

## CHAPTER

## 2

## ACIDS, BASES AND SALTS

## Syllabus

Their definitions in terms of furnishing of  $H^+$  and  $OH^-$  ions, general properties, examples and uses, concept of pH scale (Definition relating to logarithm not required), importance of pH in everyday life; preparation and uses of Sodium Hydroxide, Bleaching powder, Baking soda, Washing soda and Plaster of Paris.



## STAND ALONE MCQs

(1 mark each)

**AI** Q. 1. An aqueous solution 'A' turns phenolphthalein solution pink. On addition of an aqueous solution 'B' to 'A', the pink colour disappears. The following statement is true for solution 'A' and 'B'.

[Outside Delhi 2020]

- (A) A is strongly basic and B is a weak base.  
 (B) A is strongly acidic and B is a weak acid.  
 (C) A has pH greater than 7 and B has pH less than 7.  
 (D) A has pH less than 7 and B has pH greater than 7.

Ans. Option (C) is correct.

Q. 2. Identify the basic salt from the following salts:

- (A)  $Na_2CO_3$                       (B)  $NH_4Cl$   
 (C)  $NaNO_3$                       (D)  $KCl$

[Board SQP, 2020]

Ans. Option (A) is correct.

**Explanation:**  $Na_2CO_3$  is a basic salt.

Q. 3. Which one of the following can be used as an acid-base indicator by a visually impaired student?

- (A) Litmus                      (B) Turmeric  
 (C) Vanilla essence        (D) Petunia leaves

Ans. Option (C) is correct.

**Explanation:** Vanilla essence can be used as an acid-base indicator by visually impaired students as it is an olfactory indicator whose odour changes in acidic or basic media.

**AI** Q. 4. Which of the following is acidic in nature?

- (A) Lime juice                      (B) Human blood  
 (C) Lime water                      (D) Antacid

Ans. Option (A) is correct.

**Explanation:** Lime juice is acidic in nature as the juice is obtained from lime, a citrus fruit. This contains citric acid, and is therefore sour in taste.

Q. 5. During the preparation of hydrogen chloride gas on a humid day, the gas is usually passed through the guard tube containing calcium chloride. The role of calcium chloride taken in the guard tube is to

- (A) absorb the evolved gas.  
 (B) moisten the gas.  
 (C) absorb moisture from the gas.  
 (D) absorb  $Cl^-$  ions from the evolved gas.

Ans. Option (C) is correct.

**Explanation:** The role of calcium chloride taken in the guard tube is to absorb moisture from the gas. This is because calcium chloride is used as a drying agent which absorbs moisture from the hydrogen chloride (HCl) gas.

Q. 6. Which of the following are present in a dilute aqueous solution of hydrochloric acid?

- (A)  $H_3O^+ + Cl^-$                       (B)  $H_3O^+ + OH^-$   
 (C)  $Cl^- + OH^-$                       (D) Unionized HCl

Ans. Option (A) is correct.

**Explanation:** In a dilute aqueous solution of hydrochloric acid,  $H_3O^+ + Cl^-$  ions are present.

Q. 7. What happens when a solution of an acid is mixed with a solution of a base in a test tube?

- (i) The temperature of the solution increases
  - (ii) The temperature of the solution decreases
  - (iii) The temperature of the solution remains the same
  - (iv) Salt formation takes place
- (A) (i) only                      (B) (i) and (iii)  
(C) (ii) and (iii)                (D) (i) and (iv)

Ans. Option (D) is correct.

**Explanation:** When a solution of acid is mixed with a solution of base in a test tube then the temperature of the solution increases and salt formation takes place. This is because the process is exothermic that is excess heat is produced by the acid-base reaction which is the net result of the processes of bond-breaking and bond-making.

**AI** Q. 8. Which of the following is used for dissolution of gold?

- (A) Hydrochloric acid    (B) Sulphuric acid  
(C) Nitric acid            (D) Aqua regia

Ans. Option (D) is correct.

**Explanation:** Aqua Regia is a mixture of concentrated  $\text{HNO}_3$  and concentrated  $\text{HCl}$ . Concentrated  $\text{HNO}_3$  acts as a very strong oxidising agent which ionises Au atoms and Concentrated  $\text{HCl}$  produces nascent chlorine which in turn reacts with ionised Au atoms thus forming auric chloride.

Q. 9. Which of the following salts does not contain water of crystallisation?

- (A) Blue vitriol            (B) Baking soda  
(C) Washing soda        (D) Gypsum

Ans. Option (B) is correct.

**Explanation:** Water of crystallisation is the fixed number of water molecules present in one formula unit of a salt. Potassium nitrate, barium sulphate, potassium chloride, sodium nitrate, baking soda, etc., are the salts that do not contain water of crystallisation.

**AI** Q. 10. Sodium carbonate is a basic salt because it is a salt of

- (A) strong acid and strong base.  
(B) weak acid and weak base.  
(C) strong acid and weak base.  
(D) weak acid and strong base.

Ans. Option (D) is correct.

**Explanation:** Sodium carbonate is a basic salt of weak acid i.e. carbonic acid and a strong base i.e. sodium hydroxide.

Q. 11. 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.  
(A) (i) and (ii)            (B) (i), (ii) and (iv)  
(C) (i) and (iii)            (D) (i), (iii) and (iv)

Ans. Option (C) is correct.

**Explanation:** The common salt obtained is an important raw material for various materials of daily use, such as sodium hydroxide, baking soda, washing soda and many more.

Q. 12. One of the constituents of baking powder is sodium hydrogen carbonate, the other constituent is

- (A) hydrochloric acid.    (B) tartaric acid.  
(C) acetic acid.            (D) sulphuric acid.

Ans. Option (B) is correct.

**Explanation:** Baking powder is a mixture of baking soda (sodium hydrogen carbonate) and a mild edible acid such as tartaric acid.

Q. 13. Which of the following is not a salt?

- (A) Sodium chloride  
(B) Slaked lime  
(C) Lead sulphide  
(D) Zinc nitrate

Ans. Option (B) is correct.

**Explanation:** Slaked lime or  $\text{Ca}(\text{OH})_2$  is not a salt.

**AI** Q. 14. A compound is prepared from gypsum upon heating to a temperature of 373 K and it changes back to gypsum on adding water. Which is the incorrect statement about the compound?

- (A) The compound is used for setting fractured bones.  
(B) The compound is called plaster of Paris which is calcium sulphate dehydrate with a formula  $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ .  
(C) If heated at higher temperature, the compound becomes dehydrated and is called dead burnt plaster.  
(D) Both (A) and (B).

Ans. Option (B) is correct.

**Explanation:** The compound is called plaster of Paris which is calcium sulphate hemihydrate with a formula  $\text{CaSO}_4 \cdot 1/2\text{H}_2\text{O}$ .

