ACID BASES AND SALTS

I. MCQ'S

1. 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)

2. 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

3. 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

4. **Which of the following salts does not contain water of crystallization?**

(a) Blue vitriol (b) Baking soda
(c) Washing soda (d) Gypsum

5. 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

ANSWERS: 1. (d) 2. (d) 3. (c) 4. (b) 5. (d)

II. Questions to be answered in one word or one sentence

1. What is acid rain?

Answer: When the pH of the rain water is less than 5.6, it is called acid rain

2. What is brine?

Answer: Concentrated solution of sodium chloride is called brine

3. What are alkali?

Answer: Water soluble bases are called alkali

4. **Write any one use of Chlorine**

Answer: In water treatment and making pesticides (any other suitable use)

5. **Write the formula of a salt in which water of crystallization is present.**

Answer: $CuSO_4$. $5H_2O$, $Na_2CO_3.10H_2O$ or any other correct salt

6. **Write the chemical name and chemical formula of the salt used to remove permanent hardness of water**

Answer: Sodium carbonate decahydrate Na_2CO_3. 10 H_2O

7. **Name the substance which is used to make food articles crispy, write its chemical formula**

Answer: Baking powder or Baking soda, $NaHCO_3$

8. **Write the chemical name and chemical formula of washing soda?**

Answer : Sodium carbonate decahydrate Na_2CO_3. 10 H_2O

9. **9. Write the chemical name and chemical formula of a salt which is used for disinfecting drinking water to make it germ free**
   Answer: : Calcium oxychloride, $CaOCl_2$
10. **Name a salt which is used as soda –fire extinguisher, write its chemical formula**
    Answer: Sodium Hydrogencarbonate ($NaHCO_3$)

<u>ASSERTION REASON TYPE QUESTIONS</u>

For the following question numbers (1-5) two statements are given- one labeled 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 the correct explanation of the assertion.
c) A is true, but R is false.
d) A is false, but R is true

1. Assertion: After white washing the walls, a shiny white finish on walls is obtained after two to three days.
   Reason: Calcium Oxide reacts with Carbon dioxide to form Calcium Hydrogen Carbonate which gives shiny white finish.

2. Assertion: Plaster of Paris is a is a white powder used to join fractured bones
   Reason: On mixing with water plaster of paris changes to Gypsum giving a solid hard mass

3. Assertion: Sodium Hydroxide is formed during Chlor-alkali process

Reason: Electricity is passed through Sodium Hydroxide during chlor- alkali process.

4. Assertion: Baking soda is used for making food substances crispy during cooking.
   Reason: The chemical name of baking soda is Sodium hydrogencarbonate

5. Assertion: Our stomach produces Sulphuric acid, which helps in digestion of food.
   Reason: During indigestion excess acid secreted is neutralized by using bases called antacids.

Answers: 1.a 2.a 3.c 4.b 5.d

III. Short answer questions(2 marks)

1. **What is a neutralization reaction? Give an examples.**

Answer : A reaction in which an acid and base react with each other to give a salt and water is termed as neutralization reaction. In this reaction, energy is evolved in the form of heat.

(i) $NaOH + \quad HCl \rightarrow NaCl \; + \quad H_2O$

(Base) (Acid) (Salt) (Water)

(ii) During indigestion (caused due to the production of excess of hydrochloric acid in the stomach), we administer an antacid (generally milk of magnesia, which is basic in nature). The antacid neutralizes the excess of acids and thus gives relief from indigestion.

Example- $Mg(OH)_2 + 2HCl \rightarrow MgCl_2 \; + \; 2H_2O$

2. **Give two important uses of washing soda and baking soda.**

Answer : Two important used of washing soda and baking soda are as follows:
(1) Washing soda:
(a) It is used in glass, soap, and paper industries.
(b) It is used to remove permanent hardness of water.

(2) Baking soda:
(a) It is used as baking powder. Baking powder is a mixture of baking soda and a mild acid known as tartaric acid. When it is heated or mixed in water, it releases CO_2 that makes bread or cake fluffy.
(b) It is used in soda-acid fire extinguishers.

3. **What will be the action of the following substances on litmus paper?**

Dry HCl gas, Moistened NH_3 gas, Lemon juice, Carbonated soft drink, Curd, Soap solution.

Answer:

Substance	Action on Litmus paper
Dry HCl gas	No change
Moistened NH_3 gas	Turns red to blue
Lemon juice	Turns blue to red
Carbonated soft drink	Turns blue to red
Curd	Turns blue to red
Soap solution	Turns red to blue

4. **Name the acid present in ant sting and give its chemical formula. Also give the common method to get relief from the discomfort caused by the ant sting.**

Answer:. The acid present in ant sting is Methanoic acid (formic acid). The chemical formula is HCOOH. To get relief one should apply any available basic salt e.g., baking soda ($NaHCO_3$) on it.

5. **What happens when nitric acid is added to egg shell? Write suitable chemical reaction.**

Answer:. Egg shells contain calcium carbonate. When nitric acid is added to it, carbon dioxide gas is evolved. The reaction can be given as

$$CaCO_3 + 2HNO_3 \rightarrow Ca\left(NO_3\right)_2 + H_2O + CO_2$$

IV. Short answer questions(3 marks)

1. **A student prepared solutions of (i) an acid and (ii) a base in two separate beakers. She forgot to label the solutions and litmus paper is not available in the laboratory. Since both the solutions are colourless, how will she distinguish between the two?**

Answer: Using chemical indicator like phenolphthalein or natural indicators like turmeric, china rose

2. **How would you distinguish between baking powder and washing soda by heating?**

Answer: The chemical formula of baking powder is Sodium Hydrogencarbonate (NaHCO3). Whereas, that of washing soda is sodium carbonate ($Na_2CO_3.10H_2O$)

Sodium hydrogencarbonate on heating gives CO2 gas which will turn lime water milky whereas no such gas is obtained from sodium carbonate.

