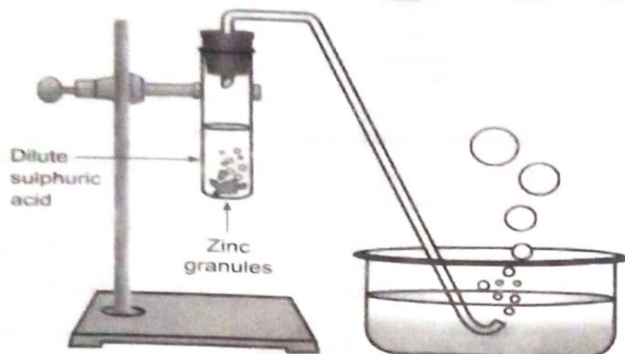


Q 4. Study the given diagram and identify the gas formed in the reaction. **E** (CBSE 2021 Term-1)

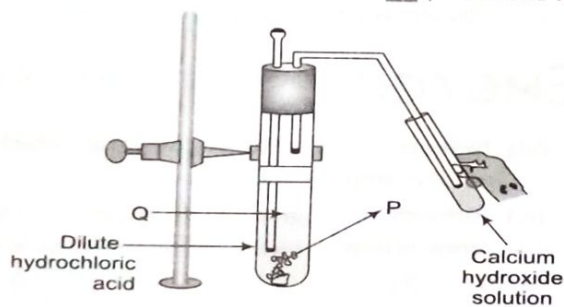


- Carbon dioxide which extinguishes the burning candle
- Oxygen due to which the candle burns more brightly
- Sulphur dioxide which produces a suffocating smell
- Hydrogen which while burning produces a popping sound

Q 5. When 2 mL of sodium hydroxide solution is added to few pieces of granulated zinc in a test tube and then warmed, the reaction that occurs can be written in the form of a balanced chemical equation as: **F** (CBSE 2024)

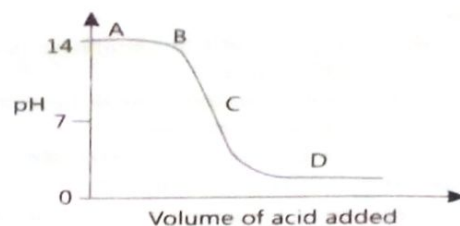
- $\text{NaOH} + \text{Zn} \longrightarrow \text{NaZnO}_2 + \text{H}_2\text{O}$
- $2\text{NaOH} + \text{Zn} \longrightarrow \text{Na}_2\text{ZnO}_2 + \text{H}_2$
- $2\text{NaOH} + \text{Zn} \longrightarrow \text{NaZnO}_2 + \text{H}_2$
- $2\text{NaOH} + \text{Zn} \longrightarrow \text{Na}_2\text{ZnO}_2 + \text{H}_2\text{O}$

Q 6. Study the experimental set-up shown in given figure and choose the correct option from the following: **U** (CBSE 2021 Term-1)



P	Q	Change observed in calcium hydroxide solution
a. K_2CO_3	Cl_2 gas	No change
b. KHCO_3	CO_2 gas	No change
c. KHCO_3	H_2 gas	Turns milky
d. K_2CO_3	CO_2 gas	Turns milky

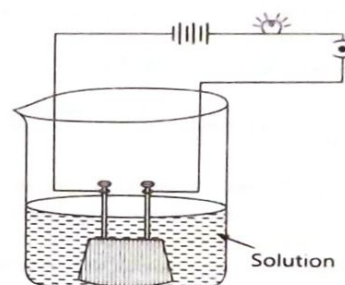
Q 7. The graph given ahead depicts a neutralisation reaction (acid + alkali $\longrightarrow$ salt + water). The pH of a solution changes as we add excess of acid to an alkali.



Which letter denotes the area of the graph where both acid and salt are present? **F** (CBSE SQP 2021 Term-1)

- A
- B
- C
- D

Q 8. In the given experimental set-up, if the experiment is carried out separately with each of the following solutions the cases in which the bulb will glow is/are: **A3** (CBSE 2023)



- Dilute hydrochloric acid
- Dilute sulphuric acid
- Glucose solution
- Alcohol

- Only (i)
- Only (ii)
- (i) and (ii)
- (ii), (iii) and (iv)

Q 9. In order to prepare dry hydrogen chloride gas in humid atmosphere, the gas produced is passed through a guard tube (drying tube) which contains: **U** (CBSE 2025)

- calcium chloride
- calcium oxide
- calcium hydroxide
- calcium carbonate

Q 10. Sodium hydroxide is termed an alkali while Ferric hydroxide is not because: **U** (CBSE 2023)

- sodium hydroxide is a strong base, while ferric hydroxide is a weak base.
- sodium hydroxide is a base which is soluble in water while ferric hydroxide is also a base but it is not soluble in water.
- sodium hydroxide is a strong base while ferric hydroxide is a strong acid.
- sodium hydroxide and ferric hydroxide both are strong base but the solubility of sodium hydroxide in water is comparatively higher than that of ferric hydroxide.

Q 11. Consider the pH value of the following acidic samples:

S. No.	Sample	pH Value
1.	Lemon Juice	2.2
2.	Gastric Juice	1.2

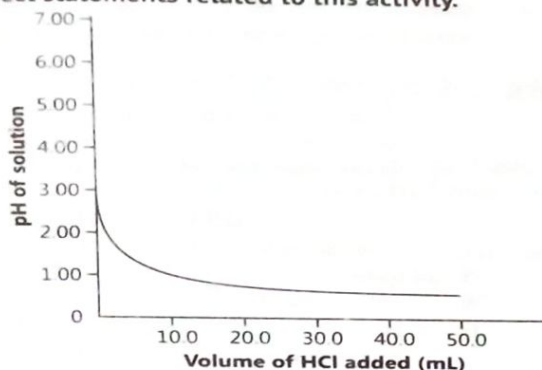
3.	Vinegar	3.76
4.	Dil. Acetic acid	3.0

The decreasing order of their H^+ ion concentration is:

K (CBSE 2021 Term-1)

- a. $3 > 4 > 1 > 2$
 b. $2 > 1 > 3 > 4$
 c. $2 > 1 > 4 > 3$
 d. $3 > 4 > 2 > 1$

- Q 12. 50.0 mL of tap water was taken in a beaker. Hydrochloric acid was added drop by drop to water. The temperature and pH of the solution was noted. The following graph was obtained. Choose the correct statements related to this activity.



- (i) The process of dissolving an acid in water is highly endothermic.
 (ii) The pH of the solution increases rapidly on addition of acid.
 (iii) The pH of the solution decreases rapidly on addition of acid.
 (iv) The pH of tap water was around 7.0.

Ap (CBSE 2021 Term-1)

- a. (i) and (ii)
 b. (i) and (iii)
 c. (iii) and (iv)
 d. (ii) and (iv)

- Q 13. Anita added a drop each of diluted acetic acid and diluted hydrochloric acid on pH paper and compared the colours. Which of the following is the correct conclusion? **A** (CBSE SQP 2022-23)

- a. pH of acetic acid is more than that of hydrochloric acid.
 b. pH of acetic acid is less than that of hydrochloric acid.
 c. Acetic acid dissociates completely in aqueous solution.
 d. Acetic acid is a strong acid

- Q 14. You have three aqueous solutions A, B and C as given below:

A – Potassium nitrate
 B – Ammonium chloride
 C – Sodium carbonate

The ascending order of the pH of these solutions is:

A (CBSE 2025)

- a. $A < B < C$
 b. $B < C < A$
 c. $C < A < B$
 d. $B < A < C$

- Q 15. Calcium phosphate is present in tooth enamel. Its nature is:

K (NCERT EXEMPLAR)