Q. 15. A milk man adds a very small amount of baking soda to fresh milk. Why?

- (A) To increase the rate of fermentation  
(B) To decrease the rate of fermentation  
(C) To increase its quality  
(D) To make paneer

Ans. Option (B) is correct.

**Explanation:** A milk man adds a very small amount of baking soda to fresh milk to decrease the rate of fermentation.

**AI** Q. 16. Which of the given substances is used in the following applications?

- I. It is used as a fire proofing material.  
II. It is used for sealing gaps in laboratory apparatus.  
III. It is used in making toys.

**A**

- (A) Bleaching powder
- (B) Plaster of Paris
- (C) Baking soda
- (D) Washing soda

Ans. Option (B) is correct.

**Explanation:** The chemical formula for Plaster of Paris is  $(\text{CaSO}_4) \cdot \frac{1}{2}\text{H}_2\text{O}$  which is commonly used as fire proofing insulating material on walls, for casting toys and can be used in sealing pots and lab apparatus.



## ASSERTION AND REASON BASED MCQs (1 Mark each)

**Directions :** In the following questions, A statement of Assertion (A) is followed by a statement of Reason (R). Mark the correct choice as.

- (A) Both A and R are true and R is the correct explanation of A.
- (B) Both A and R are true but R is NOT the correct explanation of A.
- (C) A is true but R is false.
- (D) A is false and R is True.

**Q. 1. Assertion (A):** After white washing the walls, a shiny white finish on walls is obtained after two to three days.

**Reason (R):** Calcium Oxide reacts with Carbon dioxide to form Calcium Hydrogen Carbonate which gives shiny white finish. [SQP 2020-2021]

Ans. Option (C) is correct.

[CBSE Marking Scheme, 2020]

**Explanation:** Calcium hydroxide is obtained by reaction of calcium oxide and water.

**Q. 2. Assertion (A):** When zinc is added to dilute hydrochloric acid, hydrogen is given off.

**Reason (R):** Hydrogen chloride molecules contain hydrochloric acid and hydrogen atoms.

Ans. Option (B) is correct.

**Explanation:** The metal zinc readily reacts with hydrochloric acid to produce hydrogen gas ( $\text{H}_2$ ) and zinc chloride ( $\text{ZnCl}_2$ ).

**Q. 3. Assertion (A):** Gas bubbles are observed when sodium carbonate is added to dilute hydrochloric acid.

**Reason (R):** Carbon dioxide is given off in the reaction.

Ans. Option (A) is correct.

**Explanation:** Sodium carbonate reacts with excess hydrochloric acid to form sodium chloride, water and carbon dioxide. In this reaction, bubbles of carbon dioxide are observed.

**Q. 4. Assertion (A):** Ammonia solution is an alkali.

**Reason (R):** Ammonia solution turns blue litmus paper red.

Ans. Option (C) is correct.

**Explanation:** Ammonia solution, which is alkaline, turn the red litmus paper blue.

**Q. 5. Assertion (A):** When common salt is kept open, it absorbs moisture from the air.

**Reason (R):** Common salt contains magnesium chloride.

Ans. Option (A) is correct.

**Explanation:** Magnesium chloride present in common salt is deliquescent substance *i.e.*, it absorbs moisture from the air when kept in open.

**Q. 6. Assertion (A):** Baking soda creates acidity in the stomach.

**Reason (R):** Baking soda is alkaline.

Ans. Option (D) is correct.

**Explanation:** Baking soda, being alkaline, neutralises the acidity in the stomach and removes it.

**Q. 7. Assertion (A):** Plaster of Paris is used by doctors for setting fractured bones.

**Reason (R):** When Plaster of Paris is mixed with water and applied around the fractured limbs, it sets into a hard mass.

Ans. Option (A) is correct.

**Explanation:** Plaster of Paris when mixed with water and applied around the fractured limbs, it sets in to a hard mass and keeps the bone joints in a fixed position. So, it is commonly used for setting fractured bones.

**Q. 8. Assertion:** Sodium hydrogen carbonate is an acidic salt.

**Reason:** It is a salt produced by the neutralization reaction between a strong base (NaOH) and a weak acid ( $\text{H}_2\text{CO}_3$ ).

Ans. Option (D) is correct.

**Explanation:** Sodium hydrogen carbonate is a basic salt. It is produced by the neutralization reaction between a strong base (NaOH) and a weak acid ( $\text{H}_2\text{CO}_3$ ).