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

$$Na_2CO_3.10H_2O \xrightarrow{heat} Na_2CO_3 + 10H_2O$$

3. **Name the acid present in ant sting and give its chemical formula. Also give the common method to get relief from the discomfort caused by the ant sting.**

Answer: The acid present in ant sting is methanoic acid (formic acid).
The chemical formula is HCOOH.
To get relief one should apply any available basic salt e.g., baking soda ($NaHCO_3$) on it.

4. **What is water of crystallisation ? give two examples**

Answer: Water of crystallisation is the fixed number of water molecules present in one formula unit of a salt. Examples- $CuSO_4.5H_2O$, $CaSO_4.2H_2O$

5. **Write the formula and give one use of each of the following compound-**
   a. Plaster of Paris
   b. Bleaching powder
   c. Baking soda

Answer:

a. $CaSO_4.\frac{1}{2}\ H_2O$, used to join fractured bones

b. $CaOCl_2$, used to disinfect water

c. $NaHCO_3$, making food items crispy and fluffy

LONG ANSWER QUESTION(5MARKS)

1. **Salt A commonly used in bakery products on heating gets converted into another salt B which itself is used for removal of hardness of water and a gas C is evolved. The gas C when passed through lime water, turns it milky due to formation of D. Identify A, B , C and d. write equation to show formation of D from C**

Answer: Baking powder ($NaHCO_3$), salt A is commonly used in bakery products. On heating it forms sodium carbonate (Na_2CO_3), B and CO_2 gas, C is evolved.

When CO_2 gas is passed through lime water it forms calcium carbonate ($CaCO_3$), which is slightly soluble in water making it milky.

A — $NaHCO_3$ B — Na_2CO_3 C — CO_2 gas D- $CaCO_3$

$$CO_2 + Ca(OH)_2 \rightarrow CaCO_3 + H_2O$$

2. **In one of the industrial processes used for manufacture of sodium hydroxide, a gas X is formed as by product. The gas X reacts with lime water to give a compound Y which is used as a bleaching agent in chemical industry. Identify X and Y giving the chemical equation of the reactions involved.**

Answer: In the manufacture of sodium hydroxide, hydrogen gas and chlorine gas (X) are formed as by–products. When chlorine gas (X) reacts with lime water, it forms calcium oxychloride (bleaching powder) Y. The reactions are -

$$2NaCl\ (aq)\ +\ 2H_2O(l)\ \rightarrow\ 2NaOH\ (aq)\ +\ Cl_2(g)\ +\ H_2(g)$$ X→ Cl_2 (Chlorine gas)

$$Ca\ (OH)_2(s)\ +\ Cl_2(g)\ \rightarrow CaOCl_2(s)\ +\ H_2O$$

Y — Calcium oxychloride (bleaching powder)

3. **Match the following pH values 1, 7, 10, 13 to the solutions given below:**

- **Milk of magnesia**
- **Gastric juices**

- **Brine**
- **Aqueous Sodium hydroxide.**

Amit and Rita decided to bake a cake and added baking soda to the cake batter. Explain with a balanced reaction, the role of the baking soda. Mention any other use of baking soda.

Answer:

- Milk of magnesia 10
- Gastric juices 1
- Brine 7
- Aqueous Sodium hydroxide 13

Baking soda undergoes thermal decomposition to form Na_2CO_3 ,CO_2 and H_2O ; CO_2 makes the cake fluffy & soft

$$NaHCO_3 \xrightarrow{heat} Na_2CO_3 + CO_2 + H_2O$$

Uses: Used in fire extinguishers/ antacid to neutralize excess acid in stomach / to neutralize the effect of acid in insect sting.

4. **(i) Four samples A, B, C and D change the colour of pH paper or solution to Green, Reddish-pink, Blue and Orange. Their pH was recorded as 7, 2, 10.5 & 6 respectively. Which of the samples has the highest amount of Hydrogen ion concentration? Arrange the four samples in the decreasing order of their pH.**

(ii) Rahul found that the Plaster of Paris, which he stored in a container, has become very hard and lost its binding nature. What is the reason for this? Also, write a chemical equation to represent the reaction taking place.

(iii) Give any one use of Plaster of Paris other than for plastering or smoothening of walls.

(i) a) B

b) C,A,D,B

(ii) Due to moisture in the atmosphere it converted into Gypsum

$$CaSO_4 + 1½\ H_2O \rightarrow CaSO_4.2H_2O$$

(iii) Making toys/dolls or statues /fixing broken limbs/making decorative materials.

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 Chlor alkali process. Identify B**

What type of reaction occurs when B is treated with an acidic oxide? Write a balanced chemical equation for one such solution.

Answer: B is Sodium hydroxide (NaOH) is a commonly used base and is hygroscopic, that is, it absorbs moisture from the atmosphere and becomes sticky.

The acidic oxides react with base to give salt and water.

The reaction between NaOH and CO_2 can be given as

$2\ NaOH + CO_2 \rightarrow Na_2CO_3 + H_2O$