- a. basic
 b. acidic
 c. neutral
 d. amphoteric

- Q 16. Juice of tamarind turns blue litmus to red. It is because of the presence of a chemical compound called:

K (CBSE 2025)

- a. acetic acid
 b. methanoic acid
 c. oxalic acid
 d. tartaric acid

- Q 17. Study the following table and choose the correct option. **U** (CBSE 2021 Term-1)

Salt	Parent Acid	Parent Base	Nature of Salt
a. Sodium Chloride	HCl	NaOH	Basic
b. Sodium Carbonate	H_2CO_3	NaOH	Neutral
c. Sodium Sulphate	H_2SO_4	NaOH	Acidic
d. Sodium Acetate	CH_3COOH	NaOH	Basic

- Q 18. Common salt besides being used in kitchen can also be used as the raw material for making:

- (i) washing soda
 (ii) bleaching powder
 (iii) baking soda
 (iv) slaked lime.

E (NCERT EXEMPLAR)

- a. (i) and (ii)
 b. (i), (ii) and (iv)
 c. (i) and (iii)
 d. (i), (iii) and (iv)

- Q 19. Mild non-corrosive basic salt is: **K** (CBSE SQP 2023-24)

- a. $Ca(OH)_2$
 b. NaOH
 c. NaCl
 d. $NaHCO_3$

- Q 20. A chemical compound used in glass, soap and paper industries is: **A** (CBSE 2024)

- a. washing soda
 b. baking soda
 c. bleaching powder
 d. common salt

- Q 21. The water of crystallisation is present in:

- (i) Bleaching Powder
 (ii) Plaster of Paris
 (iii) Washing Soda
 (iv) Baking Soda

F (CBSE 2025)

- a. (ii) and (iv)
 b. (ii) and (iii)
 c. (i) and (iii)
 d. (i) and (iv)



Assertion & Reason Type Questions ↓

Directions (Q. Nos. 22-30): Each of the following questions consists of two statements, one is Assertion (A) and the other is Reason (R). Give answer:

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

- Q 22. Assertion (A): Bases change red litmus solution into blue litmus solution.

Reason (R): Bases give hydroxide ions in aqueous solution. **K**

- Q 23. Assertion (A): Clove oil is an olfactory indicator.

Reason (R): Smell of clove can be characterised in acidic medium, but it cannot be recognised in basic medium. **K**

- Q 24. Assertion (A): Oxides of metals show basic characters. Reason (R): Oxides of metals react with acid to form salt and water. **U** (CBSE 2024)

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- Q 25. Assertion (A): Hydrochloric acid is a stronger acid than acetic acid.
Reason (R): On dissociation, hydrochloric acid yields lesser hydrogen ions for the same concentration as compared to acetic acid. **A**
- Q 26. Assertion (A): Strength of acid or base decreases with dilution.
Reason (R): Ionisation of an acid or a base increase with dilution. **U**
- Q 27. Assertion (A): Concentrated nitric acid is diluted by adding water slowly to acid with constant stirring.
Reason (R): Concentrated nitric acid is easily soluble in water. **A** (CBSE 2025)

Answers

- (b) Turmeric and Litmus
Turmeric and litmus are natural indicators whereas methyl orange and phenolphthalein are synthetic indicators.
- (b) (ii) and (iii)
- (c) A has pH greater than 7 and B has pH less than 7.
- (d) Hydrogen which while burning produces a popping sound
$$\text{Zn(s)} + \text{H}_2\text{SO}_4(\text{aq}) \longrightarrow \text{ZnSO}_4(\text{aq}) + \text{H}_2(\text{g})$$
- (b) $2\text{NaOH} + \text{Zn} \longrightarrow \text{Na}_2\text{ZnO}_2 + \text{H}_2$
- (d) K_2CO_3 CO_2 gas Turns milky
$$\text{K}_2\text{CO}_3 + 2\text{HCl} \longrightarrow 2\text{KCl} + \text{CO}_2 + \text{H}_2\text{O}$$

$$\text{KHCO}_3 + \text{HCl} \longrightarrow \text{KCl} + \text{CO}_2 + \text{H}_2\text{O}$$