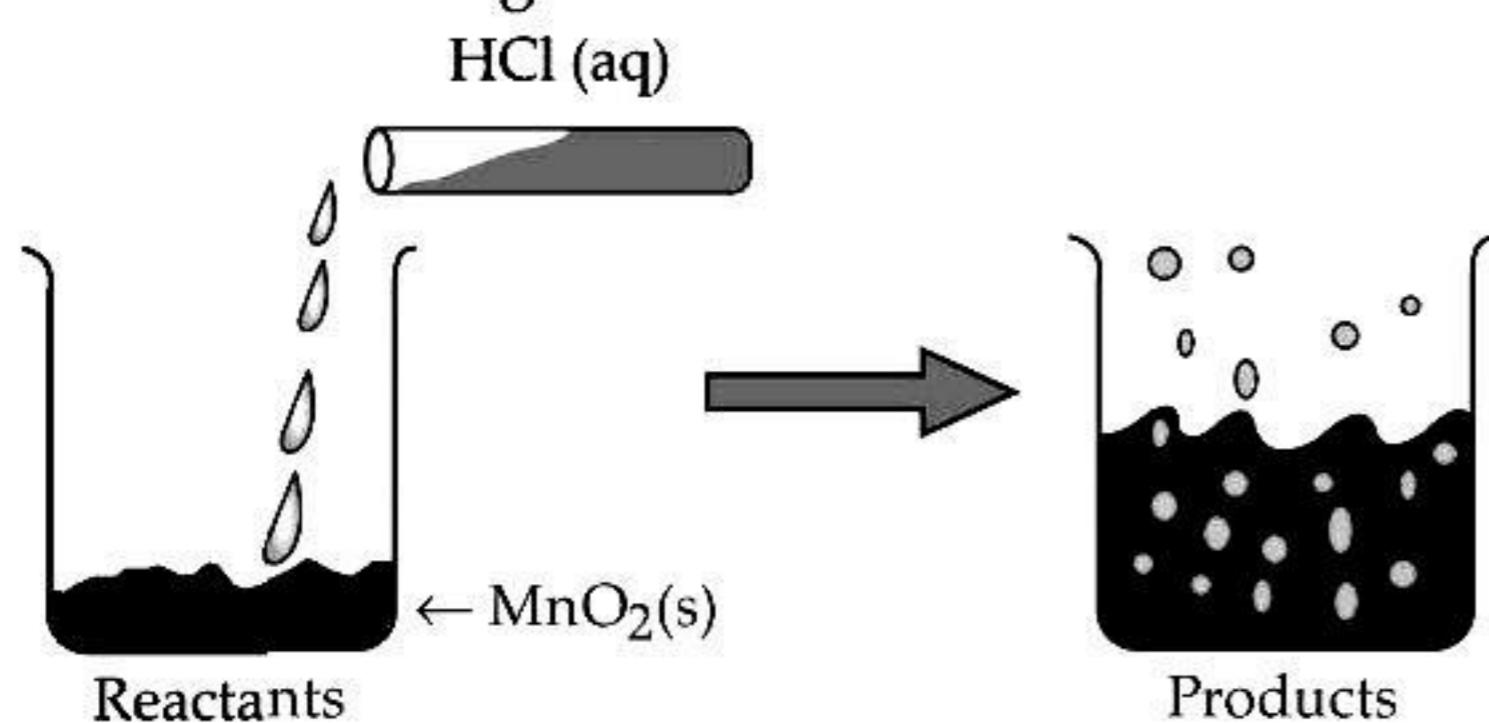


## CASE-BASED MCQs

Attempt any 4 sub-parts from each question.  
Each sub-part carries 1 mark.

I. Read the following and answer any four questions from Q.1 to Q.5. [CBSE–QB 2021]

The reaction between  $\text{MnO}_2$  with  $\text{HCl}$  is depicted in the following diagram. It was observed that a gas with bleaching abilities was released.



Q. 1. The chemical reaction between  $\text{MnO}_2$  and  $\text{HCl}$  is an example of:

- (A) displacement reaction
- (B) combination reaction
- (C) redox reaction
- (D) decomposition reaction.

Ans. Option (C) is correct.

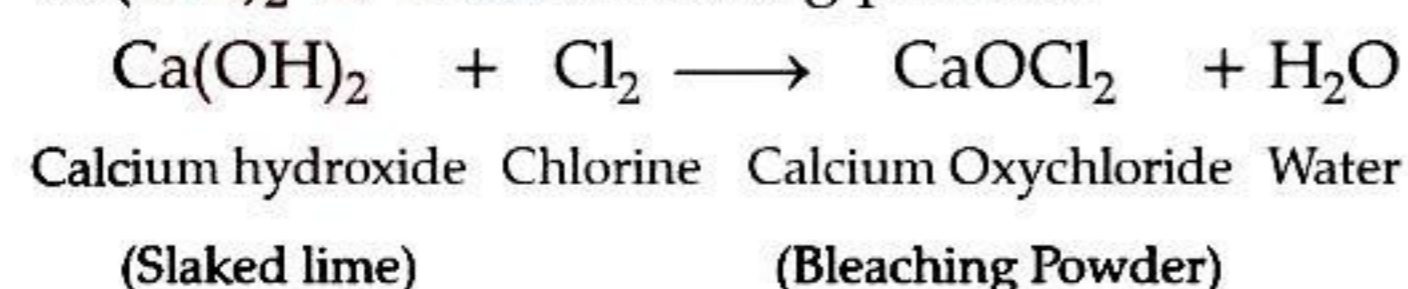
**Explanation:**  $\text{MnO}_2$  gets reduced as it loses oxygen while  $\text{HCl}$  gets oxidized to  $\text{H}_2\text{O}$ .

Q. 2. 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) conc. solution of  $\text{Ca}(\text{OH})_2$
- (D) dry  $\text{CaO}$

Ans. Option (A) is correct.

**Explanation:** Chlorine gas reacts with dry  $\text{Ca}(\text{OH})_2$  to form bleaching powder.



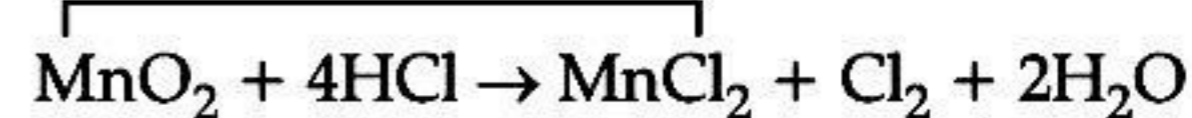
Q. 3. Identify the correct statement from the following:

- (A)  $\text{MnO}_2$  is getting reduced whereas  $\text{HCl}$  is getting oxidized.
- (B)  $\text{MnO}_2$  is getting oxidized whereas  $\text{HCl}$  is getting reduced.
- (C)  $\text{MnO}_2$  and  $\text{HCl}$  both are getting reduced.
- (D)  $\text{MnO}_2$  and  $\text{HCl}$  both are getting oxidized.

Ans. Option (A) is correct.

**Explanation:** When manganese dioxide reacts with hydrochloric acid, the manganese dioxide ( $\text{MnO}_2$ ) reduces to  $\text{MnCl}_2$  while hydrochloric acid ( $\text{HCl}$ ) oxidizes to chlorine gas ( $\text{Cl}_2$ ).

Removal of Oxygen – Reduction



Addition of Oxygen – Oxidation

Q. 4. In the above discussed reaction, what is the nature of  $\text{MnO}_2$ ?

- (A) Acidic oxide
- (B) Basic oxide
- (C) Neutral oxide
- (D) Amphoteric oxide

Ans. Option (B) is correct.

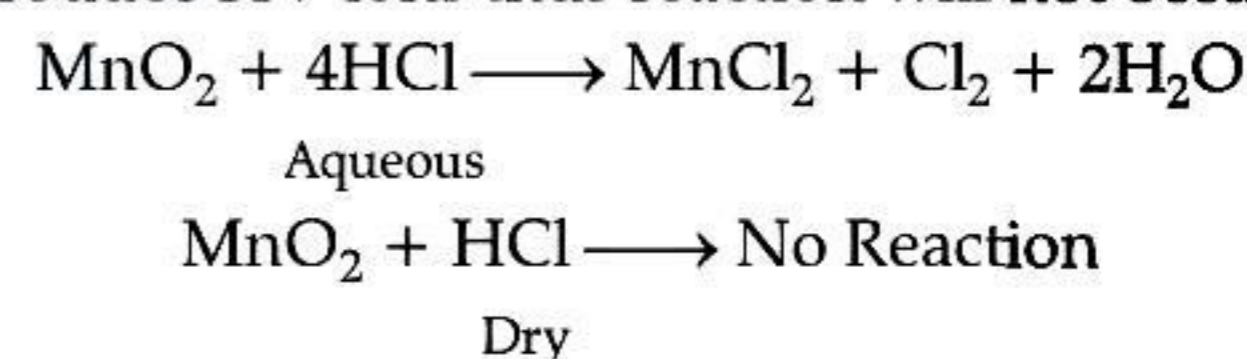
**Explanation:** Manganese is a metal and Metal oxides are basic oxides.

