

Chapter - 2

Acid, Bases And Salts

Properties of Acid

- Sour in taste
- Turn blue litmus red
- Give H^+ ions in aqueous solution
- Aqueous soln conduct electricity

Properties of Bases

- Bitter in taste
- Turn red litmus blue
- Give OH^- ions in aqueous solution
- Does conduct electricity in aqueous soln

Physical Properties of Acids

Chemical Properties of Acids

- Reacts with metals to liberate hydrogen.
- Reacts with metal carbonates/metal hydrogen carbonate to liberate CO_2
- Reacts with certain metal oxides to form salt and water.

Salts : When acid and base are combined under the given condition. Salt is formed.

Some Common Salts

Acids, Bases and Salts

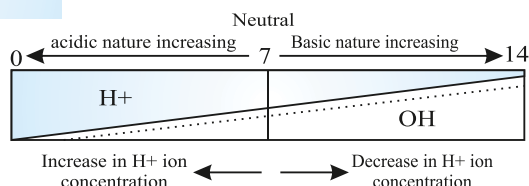
Physical Properties of Bases

Chemical Properties of Bases

- Alkali reacts with metal to liberate H_2
- Bases reacts with acidic oxides to form water.

Classification of Acid, Bases and Salts on the basis of pH scale.

pH scale : H^+ ion concentration of the solution.



Some Common Salts

- Common salt : $NaCl$
- Sodium hydroxide : $NaCl + 2H_2O \longrightarrow NaOH + Cl_2 + H_2$
- Bleaching Powder: $Ca(OH)_2 + Cl_2 \longrightarrow CaOCl_2 + H_2O$
- Baking Soda: $NaCl + H_2O + CO_2 + NH_3 \longrightarrow NH_4Cl + NaHCO_3$
- Wasing Soda: $Na_2CO_3 + 10.H_2O \longrightarrow Na_2CO_3.10H_2O$
- Plaster of Paris : $CaSO_4.2H_2O \xrightarrow[heat]{373\text{ K}} CaSO_4.\frac{1}{2}H_2O + 1\frac{1}{2}H_2O$
- Gypsum : $CaSO_4.\frac{1}{2}H_2O + 1\frac{1}{2}H_2O \longrightarrow CaSO_4.2H_2O$

ACIDS :

- These are the substances which have sour taste.
- They turn blue litmus solution red.
- They give H^+ ions in aqueous solution.
- The term 'acid' has been derived from the Latin word, acidus, which means sour.

Strong Acids : HCl , H_2SO_4 , HNO_3

Weak Acids : CH_3COOH , Oxalic acid, Lactic acid

Concentrated Acid : Having more amount of acid + less amount of water

Dilute Acid : Having more amount of water + less amount of acid

BASES :

- These are the substances which are bitter in taste and soapy in touch.
- They turn red litmus solution blue.
- They give OH^- ions in aqueous solution.

Strong Bases : $NaOH$, KOH , $Ca(OH)_2$

Weak Bases : NH_4OH

Alkalis : These are bases which are soluble in water [$NaOH$, KOH , $Ca(OH)_2$].

SALTS :

These are the compounds formed from reaction of acid and base.

Example :

$NaCl$, KCl .

INDICATORS :

These are the substances which change their colour/smell in different types of substances.

TYPES OF INDICATORS

Natural indicators

- Found in nature in plants.
- Litmus, red cabbage leaves extract, flowers of hydrangea plant, turmeric

Synthetic indicators

- These are chemical substances.
- Methyl orange, phenolphthalein

Olfactory indicators

- These substances have different odour in acid and bases.
- Vanilla, onion, clove

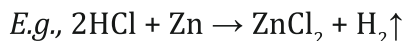
	S. No.	Indicator	Smell/Colour in acidic solution	Smell/Colour in basic solution
Natural Indicator	1.	Litmus	Red	Blue
	2.	Red cabbage leaf extract	Red	Green
	3.	Flower of hydrangea plant	Blue	Pink
	4.	Turmeric	No change	Red
Synthetic Indicator	1.	Phenolphthalein	Colourless	Pink
	2.	Methyl orange	Red	Yellow
Olfactory Indicator	1.	Onion	Characteristic smell	No smell
	2.	Vanilla essence	Retains smell	No smell
	3.	Clove oil	Retains smell	Loses smell

CHEMICAL PROPERTIES OF ACIDS AND BASES

Reaction of Metals with

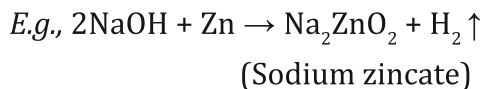
Acids

Acid + Metal \rightarrow Salt + Hydrogen gas



Bases

Base + Metal \rightarrow Salt + Hydrogen gas

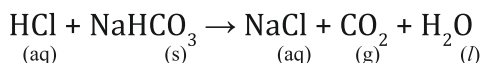
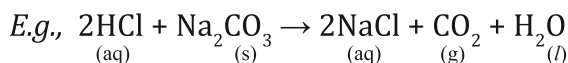


- * Hydrogen gas released can be tested by bringing burning candle near gas bubbles, it burns with pop sound.