In both cases, CO_2 is produced which turns lime water milky.
- (d) D
When both acid and salt are present, the pH of the solution becomes less than 7. From the graph, pH is less than 7 at only D.
- (c) (i) and (ii)
Bulb will glow in the case of acids (HCl , H_2SO_4 , etc.) and will not glow in case of glucose and alcohol solution.
- (a) Calcium chloride
- (b) Sodium hydroxide is a base which is soluble in water while ferric hydroxide is also a base but it is not soluble in water.
- (c) $2 > 1 > 4 > 3$



TiP

Lower is the pH value, higher is the H^+ ion concentration.

- (c) (iii) and (iv)
- (a) pH of acetic acid is more than that of hydrochloric acid.
- (d) $\text{B} < \text{A} < \text{C}$
A Potassium nitrate (KNO_3) is a neutral salt formed from a strong acid (HNO_3) and a strong base (KOH). Its pH is around 7 (neutral). B Ammonium chloride (NH_4Cl) is an acidic salt formed from a weak base (NH_3) and a strong acid (HCl). Its pH is less than

- Q 28. Assertion (A): Sodium hydrogencarbonate is used as an ingredient in antacids.
Reason (R): NaHCO_3 is a mild non-corrosive basic salt.
- Q 29. Assertion (A): During electrolysis of concentrated aqueous solution of sodium chloride, chlorine gas is given off at the cathode and hydrogen gas at the anode.
Reason (R): Ions in electrolytes are attracted to the oppositely charged electrodes.
- Q 30. Assertion (A): Plaster of Paris should be stored in a moisture proof container.
Reason (R): Plaster of Paris is a powdery mass that absorbs water to form a hard solid, gypsum.

7 (acidic). C: Sodium carbonate (Na_2CO_3) is a basic salt formed from a strong base (NaOH) and a weak acid (H_2CO_3). Its pH is greater than 7 (basic).

The correct order of increasing pH is:

B (acidic) < A (neutral) < C (Basic)

- (a) basic
- (d) Tartaric acid
- (d) Sodium Acetate CH_3COOH NaOH Basic
Sodium chloride is a neutral salt, sodium carbonate is a basic salt, sodium sulphate is a neutral salt and sodium acetate is a basic salt.
- (c) (i) and (iii)
- (d) NaHCO_3
- (a) Washing Soda
Sodium carbonate (washing soda) is used in glass, soap and paper industries.
- (b) (ii) and (iii)
Plaster of Paris $\left(\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}\right)$ and washing soda ($\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$) contain water of crystallisation.
- (b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
- (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
- (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).
- (c) Assertion (A) is true but Reason (R) is false. Reason (R) is false because on dissociation, HCl yields more hydrogen ion for the same concentration as compared to acetic acid.
- (b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).



TiP

Mixing an acid/base with water results decrease in the concentration of $\text{H}_3\text{O}^+/\text{OH}^-$ ions per unit volume. Degree of ionisation increases with dilution.

27. (d) Assertion (A) is false but Reason (R) is true. Assertion is false because to dilute concentrated nitric acid, acid must always be added slowly to water with constant stirring.
28. (b) Both Assertion (A) and Reason (R) are true but Reason (R) is not the correct explanation of Assertion (A).
29. (d) Assertion (A) is false but Reason (R) is true. Assertion is false because in this process, chlorine is given off at anode and hydrogen gas at cathode.
30. (a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of Assertion (A).



Case Study Based Questions ↓

Case Study 1

The pH scale measures how acidic or basic a substance is by making use of hydrogen ion concentrations in them.