Q. 5. What will happen if we take dry  $\text{HCl}$  gas instead of aqueous solution of  $\text{HCl}$ ?

- (A) Reaction will occur faster.
- (B) Reaction will not occur.
- (C) Reaction rate will be slow.
- (D) Reaction rate will remain the same.

Ans. Option (B) is correct.

**Explanation:** Dry  $\text{HCl}$  will not dissociate to produce  $\text{H}^+$  ions thus reaction will not occur.



II. Read the following and answer any four questions from Q.1 to Q.5. [CBSE–QB 2021]

Frothing in Yamuna:

The primary reason behind the formation of the toxic foam is high phosphate content in the wastewater because of detergents used in dyeing industries, dhobi ghat Yamuna's pollution level is so bad that parts of it have been labelled 'dead' as there is no oxygen in it for aquatic life to survive.



Q. 1. Predict the pH value of the water of river Yamuna if the reason for froth is high content of detergents dissolved in it.

- (A) 10-11
- (B) 5-7
- (C) 2-5
- (D) 7

Ans. Option (A) is correct.

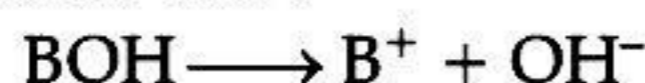
**Explanation:** Detergents are bases and bases have pH greater than 7.

Q. 2. Which of the following statements is correct for the water with detergents dissolved in it?

- (A) low concentration of hydroxide ion ( $\text{OH}^-$ ) and high concentration of hydronium ion ( $\text{H}_3\text{O}^+$ ).  
 (B) high concentration of hydroxide ion ( $\text{OH}^-$ ) and low concentration of hydronium ion ( $\text{H}_3\text{O}^+$ ).  
 (C) high concentration of hydroxide ion ( $\text{OH}^-$ ) as well as hydronium ion ( $\text{H}_3\text{O}^+$ ).  
 (D) equal concentration of both hydroxide ion ( $\text{OH}^-$ ) and hydronium ion ( $\text{H}_3\text{O}^+$ ).

Ans. Option (B) is correct.

**Explanation:** Detergents are bases. Bases ionise to form  $\text{OH}^-$  and thus there will be high concentration of  $\text{OH}^-$ .



Q. 3. 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 solutions in increasing order of their hydronium ion concentration?

- (A)  $\text{P} > \text{Q} > \text{R} > \text{S}$       (B)  $\text{P} > \text{S} > \text{Q} > \text{R}$   
 (C)  $\text{S} < \text{Q} < \text{R} < \text{P}$       (D)  $\text{S} < \text{P} < \text{Q} < \text{R}$

Ans. Option (C) is correct.

**Explanation:** The pH value and hydrogen ion concentration are inversely proportional. This means if hydronium concentration increases, the pH decreases, causing solution to become more acidic. So hydronium ion concentration will be of the order:  $\text{S} < \text{Q} < \text{R} < \text{P}$

Q. 4. High content of phosphate ion in river Yamuna may lead to:

- (A) decreased level of dissolved oxygen and increased growth of algae.  
 (B) decreased level of dissolved oxygen and no effect of growth of algae.  
 (C) increased level of dissolved oxygen and increased growth of algae.  
 (D) decreased level of dissolved oxygen and decreased growth of algae.

Ans. Option (A) is correct.

**Explanation:** The phosphate ion promote the growth of algae in water. So, the high level of phosphate ion in river Yamuna may lead to decreased level of oxygen and increased growth of algae. This process is known as eutrophication.

Q. 5. If a sample of water containing detergents is provided to you, which of the following methods will you adopt to neutralize it?

- (A) Treating the water with baking soda  
 (B) Treating the water with vinegar  
 (C) Treating the water with caustic soda  
 (D) Treating the water with washing soda

Ans. Option (B) is correct.

**Explanation:** Neutralisation takes place when acid and base react to form salt and water. Since, detergent is a base and vinegar is an acid, thus neutralization takes place.

III. Read the following and answer any four questions from Q.1 to Q.5.

Study the given table and answer the following questions. It shows the pH value of the plaque (which collects around teeth) surrounding the teeth of a child over 3 hrs.

| Time/h | pH  |
|--------|-----|
| 0.00   | 7.0 |
| 1.0    | 7.0 |
| 2.0    | 7.1 |
| 3.0    | 7.2 |
| 4.0    | 4.1 |

Q. 1. The three constituents of plaque are

- (A) Acid      (B) Saliva  
 (C) Bacteria      (D) All of these

Ans. Option (D) is correct.

**Explanation:** The constituents of plaque are acid, saliva, bacteria and food.

Q. 2. The pH which leads to tooth decay?

- (A) above 7      (B) at 7  
 (C) below 5.5      (D) above 5.5

Ans. Option (C) is correct.

**Explanation:** A lower pH below 5.5, leads to tooth decay. At this pH, the calcium phosphate of enamel of tooth gets corroded.

Q. 3. State the time during the day when condition is most favourable for process of tooth decay.

- (A) 1.0      (B) 2.0  
 (C) 3.0      (D) 4.0

Ans. Option (D) is correct.

**Explanation:** Time 4.0, lowest pH indicates the highest amount of acid produced by the bacteria.

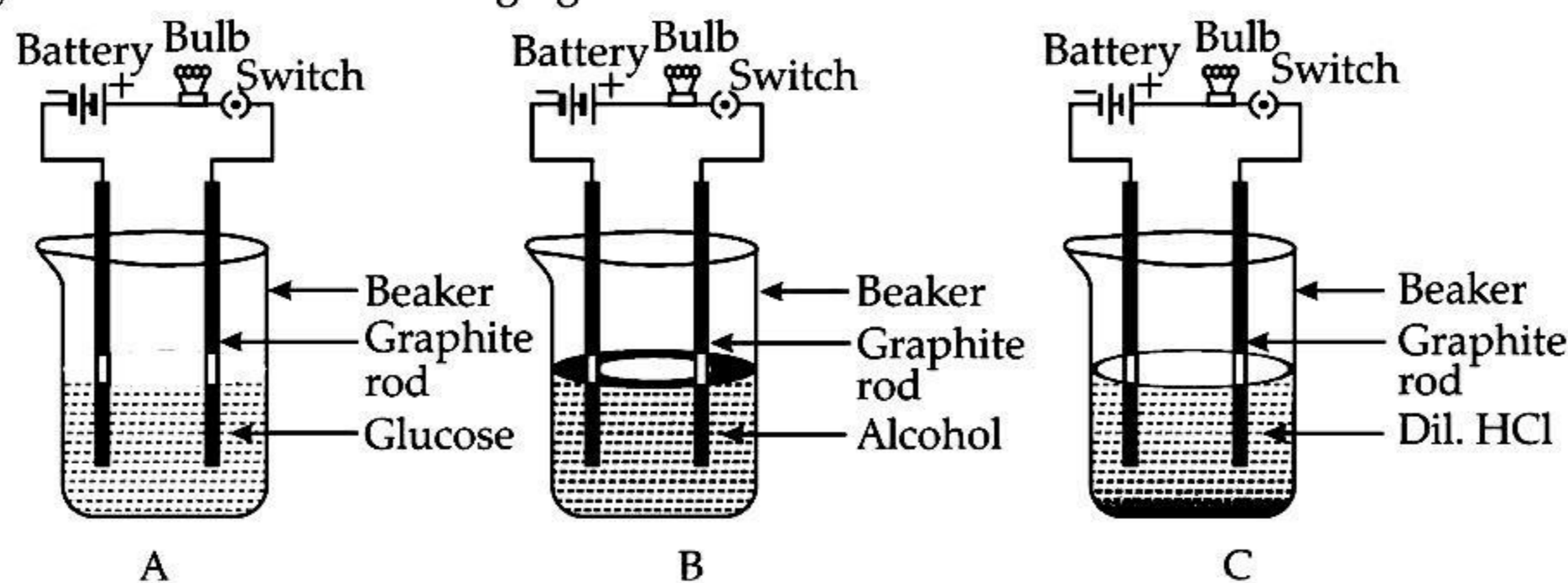
Q. 4. The nature of toothpastes commonly used to protect tooth decay is:

- (A) acidic      (B) basic  
 (C) neutral      (D) none of the above

Ans. Option (B) is correct.

**Explanation:** The tooth paste commonly used is basic so that the extra acid formed during tooth decay is neutralised and prevent tooth decay.

IV. Suhana takes three beakers A, B and C filled with aqueous solutions of glucose, alcohol and hydrochloric acid respectively as shown in the following figure:



Q. 1. Which of the following statement is correct in terms of glowing of bulb when the switch is ON?

- (A) Bulb A and B do not glow but bulb C glows.  
 (B) Bulb A and C do not glow but bulb B glows.  
 (C) Bulb B and C do not glow but bulb A glows.  
 (D) All the bulbs glow.

Ans. Option (A) is correct.

**Explanation:** Glucose and alcohol solutions do not conduct electricity as they do not have ions. Dil. HCl contains ions so the flow of ions is responsible for the flow of current.

Q. 2. The bulb glows in a solution depending on whether the solution is:

- (A) acidic (B) an electrolyte  
 (C) basic (D) a non electrolyte

Ans. Option (B) is correct.

**Explanation:** An electrolyte is a solution that can conduct electricity due to ions present in it.

Q. 3. Which of the following are present in a dilute aqueous solution of hydrochloric acid?

- (A)  $\text{H}_3\text{O}^+ + \text{Cl}^-$  (B)  $\text{H}_3\text{O}^+ + \text{OH}^-$   
 (C)  $\text{Cl}^- + \text{OH}^-$  (D) Unionized HCl

Ans. Option (A) is correct.

**Explanation:** In a dilute aqueous solution of hydrochloric acid,  $\text{H}_3\text{O}^+ + \text{Cl}^-$  ions are present.

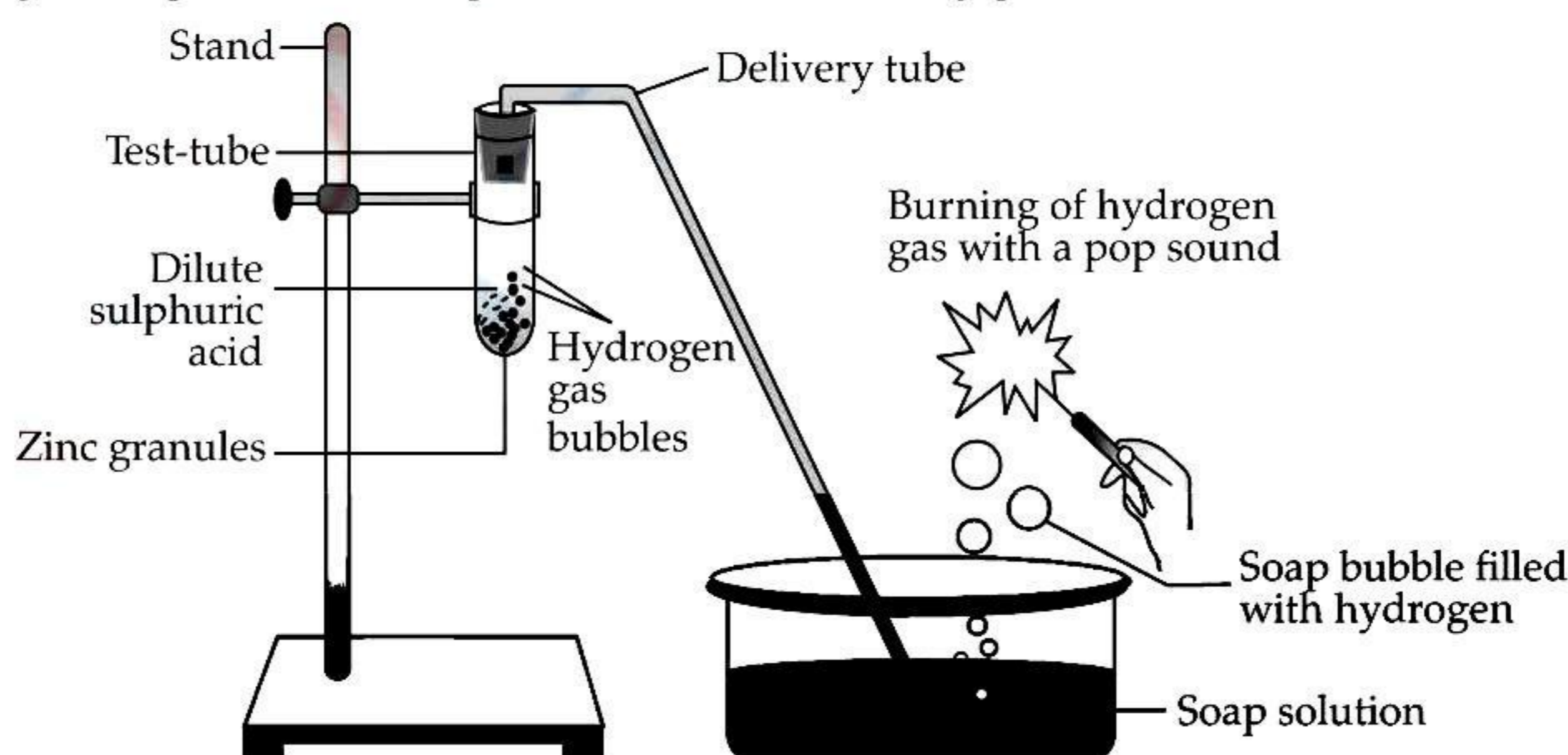
Q. 4. Which of the following statement is true if alcohol is replaced with NaOH solution:

- (A) bulb glows in alcohol but not in NaOH solution.  
 (B) bulb will glow in NaOH solution but not in alcohol.  
 (C) bulb does not glow in alcohol and neither will it glow in NaOH solution.  
 (D) bulb glows in NaOH solution as well as in alcohol.