Reaction of Metal Carbonates/Metal Hydrogen Carbonates with

Acids

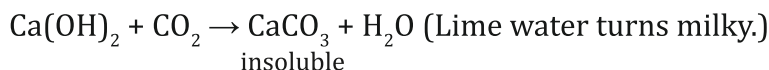
Acid + Metal Carbonate/ Metal Hydrogen Carbonate \rightarrow
Salt + CO_2 + H_2O



Bases

Base + Metal Carbonate/
Metal Hydrogen Carbonate
 \rightarrow No Reaction

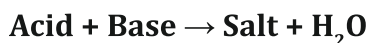
- * CO_2 can be tested by passing it through lime water.



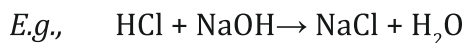
When excess * CO_2 is passed,



Reaction of Acids and Bases With Each Other



Neutralisation Reaction : Reaction of acid with base to give salt and water is called as **neutralisation** reaction.



IF :

Strong Acid + Weak Base \rightarrow Acidic salt + H_2O [pH of the Solution is less than 7]

Weak Acid + Strong Base \rightarrow Basic salt + H_2O [pH of the Solution is more than 7]

Strong Acid + Strong Base \rightarrow Neutral salt + H_2O [pH of the Solution is = 7]

Weak Acid + Weak Base \rightarrow Neutral salt + H_2O [pH of the Solution is = 7]

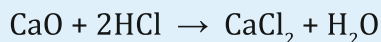
Reaction of Metallic Oxides with Acids

Metallic oxides + Acid \longrightarrow Salt + Water

Metallic oxides are basic in nature. because it reacts with acid and forms salt and water

E.g., CaO, MgO are basic oxides.

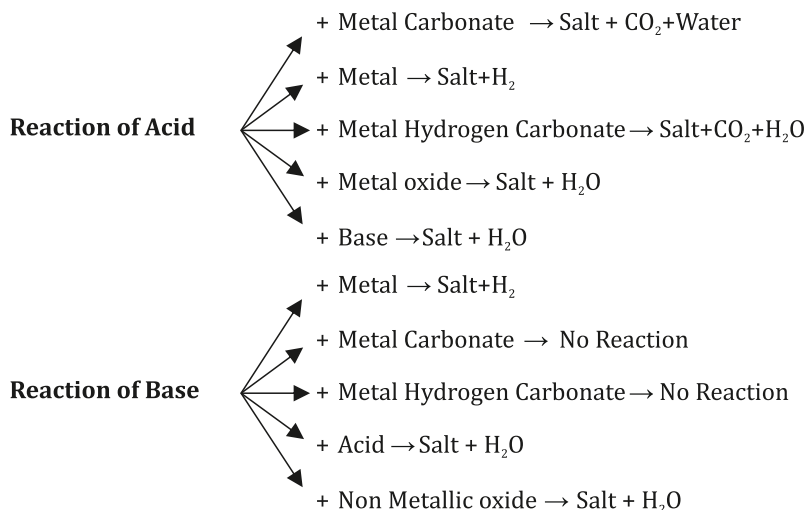
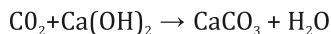
Metallic Oxide + Acid \rightarrow Salt + H₂O



Reaction of Non-metallic Oxides with Bases

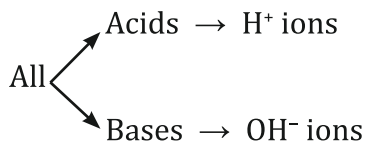
Non-metallic oxides are acidic in nature.

Non-mettalic Oxide+Base \rightarrow Salt+H₂O



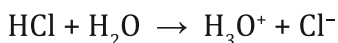
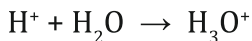
What do all Acids and Bases have in common

- All acids have H⁺ ions in common.
- Acids produce H⁺ ions in solution which are responsible for their acidic properties.
- All bases have OH⁻ (hydroxyl ions) in common.