Substance	pH	Colour shown by Universal Indicator
A	6	Greenish yellow
B	10	Navy blue
C	0	Dark red
D	8.5	Greenish blue
E	2.5	Orange

Based on the above table, answer of the following questions:

E

- Q 1. Which of the following is/are true about substance B?
- It is the strongest base among the given substance
 - It is used in antacids
 - It turns blue litmus paper to red
 - None of the above
- a. (i) and (ii) b. (ii) and (iii)
c. (i), (ii) and (iii) d. Only (iv)
- Q 2. What happens when a solution of substance D is mixed with a solution of substance E in a test tube?
- Salt formation takes place
 - Temperature of solution remains the same
 - Temperature of solution decreases
 - Temperature of solution increases
- a. Only (i) b. (i) and (ii)
c. (ii) and (iv) d. (i) and (iv)
- Q 3. Arrange the substances A, C and E in increasing order of their acidic strength.
- a. $C < E < A$ b. $A < E < C$
c. $A < C < E$ d. $E < C < A$
- Q 4. Equal volumes of hydrochloric acid and sodium hydroxide solutions of same concentration are mixed and the pH of the resulting solution is checked with a pH paper. What would be the colour obtained?
- a. Blue b. Red
c. Yellowish green d. Orange
- Q 5. Study the table given below and select the row that has the incorrect information.

	Indicators	A, C and E	B and D
a.	Action with methyl orange	They turn methyl orange red	They turn methyl orange yellow
b.	Action with litmus paper	They turn blue litmus paper red	They turn red litmus paper blue
c.	Action with phenolphthalein	No change	They turn phenolphthalein purple
d.	Action with turmeric	No change	They turn turmeric reddish brown

! Answers

- (a) (i) and (ii)
- (d) (i) and (iv)
Base (D) + Acid (E) $\longrightarrow$ Salt + Water
During this reaction, temperature of the solution increases.
- (b) $A < E < C$
- (c) Yellowish green
- (c) Action with phenolphthalein. No change. They turn phenolphthalein purple.
In acidic solution phenolphthalein is colourless but in basic solution it gives pink colour.



TiP

Learn and understand the action of different indicators and make a list of how each one differs from the other one. It is the best way to avoid confusions and mistakes.

Case Study 2

The teacher while conducting practicals in the laboratory divided the students into three groups and gave them various solutions to find out their pH and classify them into acidic, basic and neutral solutions.

Group A: Lemon juice, vinegar, colourless aerated drink.

Group B: Tomato juice, coffee, ginger juice.

Group C: Sodium hydroxide, sodium chloride, lime water.

Read the above passage carefully and give the answer of the following questions: **Ap** (CBSE 2023)

- Q 1. For the solutions provided, which group is/are likely to have pH value (i) less than 7, (ii) greater than 7?
- Q 2. List two ways of determining pH of a solution.
- Q 3. Explain, why the sour substances such as lemon juice are effective in cleaning the tarnished copper vessels?

Or

"pH has great importance in our daily life." Justify this statement by giving two examples.

! Answers

- (i) Group A and B (ii) Group C
- (i) using pH paper
(ii) using universal indicator

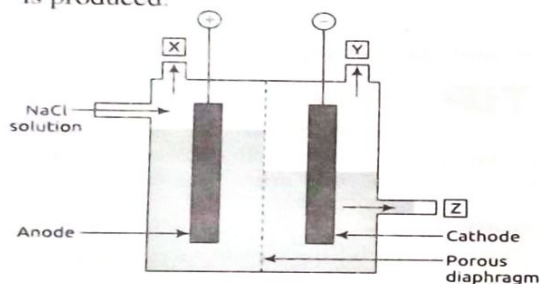
3. Copper reacts with moist carbon dioxide in air to form copper carbonate and as a result, copper vessel loses its shiny brown surface forming a green layer of copper carbonate. The citric acid present in the lemon juice neutralises the basic copper carbonate and dissolves the layer. That is why, tarnished copper vessels are cleaned with sour substances like lemon juice to give the surface of the copper vessel its characteristic lustre.

Or

- (i) Tooth decay starts when the pH of the mouth is lower than 5.5
(ii) Our body works within the pH range of 7.0 to 7.8

Case Study 3

In the diagram given below when electricity is passed through an aqueous solution of a common salt, a substance 'Z' is produced along with the evolution of gases 'X' and 'Y'. When a burning matchstick is brought near the gas 'Y' it burns with a pop sound, whereas X is used for disinfecting drinking water. When gas 'X' is passed through a solution of slaked lime, an insoluble substance 'A' is produced.



Read the above passage carefully and give the answer of the following questions:

- Q 1.** Write the name of gases 'X' and 'Y'.
Q 2. Write the balanced chemical equation for the formation of substance 'A'.
Q 3. Write your observations:
(i) If a drop of blue litmus solution is added to the aqueous solution of substance 'Z'.
(ii) If methyl orange is added to substance 'Z'.
Q 4. Write a balanced chemical reaction that takes place when 'X' and 'Y' react with each other. The product so produced will turn blue litmus red only when wet, why?

Answers

- $X = \text{Cl}_2$ gas and $Y = \text{H}_2$ gas
- $\text{Ca(OH)}_2 + \text{Cl}_2 \longrightarrow \text{CaOCl}_2 + \text{H}_2\text{O}$
Slaked lime (X) (A)
- (i) Z is NaOH. If a drop of blue litmus is added to aqueous solution of NaOH, it will not change to red.
(ii) Since 'Z', i.e., NaOH is a base, it will give yellow colour with methyl orange.
- $\text{H}_2(\text{g}) + \text{Cl}_2(\text{g}) \longrightarrow 2\text{HCl}(\text{g})$
Hydrogen chloride gas produced turns only wet blue litmus red because it is acidic in nature and dissociates in water to give H^+ ions.

Case Study 4

Common salt is a very important chemical compound for our daily life. Its chemical name is sodium chloride and it is used as a raw material in the manufacture of caustic soda, washing soda, baking soda, etc. It is also used in the preservation of pickles, butter, meat, etc.

Read the above passage carefully and give the answer of the following questions: **Ap** (CBSE 2025)

- Q 1.** Name the acid and the base from which common salt can be obtained.
Q 2. State the nature (acidic/basic/neutral) of sodium chloride. Give reason for the justification of your answer.
Q 3. What happens when electric current is passed through an aqueous solution of sodium chloride (called brine)? Name the products obtained along with the corresponding places in the electrolytic cell where each of these products is obtained.

Or

How is washing soda obtained from sodium chloride? Give chemical equation of the reactions involved in the process.

Answers

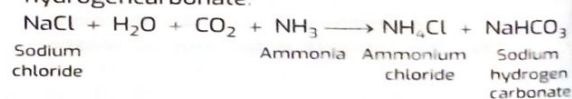
- Acid:** Hydrochloric acid (HCl).
Base: Sodium hydroxide (NaOH)
- Sodium chloride is neutral in nature because it is formed by the reaction of a strong acid (HCl) and a strong base (NaOH).
- When electric current is passed through an aqueous solution of sodium chloride (called brine), it decomposes to form sodium hydroxide, chlorine and hydrogen.

During electrolysis, chlorine gas is given off at the anode, hydrogen gas at the cathode and sodium hydroxide solution is formed near the cathode.

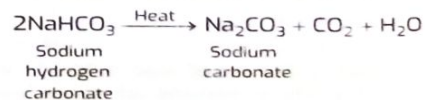
Or

Washing soda is obtained from sodium chloride in the following three steps:

- (i) A solution of sodium chloride is reacted with ammonia and carbon dioxide to obtain sodium hydrogencarbonate.



- (ii) Sodium hydrogencarbonate is heated. On heating, it decomposes to form sodium carbonate.



- (iii) Sodium carbonate is dissolved in water and recrystallised to get washing soda crystals containing 10 molecules of water of crystallisation.