Ans. Option (B) is correct.

**Explanation:** After replacement, bulb glows in B as NaOH solution contains  $\text{Na}^+$  and  $\text{OH}^-$  ions, which are responsible for electrical conductivity.

V. Study the given experimental set-up and answer the following questions.



Q. 1. The above experimental set up shows reaction between metal and

- (A) Acid  
 (B) Metal carbonate  
 (C) Metal hydrogen carbonate  
 (D) Metal oxide

Ans. Option (A) is correct.

**Explanation:** It is a reaction between a metal (Zn) and an acid ( $\text{H}_2\text{SO}_4$ )

Q. 2. Which gas is liberated during the process?

- (A) Hydrogen gas  
 (B) Carbon dioxide gas  
 (C) Nitrogen gas  
 (D) Hydrogen sulphide gas

Ans. (b) Option (A) is correct.

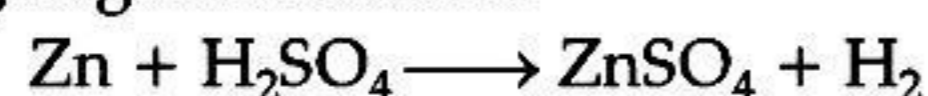
**Explanation:** During the reaction between a metal and an acid, hydrogen gas is released.

Q. 3. Write the products formed in the above process:

- (A) Zinc sulphate only  
 (B) Only hydrogen gas  
 (C) Zinc sulphate and hydrogen gas  
 (D) Zinc sulphide and hydrogen gas

Ans. Option (C) is correct.

**Explanation:** During the reaction between a zinc and sulphuric acid, zinc sulphate and hydrogen gas is released.

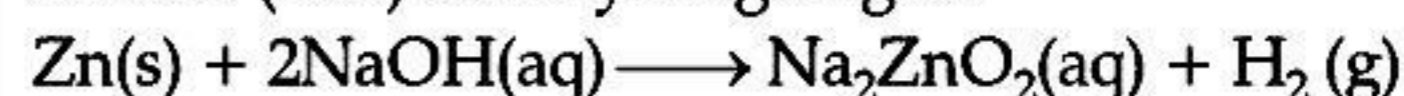


Q. 4. A new product sodium zincate is formed if sulphuric acid is replaced with:

- (A) Sodium hydroxide (B) Sodium oxide  
 (C) Zinc oxide (D) water

Ans. Option (A) is correct.

**Explanation:** If sulphuric acid is replaced with sodium hydroxide, it will produce sodium zincate (Salt) and hydrogen gas.



VI. Read the given passage and answer any four questions from Q.1 to Q.5.

P, Q, R are different colourless solids, while S is a colourless solution. They are (in random order) Sodium chloride (NaCl), Calcium Carbonate (CaCO<sub>3</sub>), Acetic acid (CH<sub>3</sub>COOH) and Phenolphthalein indicator. Small amount of the above substances were added in pairs (e.g. P with Q; Q with R etc.) to a small amount of water in a test tube. They give the following results as shown in the observation table.

Observation Table:

|   | P                | Q           | R             |
|---|------------------|-------------|---------------|
| Q | No reaction      | -           | No reaction   |
| R | Dark Pink Colour | No reaction | -             |
| S | No reaction      | No reaction | Effervescence |

Q. 1. The chemicals are:

|     | P                    | Q                    | R                    | S                    |
|-----|----------------------|----------------------|----------------------|----------------------|
| (A) | NaCl                 | CaCO <sub>3</sub>    | CH <sub>3</sub> COOH | Phenolphthalein      |
| (B) | Phenolphthalein      | NaCl                 | CaCO <sub>3</sub>    | CH <sub>3</sub> COOH |
| (C) | CH <sub>3</sub> COOH | Phenolphthalein      | NaCl                 | CaCO <sub>3</sub>    |
| (D) | CaCO <sub>3</sub>    | CH <sub>3</sub> COOH | Phenolphthalein      | NaCl                 |

Ans. Option (B) is correct.

**Explanation:** The chemical P is Phenolphthalein, Q is NaCl, R is CaCO<sub>3</sub>, and S is CH<sub>3</sub>COOH.

Q. 2. Which of the following reaction is incorrect ?

- (A) Phenolphthalein (P) + NaCl (Q)  $\longrightarrow$  No reaction  
 (B) Phenolphthalein + CaCO<sub>3</sub> (R)  $\longrightarrow$  Alkaline medium (Dark Pink Colour)  
 (C) Phenolphthalein + NaCl  $\longrightarrow$  Acidic medium (Blue colour)  
 (D) CaCO<sub>3</sub> (R) + 2CH<sub>3</sub>COOH (S)  $\longrightarrow$  (CH<sub>3</sub>COO)<sub>2</sub>Ca + CO<sub>2</sub> (effervescence) + 2H<sub>2</sub>O

Ans. Option (C) is correct.

**Explanation:** The correct reactions are:

- (i) Phenolphthalein (P) + NaCl (Q)  $\longrightarrow$  No reaction  
 (ii) Phenolphthalein + CaCO<sub>3</sub> (R)  $\longrightarrow$  Alkaline medium (Dark Pink Colour)  
 (iii) CaCO<sub>3</sub> (R) + 2CH<sub>3</sub>COOH (S)  $\longrightarrow$  (CH<sub>3</sub>COO)<sub>2</sub>Ca + CO<sub>2</sub> (effervescence) + 2H<sub>2</sub>O

Q. 3. The chemicals that can be used as an acid-base indicator by a visually impaired student is \_\_\_\_\_.

- (A) Petunia leaves (B) Vanilla essence  
 (C) Phenolphthalein (D) Turmeric

Ans. Option (B) is correct.

**Explanation:** Vanilla essence can be used as an acid-base indicator by visually impaired students as it is an olfactory indicator whose odour changes in acidic or basic media.

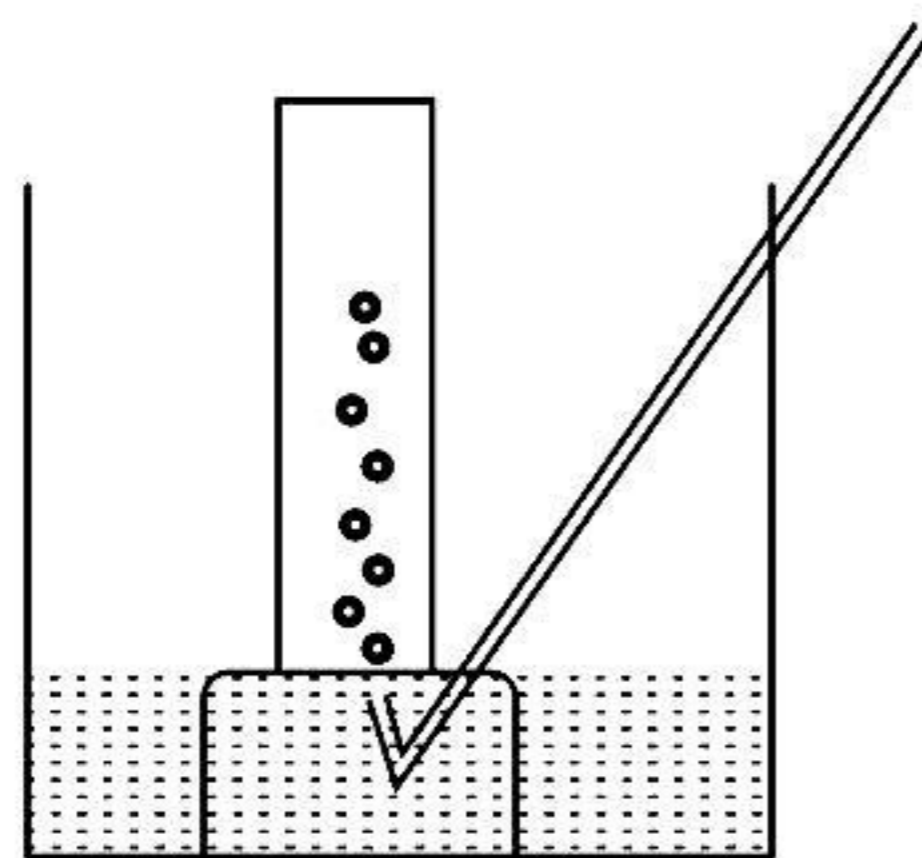
Q. 4. If acetic acid and hydrochloric acid of same concentration are taken, HCl is a stronger acid because it contains:

- (A) more of Cl<sup>-</sup> ions.  
 (B) more of H<sup>+</sup> ions.  
 (C) less of H<sup>+</sup> ions  
 (D) more of CH<sub>3</sub>COO<sup>-</sup> ions.

Ans. Option (B) is correct.

**Explanation:** HCl is stronger because it gives rise to more H<sup>+</sup> ions than acetic acid.

VII. A metal is treated with dilute sulphuric acid. The gas evolved is collected by the method shown in the figure:



Q. 1. Name the gas evolved:

- (A) Hydrogen  
(B) Oxygen  
(C) Sulphur dioxide gas  
(D) Carbon dioxide

Ans. Option (A) is correct.

**Explanation:** Hydrogen gas. It is soluble in water.

Q. 2. The gas evolved is :

- (A) Lighter than air  
(B) Heavier than air

Ans. Option (A) is correct.

**Explanation:** Lighter than air. When a burning splinter is brought near the gas it burns with a pop sound.

Q. 3. If the metal used above is zinc, choose the correct balanced chemical equation for the evolution of gas ?

- (A)  $2\text{Zn}_{(s)} + \text{H}_2\text{SO}_4(\text{dil}) \rightarrow 2\text{ZnSO}_4(\text{aq}) + \text{H}_{2(g)}\uparrow$   
(B)  $\text{Zn}_{(s)} + \text{H}_2\text{SO}_4(\text{dil}) \rightarrow \text{ZnSO}_4(\text{aq}) + \text{H}_{2(g)}\uparrow$   
(C)  $\text{Zn}_{(s)} + 2\text{H}_2\text{SO}_4(\text{dil}) \rightarrow 2\text{ZnSO}_4(\text{aq}) + \text{H}_{2(g)}\uparrow$   
(D)  $2\text{Zn}_{(s)} + \text{H}_2\text{SO}_4(\text{dil}) \rightarrow \text{ZnSO}_4(\text{aq}) + 2\text{H}_{2(g)}\uparrow$

Ans. Option (B) is correct.

**Explanation:** The balanced chemical equation is :  $\text{Zn}_{(s)} + \text{H}_2\text{SO}_4(\text{dil}) \rightarrow \text{ZnSO}_4(\text{aq}) + \text{H}_{2(g)}\uparrow$

Q. 4. What nature of hydrogen is used as a fuel in rocket ?

- (A) solid (B) liquid  
(C) gaseous (D) all of the above

Ans. Option (B) is correct.

**Explanation:** Liquid hydrogen is used as a fuel in rockets.

VIII. Read the given passage and answer any four questions from Q.1. to Q.5.

Suhana wanted her house to be white washed. She bought 10 kg of quicklime from the market and dissolved it in 30 L of water. On adding lime to water, she observed that the water started boiling even when it was not being heated.

Q.1. Name the product when water is added to quicklime.

- (A) Calcium oxide (B) Calcium hydroxide  
(C) Calcium dioxide (D) Calcium carbonate

Ans. Option (B) is correct.

**Explanation:** Calcium hydroxide,  $\text{Ca}(\text{OH})_2$   
 $\text{CaO} + \text{H}_2\text{O} \rightarrow \text{Ca}(\text{OH})_2 + \text{Heat}$

Q. 2. The common name for quick lime is:

- (A) Calcium hydroxide (B) Calcium oxide  
(C) Calcium dioxide (D) Calcium carbonate

Ans. Option (B) is correct.

**Explanation:** The common name for quick lime is CaO.

Q. 3. The correct formula for calcium hydroxide is:

- (A)  $\text{Ca}(\text{OH})$  (B)  $\text{Ca}(\text{OH})_2$   
(C)  $\text{Ca}(\text{OH})_2$  (D)  $\text{Ca}_2\text{OH}_2$

Ans. Option (C) is correct.

**Explanation:** The chemical formula for calcium hydroxide is  $\text{Ca}(\text{OH})_2$   
 $\text{CaO} + \text{H}_2\text{O} \rightarrow \text{Ca}(\text{OH})_2 + \text{Heat}$

Q. 4. Which of the following statements is correct about the above reaction based on your observations?

- (i) It is an endothermic reaction.  
(ii) It is an exothermic reaction  
(iii) The pH of the resulting solution will be more than seven.  
(iv) The pH of the resulting solution will be less than seven.  
(A) (i) and (ii) (B) (ii) and (iii)  
(C) (i) and (iv) (D) (iii) and (iv)

Ans. Option (B) is correct.

**Explanation:** It is an exothermic reaction because heat is given out. The resulting compound is  $\text{Ca}(\text{OH})_2$  which is basic in nature. So the pH of the resulting solution will be more than seven.

IX. Read the given passage and answer the following questions from Q.1. to Q.4.

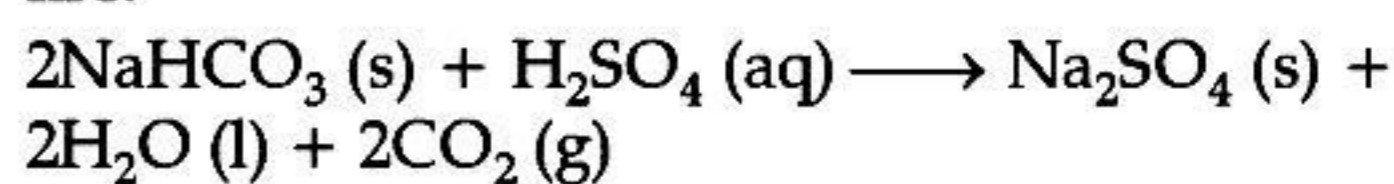
Sanjana while preparing cake used baking soda in small amounts. It helps to make the cake soft and spongy. An aqueous solution of baking soda also turns red litmus blue. It is also used in soda acid extinguisher.

Q. 1. Name the gas produced by the reaction of baking soda and acid which helps as fire extinguisher:

- (A) Carbon monoxide (B) Carbon dioxide  
(C) Hydrogen (D) Oxygen

Ans. Option (B) is correct.

**Explanation:** The  $\text{CO}_2$  gas produced by the reaction of baking soda and acid in the soda – acid fire extinguisher, helps in extinguishing fire.



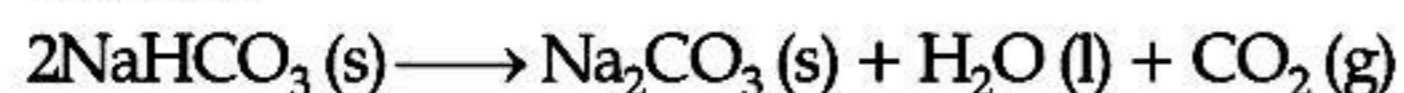
Q. 2. Name the products formed when baking soda is heated:



- (A) Sodium sulphate and carbon dioxide gas.
- (B) Sodium carbonate and water.
- (C) Sodium carbonate, carbon dioxide and water.
- (D) Sodium oxide carbon dioxide and water.

Ans. Option (C) is correct.

**Explanation:** When it is heated, it disintegrates into sodium carbonate, water and carbon dioxide.



Q. 3. The pH of baking soda solution is :

- (A) more than 7
- (B) less than 7
- (C) equal to 7
- (D) less than 7 but more than 3.

Ans. Option (A) is correct.

**Explanation:** pH value of baking soda solution is higher than 7 i.e., it is alkaline.

Q. 4. What is the chemical name for baking soda?

- (A) Sodium carbonate
- (B) sodium bicarbonate
- (C) calcium carbonate
- (D) calcium bicarbonate.

Ans. Option (B) is correct.

**Explanation:** The chemical name for baking soda is sodium bicarbonate.

X. Read the given passage and answer the following questions from Q.1. to Q.5.

A dry pellet of a common base B when kept in open absorbs moisture and turns sticky. The compound is also a by-product of chloro-alkali process.

Q. 1. Identify B:

- (A) Sodium chloride      (B) Sodium hydroxide
- (C) Carbon dioxide      (D) Sodium carbonate

Ans. Option (B) is correct.

**Explanation:** B is sodium hydroxide (NaOH). It is obtained by the electrolytic decomposition of solution of sodium chloride (brine). When electricity is passed through an aqueous solution of sodium chloride (brine), it decomposes to form sodium hydroxide. Chlorine gas is given off at the anode, and the hydrogen gas at the cathode. The process is called chlor - alkali process because of the products formed- Chlor for chlorine and alkali for sodium hydroxide.

Q. 2. What type of reaction occurs when B is treated with an acidic oxide?

- (A) Neutralisation
- (B) Double decomposition
- (C) Combination
- (D) Displacement

Ans. Option (A) is correct.

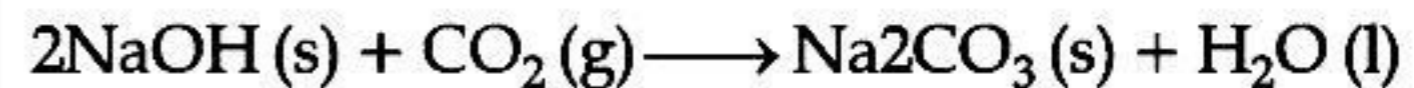
**Explanation:** Neutralisation reaction occurs when B is treated with an acidic oxide.

Q. 3. What is the raw material used in chloro-alkali?

- (A) Aqueous solution of sodium chloride
- (B) Sodium chloride in dry form
- (C) Sodium hydroxide
- (D) Sodium carbonate

Ans. Option (A) is correct.

**Explanation:** The raw material used in chloro-alkali is NaOH.

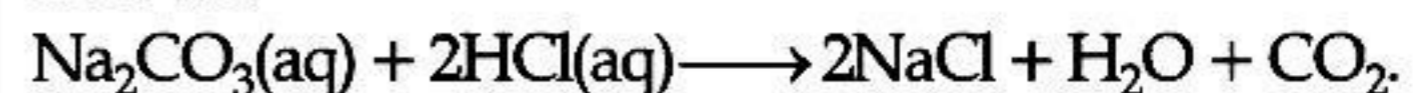


Q. 4. When aqueous sodium carbonate ( $\text{Na}_2\text{CO}_3$ ) reacts with HCl (aq), it gives

- (A) NaOH,  $\text{H}_2$  and  $\text{CO}_2$
- (B) NaCl,  $\text{H}_2\text{O}$  and  $\text{CO}_2$
- (C)  $\text{NaHCO}_3$ ,  $\text{H}_2$  and  $\text{CO}_2$
- (D)  $\text{NaHCO}_3$ ,  $\text{H}_2\text{O}$  and  $\text{CO}_2$

Ans. Option (B) is correct.

**Explanation:** The chemical reaction is as follows:



□□□