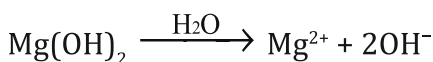
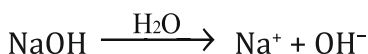


Acid or Base in Water Solution

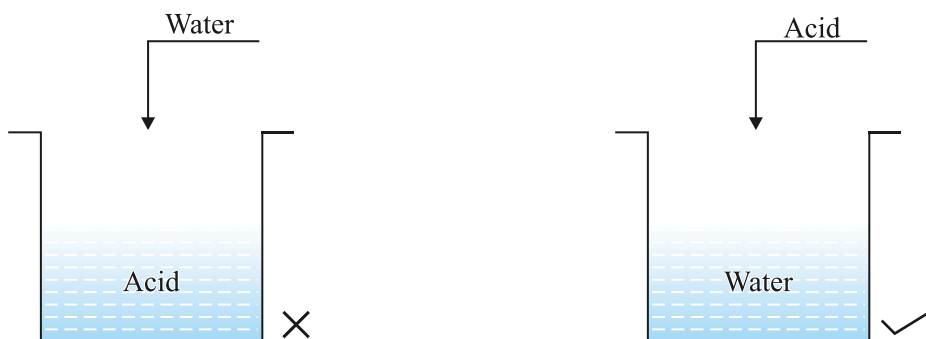
- Acids produce H^+ ions in presence of water.
- H^+ ions cannot exist alone, they exist as H_3O^+ (hydronium ions).



Bases when dissolved in water gives OH^- ions.



- Bases soluble in water are called alkali.
- While diluting acids, it is recommended that the acid should be added to water and not water to acid because the process of dissolving an acid or a base in water is highly exothermic.



If water is added to acid, the heat generated may cause the mixture to splash out and cause burns and the glass container may also break due to excessive local heating.

Adding water to acid may

Cause mixture to splash out

Break the glass container

Mixing an acid or a base with H_2O results in decrease of concentration of ions ($\text{H}_3\text{O}^+/\text{OH}^-$) per unit volume. Such a process is called as dilution.

Strength of Acid and Base

Strength of acid or base can be estimated using universal indicator.

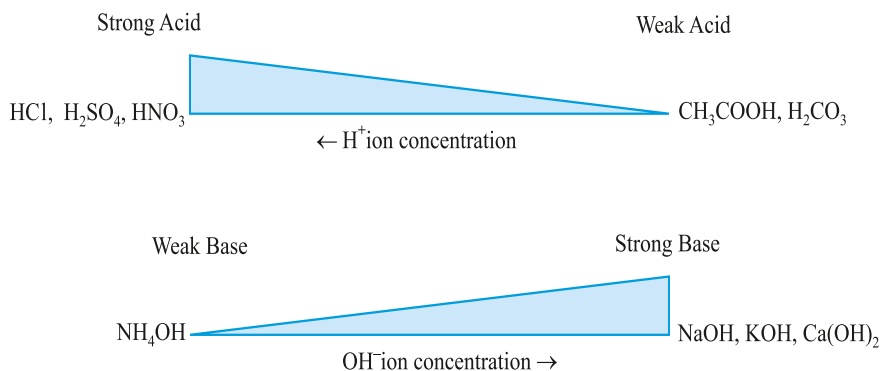
Universal indicator : is a mixture of several indicators. It shows different colours at different concentrations of H^+ ions in the solution.

pH Scale : A scale for measuring H^+ ion concentration in a solution . p in pH stands for 'potenz' a German word which means power.

pH = 7 \rightarrow neutral solution

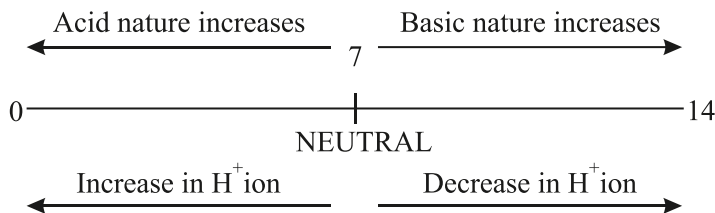
pH less than 7 \rightarrow acidic solution

pH more than 7 \rightarrow basic solution



On diluting an acid : pH increases \uparrow

On diluting a base : pH decreases \downarrow



Importance of pH in everyday life

- | | |
|--|--|
| 1. Plants and animals are pH sensitive | <ul style="list-style-type: none"> • Our body works within the pH range of 7-7.8. • When pH of rain water is less than 5.6, it is called acid rain. |
| 2. pH of the soil | <ul style="list-style-type: none"> • Plants require a specific pH range for their healthy growth. If the pH of soil of any place is less or more, then farmers have to mix some acidic or basic substances as required. |

