

Chapter 2: Acids, Bases and Salts

NCERT Exemplar · Class 10 · Science

Multiple Choice Questions

Question 1

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

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

A.

The temperature of the solution increases

B.

The temperature of the solution decreases

C.

The temperature of the solution remains the same

D.

Salt formation takes place

Solution

The answer is (d) (i) and (iv)

Explanation:

When acid is mixed with a solution of base it results in a neutralization reaction. Neutralization is an exothermic reaction which results in the formation of salt.

Question 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

Answer

Correct option: D

Solution

The answer is (d) Hydrochloric acid

Explanation:

If the solution turns red litmus to blue colour then the solution should be basic in nature. Its effect can be neutralized by adding an acid hence (d) Hydrochloric acid is the answer.

Question 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

Answer

Correct option: C

Solution

The answer is (c) absorb moisture from the gas

Explanation:

Calcium is a good dehydrating agent. It has the property to absorb moisture. Hence it is used as a desiccant to dry gases and Hydrocarbons in the industries.

Question 4

Which of the following salts does not contain water of crystallisation?

A.

Blue vitriol

B.

Baking soda

C.

Washing soda

D.

Gypsum

Answer

Correct option: B

Solution

The answer is (b) Baking soda

Explanation

Baking sodas is white amorphous powder whereas other salts given in the question are crystalline in nature.

Question 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

Answer

Correct option: D

Solution

The answer is (d) weak acid and strong base

Explanation:

Salt formed by weak acid and strong base form strong salt. Here, Sodium is a strong base and carbonate is a weak acid.

Question 6

Calcium phosphate is present in tooth enamel. Its nature is

A.

basic

B.

acidic

C.

neutral

D.

amphoteric

Answer

Correct option: A

Solution

The answer is (a) basic

Explanation:

Phosphate ion present in calcium phosphate is a strong base and it forms a strong salt. Hence, calcium phosphate is basic in nature.

Question 7

A sample of soil is mixed with water and allowed to settle. The clear supernatant solution turns the pH paper yellowish-orange. Which of the following would change the colour of this pH paper to greenish-blue?

A.

Lemon juice

B.

Vinegar

C.

Common salt

D.

An antacid

Answer

Correct option: D

Solution

The answer is (d) An antacid

Explanation:

Sample solution turn pH paper yellowish-orange which confirms the acidic nature of the sample. To make the colour to greenish-blue, we have to add an antacid.

Question 8

Which of the following gives the correct increasing order of acidic strength

A.

Water < Acetic acid < Hydrochloric acid

B.

Water < Hydrochloric acid < Acetic acid

C.

Acetic acid < Water < Hydrochloric acid

D.

Hydrochloric acid < Water < Acetic acid

Solution

The answer is a) Water < Acetic acid < Hydrochloric acid

Explanation:

Water is neutral in its pure form, Acetic acid is an organic acid which is weak in nature and Hydrochloric acid is a strong acid.

Question 9

If a few drops of a concentrated acid accidentally spills over the hand of a student, what should be done?

A.

Wash the hand with saline solution

B.

Wash the hand immediately with plenty of water and apply a paste of sodium hydrogen carbonate

C.

After washing with plenty of water apply a solution of sodium hydroxide on the hand

D.

Neutralise the acid with a strong alkali

Answer

Correct option: B

Solution

The answer is (b) Wash the hand immediately with plenty of water and apply a paste of sodium hydrogen carbonate

Explanation:

Washing affected hand with plenty of water will reduce the concentration of the acid. