl gas not change the colour of the dry blue litmus paper, whereas acidic acid can do?

A) i. HCl gas doesn't change the colour of dry blue litmus paper to red colour, because of absence of H^+ ions in HCl gas.

ii. But HCl acid is in liquid state and contains H^+ ions. That's why blue litmus turns to red in colour.

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27. How is the concentration of Hydronium ions effected, when a solution of an acid is diluted?

A) The Hydronium ion concentration is decreases due to dilution. Hence, the strength of the acid decreases.

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28. How is the concentration of Hydroxide ions effected, when excess base is dissolved in a solution of sodium hydroxide (NaOH)?

A) Hydroxide ion (OH^-) concentration of solution is increases.

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29. Why should curd and sour substances not be kept in copper and brass vessels?

A) i. Curd and other sour substances contain acids

ii. Which can react with the metals of brass and copper vessels.

iii. So, they produce toxic metal compounds which can cause food poisoning and damage our health.

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30. Which gas is usually liberated when an acid reacts with a metal? Illustrate with the help of an example. How will you test the presence of this gas?

A) i. Hydrogen (H_2) gas is liberated due to the reaction between acids and metals.

ii. Examples:

$Mg + H_2SO_4$ ----------> $MgSO_4 + H_2$

$Fe + 2HCl$ ----------→ $FeCl_2 + H_2$

iii. Hydrogen gas put off a burning article with pop sound.

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31. Why does distilled water not conduct electricity, whereas rain water does?

A) i. Distilled water is purest form of water. So, it is having no impurities like salts, acids etc……

ii. That's why it is having no ions. Therefore, distilled water is a bad conductor of electricity.

iii. We know that, atmosphere is a mixture of several gasses. This also contains acidified gasses like Carbon dioxide (CO_2).

iv. When the rain water falls through the atmosphere, these acidified gasses dissolves in water and produce acids.

v. We know that acids produce H^+ ions in their aqueous solutions.

vi. So, rain water is a good conductor of electricity.

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32. Why do acids does not show acidic behavior in the absence of water?

A) i. Acids produces H^+ ions on dissolving in water.

ii. We know that H^+ ions are responsible for acidic nature of acids.

iii. In the absence of water, acids do not produce H^+ ions. Hence, they do not show acidic behavior.

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33. 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 compounds formed is calcium chloride.

A) i. The gas evolved in this reaction is CO_2

ii. We know that CO_2 gas is released due to the reaction between acids and carbonates.

iii. from the given information, the salt produced in this reaction is $CaCl_2$

iv. That is, the reaction occurred between $CaCO_3$ and HCl.

v. The reaction as follows

$$CaCO_3\ (s) + 2\ HCl\ (aq) \text{ ----------> } CaCl_2 + H_2O + CO_2$$

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34. What is pH scale?

A) A scale for measuring hydrogen ion concentration in a solution is called pH scale.

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35. Write a short note on pH scale.

A) i. pH scale is used to measure strength of an acid or a base with respect to presence of H^+ ion concentration of given solution.

ii. It is introduced by a German scientist Soren Sen.

iii. The 'p' in pH stands for potenz in German meaning 'power'

iv. The range of pH scale using to measure the strength of acid and base is 0 – 14.

v. The strength of given solution is estimated by the following

a. If pH is less than 7 (pH < 7): The solution is acidic in nature

b. if pH is equal to 7 (pH = 7): The solution is neutral in nature

c. if pH is greater than 7 (pH > 7): The solution is basic in nature.

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36. Write a short note on Universal Indicator.

A) i. It is a mixture of several indicators.

ii. It is helpful to identify not only the nature of given solution, but also helpful to find the pH value of the solution.

iii. Generally, the universal indicator paper is in green colour.

iv. With respect to pH value, universal indicator paper changes its colour from red to violet.

v. With respect to the change in colour of universal indicator paper, we can estimate pH value and nature of the given solution as follows:

pH Value	Type	Colour
0–1	Strong Acid	Deep Red
2–3	Acid	Dark Orange
4–6	Weak Acid	Yellow to Yellow-Green
7	Neutral	Green
8–10	Weak Base	Blue-Green to Blue
11–12	Base	Dark Blue
13–14	Strong Base	Violet / Purple

37. Define the following.

A) i. **Strong Acid:** A strong acid is an acid that completely ionizes (or dissociates) in water to produce a high concentration of hydrogen ions (H^+).

ii. **Weak Acid:** A weak acid does not break down completely in water and produces fewer H^+ ions, so it is less acidic.

iii. **Neutral Substance:** A neutral substance does not produce H^+ (hydrogen ions) or OH^- (hydroxide ions) in water.

iv. **Weak Base**: A weak base does not completely break down in water and produces fewer OH^- ions, so it is weak basic.

v. **Strong Base**: A strong base breaks down fully in water and releases a lot of OH^- ions, making the solution strongly basic (alkaline).

38.Complete the following table.

Sl. No	Solution	Colour of pH paper	Approximate pH value	Nature of the substance
1.	Saliva (before meal)	Green	7	Neutral
2.	Saliva (after meal)	Yellow	6 – 6.5	Weak Acid
3.	Lemon juice	Red	2	Strong Acid
4.	Colourless aerated drink	Red/ Orange	3	Acid
5.	Carrot juice	Greenish Yellow	5 - 6	Weak Acid
6.	Coffee	Yellow	5	Acid
7.	Tomato juice	Orange	4	Acid
8.	Tap water	Green	7	Neutral
9.	1M NaOH	Purple/ Violet	14	Strong Base
10.	1M HCl	Red	1	Strong Acid

39. Five solutions A, B, C, D and E when tested with universal indicator showed pH as 4,1,11,7 and 9, respectively. Which solution is (a) neutral? (b) strongly alkaline? (c) strongly acidic? (d) weakly acidic? (e) weakly alkaline?

Arrange the pH in increasing order of hydrogen-ion concentration

A.

Sl. No	Solution	pH Value	Nature
1.	A	4	Weakly Acidic
2.	B	1	Strongly Acidic
3.	C	11	Strongly Alkaline
4.	D	7	Neutral
5.	E	9	Weakly Alkaline

pH value in increasing order of Hydrogen ion concentration:

C < E < D < A < B

Note:

i. pH value is inversely proportional to the H^+ ion concentration.

ii. Decreasing order of pH value refers increasing order of H^+ ion concentration of given solutions.

40. What is pH value?

A) The negative logarithmic value of H^+ ion concentration is called pH value. Mathematically ,

pH value = **-** log $[H^+]$

41. Calculate pH value of solution whose H^+ ion concentration is 10^{-4}.

A) Given: $[H^+] = 10^{-4}$

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

$= - \log 10^{-4}$

$= - (-4) \log 10$ ($\log a^m = m \log a$)

$= 4 \times 1$ ($\log 10 = 1$)

$= 4$

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42. Calculate H^+ ion concentration of given solution, whose pH value is 9.

A) Given: pH of given solution = 9

We know that, $pH = - \log [H^+]$

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

$[H^+] = 10^{-pH}$ ($\log_{10} a = b$, then $a = 10^b$)

$= 10^{-9}$

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43. Write the importance of pH in every day life.

A) a. **<u>In the digestion of the food</u>**:

i. pH plays a very important role in the digestion of food.

ii. In the stomach the secretion of Hydrochloric acid happens, which changes the pH of stomach between 1 – 3, and this pH range is responsible for activation of responsible enzymes which will digest the food

b. **<u>In Soil:</u>**

i. The pH of soil plays a major role in the growth of plants and crops.

ii. The ideal pH of soil for the growth of plants is 6.3 – 7.3, which will be the responsible for the healthy growth of the plants.

iii. If the soil is acidic, to neutralize the soil, add lime powder like basic fertilizer.

iv. Add acidic fertilizers to neutralize the basic nature of the soil.

c. **<u>In prevention of Tooth Decay:</u>**

i. The pH of mouth becomes acidic due to bacteria in the mouth decomposes food particles in the mouth produce acids.

ii. It will result the decay of the teeth.

iii. To prevent tooth decay by the use of tooth paste which is basic in nature.

d. **<u>pH of Blood:</u>**

i. The pH range of human blood is 7.1 – 7.8, which is basic in nature and it is also optimum survival.

ii. If the pH changes other than the optimum range, then the functions of the body will be failed.

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44. Is pH causes tooth decay? Explain.

A) i. Yes, pH causes tooth decay.

ii. Enamel of our tooth made with Calcium Phosphate, a salt which dissolve in acid but not in water.

iii. When our mouth pH is less the 5.5 due to produced acid in our mouth by bacteria by decomposition of food particles, causes tooth decay.

iv. To avoid tooth decay by using tooth paste, a basic substance to neutralize our mouth.

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45. What is Acidity?

A) i. Getting irritation in our stomach due to excess of acid is called 'Acidity'.

ii. We can get rid from acidity by using antacids, usually antacids are made with mild bases like milk of magnesia ($Mg(OH)_2$)

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46. What are 'Antacids'? Give examples.

A) Antacids are medicines that help neutralize excess stomach acid and relieve indigestion and acidity.

Examples:

Magnesium hydroxide (Milk of magnesia) – $Mg(OH)_2$

Aluminium hydroxide – $Al(OH)_3$

Sodium bicarbonate – $NaHCO_3$

NOTE:

Table 2.3 Some naturally occurring acids

Natural source	Acid	Natural source	Acid
Vinegar	Acetic acid	Sour milk (Curd)	Lactic acid
Orange	Citric acid	Lemon	Citric acid
Tamarind	Tartaric acid	Ant sting	Methanoic acid
Tomato	Oxalic acid	Nettle sting	Methanoic acid

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47. You have two solutions, A and B. The pH of solution A is 6 and pH of solution B is 8. Which solution has more hydrogen ion concentration? Which of this is acidic and which one is basic?

A)

Sl. No	Solution	pH value	Nature	$[H^+]$ ion concentration
1.	A	6	Acidic	10^{-6}
2.	B	8	Basic	10^{-8}

Substance A contains more $[H^+]$ ion concentration.

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48. What effect does the concentration of $H^+(aq)$ ions have on the nature of the solution?

A) Higher the H^+ ion concentration of solution causes more acidic nature.

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49. Do basic solutions also have $H^+(aq)$ ions? If yes, then why are these basic?

A) i. Yes, basic solutions also contain H^+ ions by the ionization of water in which the base is dissolved.

ii. But in basic solutions OH^- ions are much more comparing with H^+ ion concentration. Hence, they posses Basic Nature.

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50. Under what soil condition do you think a farmer would treat the soil of his fields with quick lime (calcium oxide) or slaked lime (calcium hydroxide) or chalk (calcium carbonate)?

A) i. Materials which are listed in the question are basic in nature.

ii. They are to be used to reduce acidic nature of soil when whose pH value is very low.

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51. Fresh milk has a pH of 6. How do you think the pH will change as it turns into curd? Explain your answer.

A) i. Milk turns into curd due to lactic acid produced by a bacteria called lactobacillus.

ii. That's why the pH of milk will fall less than 6.

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52. A milkman adds a very small amount of baking soda to fresh milk.

(a) Why does he shift the pH of the fresh milk from 6 to slightly alkaline?

A) i. We know that fresh milk is naturally slightly acidic.

ii. To maintain the freshness of milk for some more time, milk made to slightly alkaline.

iii. That's why milk may not get sour easily due to lactic acid.

(b) Why does this milk take a long time to set as curd?

A) i. The lactic acid being formed during curding has to first neutralize the alkali present in the milk.

ii. That's why milk added with baking soda takes longer time to set as curd.

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53. Equal lengths of magnesium ribbons are taken in test tubes A and B. Hydrochloric acid (HCl) is added to test tube A, while acetic acid (CH3COOH) is added to test tube B. Amount and concentration taken for both the acids are same. In which test tube will the fizzing occur more vigorously and why?

A) i. Fizzing happens because magnesium reacts with acid to produce a gas called hydrogen.

ii. Test tube A (with HCl) will show more fizzing.

iii. Because HCl is a strong acid and reacts faster with magnesium than acetic acid.

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54. What is family of salts?

A) A group of salts which are having either common positive ions or common negative ions is called a family of salts.

Examples:

i. **Chloride salts**: Sodium Chloride (NaCl), Potassium Chloride (KCl), Magnesium Chloride ($MgCl_2$), Calcium Chloride ($CaCl_2$) etc…….

In all these salts, Chloride (Cl^-) a negative ion becomes common.

ii. **Sodium Salts:** Sodium Chloride (NaCl), Sodium Carbonate (Na_2CO_3), Sodium Sulphate (Na_2SO_4), Sodium Nitrate ($NaNO_3$) etc…….

In all these salts, Sodium (Na^+) a positive ion becomes common.

---

55. Write a short note on pH of salts.

A) a. **Acidic Salts**:

i. The pH of salts is less than 7 are called Acidic salts.

ii. These are formed due to the reaction between a strong acid and a weak base.

iii. Example:

Ammonium chloride (NH_4Cl)

→ Formed from HCl (strong acid) and NH_4OH (weak base)

Ammonium sulphate ($(NH_4)_2SO_4$)

→ Formed from H_2SO_4 (strong acid) and NH_4OH (weak base)

Aluminium chloride ($AlCl_3$)

→ Formed from HCl (strong acid) and Aluminium Hydroxide (weak base)

b. **Basic Salts:**

i. The pH of salts greater than 7 are called Basic salts.

ii. These are formed due to the reaction between a weak acid and a strong base.

iii. Example:

Sodium carbonate (Na_2CO_3)

→ Formed from NaOH (strong base) and H_2CO_3 (weak acid)

Sodium acetate (CH_3COONa)

→ Formed from NaOH (strong base) and CH_3COOH (acetic acid – weak acid)

Calcium carbonate ($CaCO_3$)

→ Formed from $Ca(OH)_2$ (strong base) and H_2CO_3 (weak acid)

c. **Neutral Salts**:

i. The pH of salts is equal to 7 are called Neutral salts.

ii. These are formed due to the reaction between a Strong acid and Strong base.

iii. Example:

Sodium chloride (NaCl)

→ Formed from HCl (strong acid) and NaOH (strong base)

Potassium nitrate (KNO_3)

→ Formed from HNO_3 (strong acid) and KOH (strong base)

Sodium sulphate (Na_2SO_4)

→ Formed from H_2SO_4 (strong acid) and NaOH (strong base)

---

56. What is the chemical name of common salt? What are its sources?

A) i. Sodium Chloride (NaCl) is the chemical name of common salt.

ii. Common salt is obtained by the evaporation of Sea water and in the form of rock salt from the Earth's crust.

---

57. What is Brine?

A) Aqueous solution of sodium chloride (or) water solution of common salt is called Brine.

---

58. What is chlor-alkali process? Why it is called chlor-alkali process?

A) i. Electrolysis of Brine is called chlor-alkali process.

ii. The chemical equation of chlor-alkali process is

$$2\,NaCl + 2\,H_2O \xrightarrow{\text{Electrolysis}} 2\,NaOH\,(aq) + Cl_2\,(g) + H_2\,(g)$$

(at anode) (at cathode)

iii. In this process, a water soluble base NaOH and Chlorine gas are liberated. That's why this process is called 'Chlor-Alkali' process.

---

59. Draw a neat labelled diagram of Chlor-Alkali Process.

A)

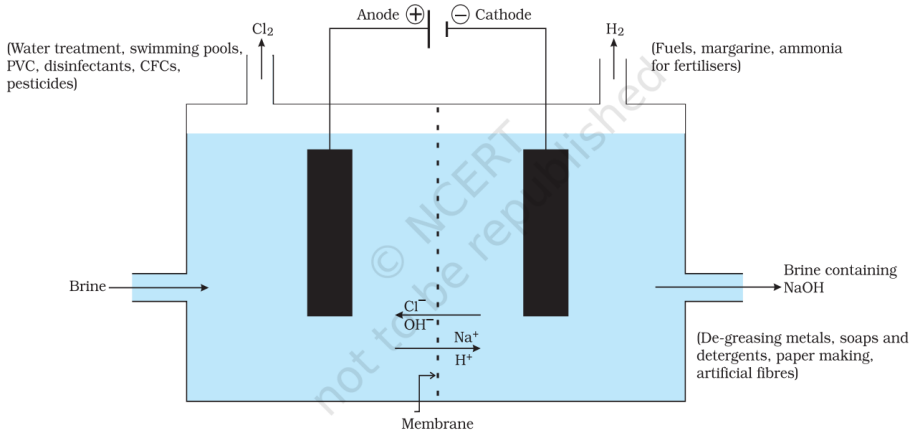

Figure 2.8 *Important products from the chlor-alkali process*

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60. Write chemical equation of Chlor-Alkali process. List the products in this process and write their uses.

A) i. The chemical equation of chlor-alkali process is

$$2\,NaCl + 2\,H_2O \xrightarrow{\text{Electrolysis}} 2\,NaOH\,(aq) + Cl_2\,(g) + H_2\,(g)$$

(at anode) (at cathode)

ii. The products in this reaction are :

a. Sodium Hydroxide, an alkali

b. Chlorine Gas

c. H_2

iii. Uses of:

a. **Sodium Hydroxide**:

> Used as cleaning agent of greasy surface of metal bodies
> Used in soap and detergent industries
> Used in glass and paper industry.
> Used in making artificial fibers.

b. **Chlorine Gas**:

> Used to eradication of micro-organisms from water by chlorination process.
> Used in manufacturing of PVC plastic.
> Used in preparation of CFC's
> Used in producing pesticides

c. **Hydrogen Gas**:

> Used as rocket fuel and fuel of other industries.
> Used in hydrogenation of oils to produce like margarine.
> Used in manufacturing of fertilizers like Ammonia.

---

61. Write a short note on Bleaching powder.

A) i. The chemical name of Bleaching powder is Calcium Oxy Chloride and its chemical formula is $CaOCl_2$.

ii. It is produced by using dry slaked lime ($Ca(OH)_2$) and chlorine gas (Cl_2) by following reaction:

$$Ca(OH)_2 + Cl_2 \text{ ----------> } CaOCl_2 + H_2O$$

iii. Uses of Bleaching Powder:

> Used to make water free from gems.
> Used as oxidizing agent in several industries.
> It is used as disinfectant of our surroundings.
> Used in laundry shops to remove stains from clothes.
> Used in textile industry to bleach cotton and linen.
> Used in paper industry to bleach wood pulp.

---

62. Explain the preparation of Baking soda.

A) i. The chemical name of Baking soda is Sodium Hydrogen Carbonate and its chemical formula is $NaHCO_3$.

ii. It is prepared by using sodium chloride, water, carbon dioxide and ammonia (NH_3) by following reaction:

$$NaCl + H_2O + CO_2 + NH_3 \text{ ----------> } NaHCO_3 + NH_4Cl$$

---

63. Write the chemical properties of Baking soda (Sodium Hydrogen Carbonate).

A) i. Baking soda is a mild basic salt.

ii. On heating baking soda, decomposes into Sodium carbonate, carbon dioxide and water.

$$2\,NaHCO_3 \xrightarrow{\text{Heat}} Na_2CO_3 + CO_2 + H_2O$$

iii. Baking soda produce salt and carbon dioxide when it is reacts with acids.

$NaHCO_3 + HCl$ ----------> $NaCl + CO_2 + H_2O$

---

64. Write the uses of Baking soda.

A) i. Used in preparation of Baking powder.

ii. Used in making of antacids.

iii. Used as an anti-septic substance.

iv. Used in soda acid fire extinguisher.

---

65. What is Baking powder? How does it make cakes and breads fluffy and spongy?

A) i. Baking powder is a mixture of baking soda and mild edible acids like tartaric acid.

ii. Generally baking powder is mixed with ingredients of dish.

iii. Then for making a dish either adding water or heating.

iv. Therefore, the following reaction takes place:

$NaHCO_3 + H^+$ (from any edible acid) --------> $CO_2 + H_2O$ + Edible Sodium Salt.

v. Carbon dioxide produced during the reaction can cause bread or cake to raise making them soft and spongy.

---

66. Why don't we are using baking soda instead of baking powder in cooking?

A) i. On heating baking soda, decomposes into Sodium carbonate, carbon dioxide and water.

$2\ NaHCO_3 \xrightarrow{Heat} Na_2CO_3 + CO_2 + H_2O$

ii. In this reaction we are obtained Sodium carbonate, a basic salt with bitter in taste along with carbon dioxide.

iii. The bitter taste of sodium carbonate spoils taste of the dish. That's why we are using baking powder but not baking soda.

---

67. Explain the process of making Washing Soda.

A) i. The chemical name of washing soda is Sodium Carbonate Deca Hydrate and its chemical formula is $Na_2CO_3 . 10\ H_2O$.

ii. It is prepared by using sodium chloride, water, carbon dioxide and ammonia (NH_3) by following three stages:

Stage -1: Preparation of Baking soda

$NaCl + H_2O + CO_2 + NH_3$ ----------> $NaHCO_3 + NH_4Cl$

Stage -2: Obtain Sodium Carbonate by heating of baking soda

$2\ NaHCO_3 \xrightarrow{Heat} Na_2CO_3 + CO_2 + H_2O$

Stage -3: Recrystallization of sodium carbonate with water

$Na_2CO_3 + 10\ H_2O$ ----------> $Na_2CO_3 . 10\ H_2O$

---

68. Write the uses of Washing soda.

A) i. It is used in glass, soap and paper industries.

ii. It is used in the manufacture of sodium compounds such as borax.

iii. Sodium carbonate can be used as a cleaning agent for domestic purposes.
iv. It is used for removing permanent hardness of water.

69. What are hydrated salts? Give examples.

A) Each and every molecule of some of the salts are chemically attached with fixed number of water molecules are called Hydrated salts.

Examples.

Chemical Name	Formula	Common Name
Copper(II) sulphate pentahydrate	$CuSO_4 \cdot 5H_2O$	Blue vitriol
Sodium Carbonate Deca Hydrate	$Na_2CO_3 \cdot 10H_2O$	Washing soda
Calcium Sulphate Di Hydrate	$CaSO_4 \cdot 2H_2O$	Gypsum
Magnesium sulphate heptahydrate	$MgSO_4 \cdot 7H_2O$	Epsom salt
Iron(II) sulphate heptahydrate	$FeSO_4 \cdot 7H_2O$	Green vitriol
Calcium Sulphate HemiHydrate	$CaSO_4 \cdot 1/2\ H_2O$	Plaster of Paris

70. What is water of crystallization? Explain with an activity.

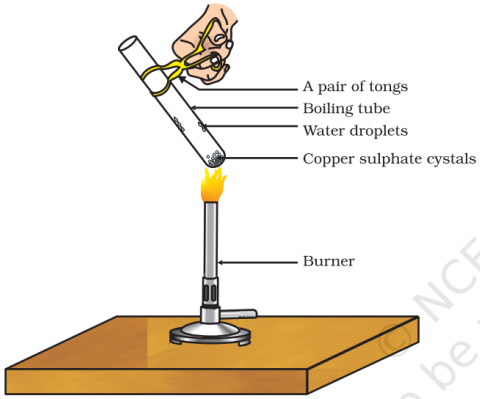
A) **Water of Crystallization:** The fixed number of water molecules are chemically attached with one formula unit of a salt is called 'Water of Crystallization'.

Aim: To study about water of crystallization.

Apparatus: A test tube, Bunsen burner, a pair of tongs

Chemical: Blue vitriol (Copper Sulphate pentahydrate)

Diagram:



Procedure:

i. Take some blue coloured Copper sulphate crystals in a clean and dry test tube.
ii. Heat the crystals by using Bunsen burner as shown in the fig

Observation:

i. The blue colour of the salt is changes into white.
ii. Some water droplets are observed at the brim and on walls of the test tube.

iii. Add 2 – 3 drops of water on the sample of the Copper sulphate obtained after heating. We are noticed that the salt restored its blue colour.

Conclusion:

i. The salt obtained blue colour due to presence of water molecules at each and every molecule of salt.

ii. Hence, water of crystallization is proved.

---

71. What are the advantages of water of crystallization of salts?

A) i. Gives Color to the Salt

ii. Helps to form proper crystalline structure.

iii. Shows purity of the salt.

iv. Give strength between the molecules of salt.

---

72. What is Plaster of Paris? How it is formed?

A) i. The chemical name of Plaster of Paris is Calcium Sulphate. Hemihydrate and its chemical formula is $CaSO_4 \cdot 1/2\ H_2O$.

ii. It is obtained by heating of Gypsum at 373K of temperature.

$$CaSO_4 \cdot 2\ H_2O \xrightarrow{373\ K} CaSO_4 \cdot 1/2\ H_2O + 1\ {}^1/_2\ H_2O$$

(OR)

$$2\ (CaSO_4 \cdot 2\ H_2O) \xrightarrow{373\ K} 2\ CaSO_4 \cdot H_2O + 3\ H_2O$$

NOTE:

In plaster of paris, every two calcium sulphate molecules are chemically attached with one water molecule. Because, half molecule never be existed.

---

73. Plaster of Paris should be stored in a moisture-proof container. Explain why?

A) i. When plaster of paris is exposed to moisture or water leads to becoming hard.

ii. This will make plaster of paris useless after sometime.

iii. That's why plaster of paris should be stored in a moisture proof container.

---

74. Write the chemical equation of Plaster of paris (POP) with water.

A) $$CaSO_4 \cdot 1/2\ H_2O + 1\ {}^1/_2\ H_2O \xrightarrow{Moisture} CaSO_4 \cdot 2\ H_2O$$

---

75. Write the uses of Plaster of Paris.

A) i. It is used in Hospitals for setting fractured bones in right position to ensure correct healing.

ii. Used in making toys, decorative materials, black board chalks etc……

iii. Plaster of paris is used of fire proofing materials

iv. It is used for making surfaces like the walls of house and ceilings of houses, smooth before painting.

---

76. What is the common name of the compound $CaOCl_2$?

A) Bleaching Powder.

---

77. Name the substance which on treatment with chlorine yields bleaching powder.

A) Dry Slaked Lime (Calcium Hydroxide).

---

78. Name the sodium compound which is used for softening hard water.

A) Sodium Carbonate Decahydrate (Washing Soda)

---

79. What will happen if a solution of sodium hydrogen carbonate is heated? Give the equation of the reaction involved.

A) On heating baking soda, decomposes into Sodium carbonate, carbon dioxide and water.

$$2\ NaHCO_3 \xrightarrow{Heat} Na_2CO_3 + CO_2 + H_2O$$

---

80. Write word equations and then balanced equations for the reaction taking place when –

(a) dilute sulphuric acid reacts with zinc granules.

A) $H_2SO_4 + Zn$ ---------> $ZnSO_4 + H_2$

(b) dilute hydrochloric acid reacts with magnesium ribbon.

A) $2HCl + Mg$ ----------> $MgCl_2 + H_2$

(c) dilute sulphuric acid reacts with aluminium powder.

A) $3\ H_2SO_4 + 2\ Al$ ---------> $Al_2(SO_4)_3 + 3\ H_2$

(d) dilute hydrochloric acid reacts with iron filings

A) $2\ HCl + Fe$ ----------> $FeCl_2 + H_2$

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