3. pH in our digestive system	<ul style="list-style-type: none"> • Our stomach produces HCl acid which helps in digestion. • During indigestion, stomach produces more acid and cause pain and irritation. • To get rid of this pain, people uses antacid (mild base) like milk of magnesia $[\text{Mg}(\text{OH})_2]$ to neutralize excess acid.
4. pH change as cause of tooth decay	<ul style="list-style-type: none"> • Tooth decay starts when pH of mouth is lower than 5.5. • Tooth enamel made up of calcium phosphate (hardest substance in body) does not dissolve in water but corrodes when pH is lower than 5.5 due to acids produced by degradation of food particles by bacteria. • Using toothpaste (generally basic) tooth decay can be prevented.
5. Self defence by animals and plants through chemical warfare	<p>(a) Bee sting leaves an acid which cause pain and irritation. Use of a mild base like baking soda on stung area gives relief.</p> <p>(b) Stinging hair of nettle leaves inject methanoic acid causing burning sensation or pain. Rubbing with leaf of dock plant give relief.</p>

pH of Salts :

- (i) Strong Acid + Strong Base \rightarrow Neutral Salt : pH = 7 eg. NaCl
- (ii) Salt of strong acid + Weak base \rightarrow Acidic salt : pH < 7 eg. NH_4Cl
- (iii) Salt of strong base + Weak acid \rightarrow Basic salt : pH > 7 eg. CH_3COONa

Chemicals from Common Salt (NaCl)

1.	2.	3.	4.	5.
Sodium Hydroxide (NaOH)	Bleaching Powder (CaOCl ₂)	Baking Soda (NaHCO ₃)	Washing Soda (Na ₂ CO ₃ ·10H ₂ O)	Plaster of Paris (CaSO ₄ ·½H ₂ O)

1. Sodium Hydroxide (NaOH) : When electricity is passed through an aqueous solution of NaCl (brine), it decomposes to form NaOH. (Chlor-alkali process)

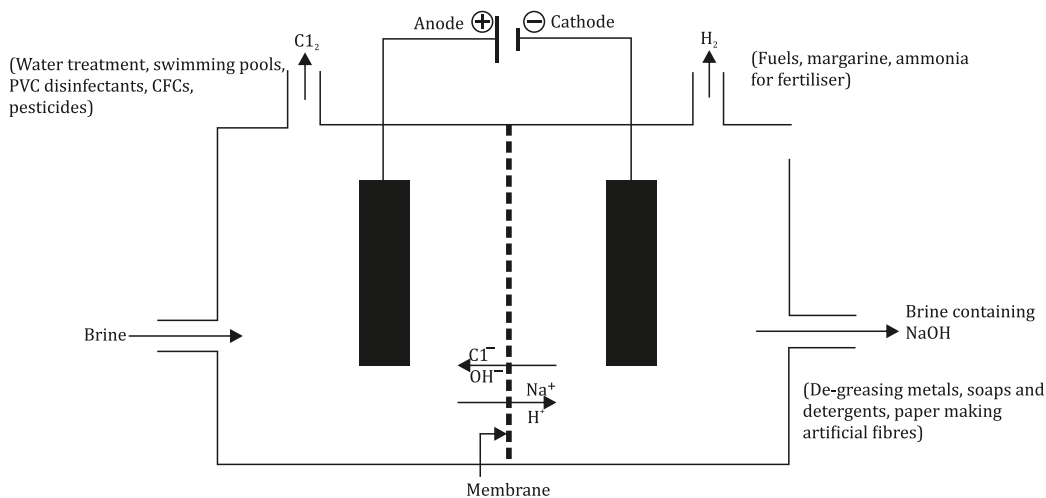


Figure 2.8 Important products from the chlor-alkali process



At anode : Cl₂ gas

At cathode : H₂ gas

Near cathode : NaOH solution is formed.

Uses :

H₂ : Fuels, margarine

Cl₂ : Water treatment, PVC, CFC's

HCl : Cleaning steels, medicines

NaOH : Degreasing metals, soaps and paper making

Cl₂ + NaOH → Bleach : Household bleaches, bleaching fabrics

2. Bleaching Powder (CaOCl_2): It is produced by the action of chlorine on dry slaked lime.



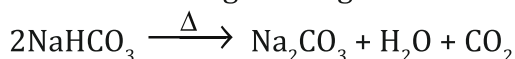
Uses :

- (a) Bleaching cotton and linen in textile industry.
- (b) Bleaching wood pulp in paper factories.
- (c) Oxidizing agent in chemical industries.
- (d) Disinfecting drinking water.

3. Baking Soda (Sodium Hydrogen Carbonate) (NaHCO_3) :



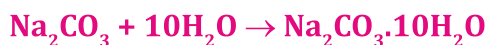
- It is mild non-corrosive base.
- When it is heated during cooking :



Uses :

- (a) For making baking powder (mixture of baking soda and tartaric acid). When baking powder is heated or mixed with water, CO_2 is produced which causes bread and cake to rise making them soft and spongy.
- (b) An ingredient in antacid.
- (c) Used in soda-acids, fire extinguishers.

4. Washing Soda ($\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$) : Recrystallization of sodium carbonate gives washing soda. It is a basic salt.



Uses :

- (a) In glass, soap and paper industry.
- (b) Manufacture of borax.
- (c) Cleaning agent for domestic purposes.
- (d) For removing permanent hardness of water.

5. Plaster of Paris (Calcium sulphate hemihydrates) ($\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$) :

On heating gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$) at 373K, it loses water molecules and becomes Plaster of Paris (POP).

It is a white powder and on mixing with water it changes to gypsum.



Uses :

- (a) Doctors use POP for supporting fractured bones.
- (b) For making toys, material for decoration.
- (c) For making surfaces smooth.

Water of Crystallization : It is a fixed number of water molecules present in one formula unit of a salt.

E.g., $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ has 5 water molecules.

$\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$ has 10 water molecules.

$\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ has 2 water molecules.

VERY SHORT ANSWER TYPE OF QUESTION (1 MARK)

- Q.1 To protect tooth decay we are advised to brush our teeth regularly. The nature of tooth paste used is-
a) acidic b) neutral c) basic d) corrosive
- Q.2 A compound x in aqueous solution turns red litmus solution into blue Identify 'x'
a) Hydrochloric acid b) Ammonium hydroxide solution.
c) Sodium chloride solution d) Vinegar
- Q.3 Which one is stronger acid, with $\text{pH}=5$ or with $\text{pH}=2$?
- Q.4 What happens when chlorine is passed over dry slaked lime.
(CBSE-2010, 2011)
- Q.5 Dry HCl gas does not change the colour of dry blue litmus paper. Why?
- Q.6 Fill in the blanks-
- a) The chemical formula of plaster of paris is _____.
 - b) Neutral substances have a $\text{pH}=\rule{1.5cm}{0.4pt}$.
 - c) Gold can be dissolved in _____.
 - d) Commonly used antacid is _____.

Q.7 Given below are the results of solution tested with universal indicator (pH paper)

- (i) Sulphuric acid Red.
- (ii) Metal Polish Dark Blue.
- (iii) Milk of Magnesia Light blue.
- (iv) Liquid Soap Yellow.
- (v) Over cleaner Purple.
- (vi) Car battery acid Pink.

Arrange the solutions in increasing order of their pH.

Q.8 Complete the following reaction-

- I) $\text{Na}_2\text{CO}_3 + \text{HCl} \longrightarrow$
- ii) $\text{NaOH} + \text{HCl} \longrightarrow$
- iii) $\text{CuO} + \text{HCl} \longrightarrow$
- iv) $\text{Zn} + \text{NaOH} \longrightarrow$
- v) $\text{Ca}(\text{OH})_2 + \text{Cl}_2 \longrightarrow$

Q.9 Fill the missing data in following table

	Name of salt		Salt obtained	
	Formula		Base	Acid
1	Ammonium chloride	NH_4Cl	NH_4OH	_____
2	Copper sulphate	CuSO_4	_____	H_2SO_4
3	Sodium Chloride	NaCl	NaOH	_____
4	Magnesium Nitrate	$\text{Mg}(\text{NO}_3)_2$	_____	HNO_3
5	Potassium sulphate	K_2SO_4	_____	_____
6	Calcium nitrate	$\text{Ca}(\text{NO}_3)_2$	$\text{Ca}(\text{OH})_2$	_____

Q.10 Classify these chemicals into strong and weak acid-

Hydrochloric acid, Formic acid, nitric acid, acetic acid, Sulphuric acid, citric acid (NCERT Exemplar)

Answer

- 1 c)
- 2 b)

11. Name the acid present in ant sting.
12. What happens when egg shell is added to nitric acid ?
13. Name two constituents of baking powder.
14. What is the pH of gastric juices released during digestion ?
15. Which solution is used to dissolve gold ? Write its constituents.
16. How will you test a gas which is liberated when HCl reacts with an active metal ?
17. Why does flow of acid rain water into a river make the survival of aquatic life in the river difficult ?
18. When conc. acid is added to water, whether the process is exothermic or endothermic ?
19. Which by-product of chlor-alkali process is used for manufacturing bleaching powder ?
20. Name One salt which does not have water of crystallisation.

Practical Based MCQ's

1. On putting a drop of liquid on a pH paper a student observes a small patch of blue color on pH paper. The liquid is most probably-
a) H_2O b) HCl c) NaOH d) H_2SO_4
2. The correct method of finding the pH of solution is—
a) Heat the solution in test-tube and expose the pH paper to the vapours formed—
b) Pour solution on pH paper
c) Dip the pH paper in solution
d) Put a drop of solution on pH paper using dropper (CBSE-2011)
3. The colour obtained on pH paper for highly acid, basic and neutral solutions are respectively.
a) blue, orange, green
b) yellow, blue, green

- c) red, blue, green
 - d) red, green, blue
4. Four student- 'A', 'B', 'C' and D measured pH value of water, lemon juice and sodium bicarbonate solution. The student who has expressed correct pH values in decreasing order.
- a) Water > lemon juice > Sod. bicarbonate solution
 - b) Lemon juice > Water > Sod. bicarbonate solution
 - c) Sod. bicarbonate solution > water > lemon juice
 - d) Water > Sod. bicarbonate solution > lemon juice (CBSE-2010)
5. If we add some sodium carbonate in distilled water, the pH of solution will be-
- a) less than 7
 - b) more than 7
 - c) exactly 7
 - d) very close to 7
6. Dil HCl is added to sodium carbonate. It is observed that:-
- a) No change takes place
 - b) A loud sound is produced immediately
 - c) Immediately a brisk effervescence occur
 - d) The solution turns black.
7. A student added Zn grannules to dil HCl and made following observations:-
- (i) The surface of Zn become black
 - (ii) A colourless gas evolved which burns with pop/sound
 - (iii) The solution remains colourless

The correct observations are-

- a) I and II b) I and III c) II and III d) I, II and III
8. Four students performed reactions of zinc and sodium carbonate with dil Hydrochloric acid and sodium hydroxide and presented their result as follows.

The (✓) represent evolution of gas and 'x' represent no reaction.

A		Zn	Na_2CO_3
	HCl	✓	✓
	NaOH	✓	×

B		Zn	Na_2CO_3
	HCl	✓	×
	NaOH	✓	✓

C		Zn	Na_2CO_3
	HCl	×	×
	NaOH	✓	✓

D		Zn	Na_2CO_3
	HCl	✓	✓
	NaOH	×	×

The right set of observation is

a) A b) B c) C d) D

9. A colourless and odourless gas is liberated when hydrochloric acid is added to solution of sodium carbonate. The name of gas is-

- a) Carbon dioxide
- b) Nitrogen dioxide
- c) Sulphur dioxide
- d) Sulphur trioxide

10. When HCl reacts with Zn metal the gas liberated is -

- a) Oxygen b) Nitrogen c) Chlorine d) Hydrogen

Multiple Choice Questions

1. An acid can react with
(a) AgCl (b) Na_2CO_3 (c) AgNO_3 (d) None of the above
2. Which of the following statement is correct?
(a) Both bases and alkalies are soluble in water
(b) Alkalies are soluble in water but all bases
(c) Bases are soluble in water but all alkalies are
(d) $\text{C}_2\text{H}_5\text{OH}$ is a base because it has OH in its formula
3. Solution A,B,C and D have pH 3,4,6 and 8 respectively. The solution with highest acidic strength is
(a) A (b) B (c) C (d) D
4. A solution turns blue litmus red. The pH of the solution will be
(a) 8 (b) 10 (c) 12 (d) 6
5. Which of the following is a neutral salt
(a) NaCl (b) Na_2SO_4 (c) KCl (d) all of the above
6. Which of the following correctly represents the molecular formula of washing soda?
(a) Na_2CO_3 (b) $\text{Na}_2\text{CO}_3\cdot\text{H}_2\text{O}$
(c) $\text{Na}_2\text{CO}_3\cdot 5\text{H}_2\text{O}$ (d) $\text{Na}_2\text{CO}_3\cdot 10\text{H}_2\text{O}$
7. Gypsum salt is
(a) $\text{CaSO}_4\cdot 2\text{H}_2\text{O}$ (b) Ca_2SO_4 (c) $\text{CaSO}_4\cdot \frac{1}{2}\text{H}_2\text{O}$ (d) CaSO_4
8. Which of the following is used in making toys?
(a) $\text{CaSO}_4\cdot 2\text{H}_2\text{O}$ (b) $\text{Na}_2\text{SO}_4\cdot 10\text{H}_2\text{O}$
(c) $\text{CaSO}_4\cdot \frac{1}{2}\text{H}_2\text{O}$ (d) CaSO_4
9. The type of medicine used to treat indigestion is hyperacidity is
(a) antibiotic (b) antacid (c) sulpha drug (d) pain killer
10. Which one of the following is a weak acid
(a) HCl (b) H_2CO_3 (c) HNO_3 (d) H_2SO_4

11. The table provides the pH value of four solutions P, Q, R and S.

Solution	PH value
P	2
Q	9
R	5
S	11

Which of the following correctly represents the solution in increasing order of their hydronium ion concentration.

- (a) $P > Q > R > S$
 - (b) $P > S > Q > R$
 - (c) $S < Q < R < P$
 - (d) $S < P < Q < R$
12. Chlorine gas reacts with _____ to form bleaching powder
- (a) Dry $\text{Ca}(\text{OH})_2$
 - (b) Dil. solution of $\text{Ca}(\text{OH})_2$
 - (c) Con. solution of $\text{Ca}(\text{OH})_2$
 - (d) Dry CaO
13. A Solution turns red litmus blue, its pH is likely to be
- (a) 1
 - (b) 4
 - (c) 5
 - (d) 10
14. Which one of the following salts does not contain water of crystallisation?
- (a) Copper sulphate
 - (b) Baking soda
 - (c) Washing Soda
 - (d) Gypsum
15. An aqueous solution turns red litmus solution blue excess addition of which of the following solution would reverse the change?
- (a) Baking powder
 - (b) Lime
 - (c) Ammonium hydroxide solution
 - (d) Hydrochloric acid

Assertion and Reason type of questions

In the following questions a statement of Assertion is followed by a statement are given-one labelled Assertion (A) and the other labeled Reason (R). Select the correct answer to these questions from the codes (a), (b), (c) and (d) as given below:

- (a) Both A and R are true, and R is correct explanation of the assertion.
- (b) Both A and R are true, but R is not correct explanation of the assertion.
- (c) A is true, but R is false.
- (d) A is false, but R is true.

1. **Assertion (A):** Salts are the products of the an acid- base reaction.

Reason (R): Salt may be acidic or basic.

2. **Assertion (A):** NaCl is a basic salt.

Reason (R): On passing electricity aqueous solution of NaCl forms NaOH.

3. **Assertion (A):** The acid must always be added slowly to water with constant stirring.

Reason (R): The process of dissolving an acid in water is a highly exothermic.

4. **Assertion (A):** A scale for measuring hydrogen ion concentration in a solution, called pH scale.

Reason (R): Values less than 7 on the pH scale represent an acidic solution.

5. **Assertion (A):** Ammounium chloride is a basic salt.

Reason (R): Salts of strong acid and weak base are acidic with pH value less than 7.

SHORT ANSWER TYPE OF QUESTIONS (2 and 3 Marks)

1. Why does bleaching powder smell strongly of chlorine and does not dissolve completely in water ?
2. Hold one moist and one dry strip of blue litmus paper over dry HCl acid gas. Which strip will turn red and why ?
3. What is Plaster of Paris ? How is it obtained from gypsum ?
4. What is the role of toothpastes in preventing cavities ?
5. Explain why sour substances are effective in cleaning copper vessels ?
6. A white powder is added while baking breads and cakes to make them soft and fluffy. What is the name of the powder ? What are its main ingredients ?
7. How washing soda is prepared from baking soda ?
8. Though the compounds such as glucose and alcohol have hydrogen atoms in their molecule, yet they are not categorized as acids. Why ?
9. What is the reaction called when an acid reacts with base to produce salt and water ? Give example also.
10. Why pickles and curd are not stored in copper and brass utensils ?
11. On passing excess CO_2 through lime water, it first turns milky and then becomes colourless. Explain why ? Write chemical equations.
12. How are bases different from alkalis ? Are all bases alkalis ?
13. While constructing a house, a builder selects marble flooring and marble top for kitchen where vinegar and juices of lemon, tamarind etc. are more often used for cooking. Will you agree to this selection and why ?
14. Indicate with the help of a diagram the variation of pH with change in concentration of H^+ (aq) and OH^- (aq) ions.
15. Write the name and formulae of any three hydrated salts.
16. Give the equation of reaction between calcium carbonate and hydrochloric acid.

17. Why metallic oxides are called basic oxides and non-metallic oxides are called acidic oxides ?
18. What is pH scale ? What is pH value of salt formed by a
(a) weak acid and strong base ?
(b) strong acid and strong base ?
- Q.19 A metal compound 'A' reacts with dil H_2SO_4 to produce a gas which extinguishers a burning candle. Identify compound 'A' and gas produces. Write a balanced chemical equation for the reaction if one of compound formed is sodium sulphate (CBSE-2016)
- Q.20 pH value of salt is 11, which makes Pakoda tasty and crispy. Identify it and write the chemical equation of its formation. Write its two uses also. (CBSE-2018)
- Q.21 A compound which is prepared by gypsum has the property of hardening when mixed with water. Identify and write its chemical formulae. Write the chemical equation for preparation and mention any one use of it? (CBSE sample paper-2018)
- Q.22 Identify the acid and base which form sodium hydrogen carbonate. Write the chemical equation in support of your answer state whether the compound is acidic, basic or neutral. Also write the pH. (CBSE-2019)
- Q.23 A compound 'X' is heated with more con. H_2SO_4 at 443K and produced a Compound 'Y'. Compound 'X' reacts with metal Na and a colourless gas 'z' evolves. Identify 'X', 'Y' and 'Z'. Write the equation of chemical reaction takes place with 'Y' and also write the role of conc H_2SO_4 . (CBSE-2019)
- Q.24 2ml of sodium hydroxide solution is added to few pieces of granulated Zn metal taken in test-tube. When the contents are warmed, a gas is evolved which is bubbled through soap solution before testing. Write the equation of chemical reaction involved and test to detect gas. Name the gas which will be evolved when same metal reacts with solution of strong acid. (CBSE-2018)

Long Answer Type of Questions (5 Marks)

1. What is water of crystallisation? Write the common name and chemical formula of a commercially important compound which has 10 molecules of water. How is this compound obtained? Write its chemical equation also. List any two uses of this compound.
2. An element P does not react with dil H_2SO_4 . It forms an oxide PO which turns red litmus into blue. P is a metal or a non-metal? Justify your answer.
3. What is the chemical name and formula of bleaching powder. What happens when bleaching powder is exposed to air for long time? Give any two important uses of bleaching powder.

Competency Based Questions:

Read the passage carefully and answer the questions:

There are many substances which show one colour or odour in the acidic medium and a different colour or odour in the basic medium. Such substances are called acid-base indicators. An indicator is a weak acid or base that is added to the analyzed solution, and it changes colour when the equivalence point is reached. Let's take the real-life example of our fish tank. Over time, plants, rocks, and the fish themselves will alter the pH of the water. Most fish can adjust to a pH that changes slowly over time, but are very sensitive to sudden changes in pH. So when it's time to clean the tank and add new water, we should add water that is near the pH of what the fish have been swimming in and fish do not get a pH shock. To test a solution that whether it is acidic, basic or neutral, we use indicators. There are 3 types of indicators- Natural, Synthetic and Olfactory.

Indicator	Colour in the neutral solution	Colour in the acidic solution	Colour in the basic solution
Litmus	Purple	Red	Blue
Phenolphthalein	Colourless	Colourless	Pink
Methyl Orange	Orange	Red	Yellow

- (i) Which of the following will turn Blue litmus red?
- (a) Dry HCl (b) Aqueous HCl
(c) Solution of HCl in Benzene (d) All the above
- (ii) Phenolphthalein is
- (a) Yellow in acidic and pink in basic medium
(b) Pink in acidic and colourless in basic medium
(c) Colourless in acidic and pink in basic medium
(d) Pink in acidic and yellow in basic medium
- (iii) Methyl Orange is in HCl and in NaOH
- (a) red and yellow (b) red and red
(c) yellow and red (d) yellow and yellow
- (iv) What are the colour of methyl orange in acidic and basic medium.

Or

If the pH of a solution is 4-5 and you want to change its pH to 8. Which substance will you prefer to add into it and why?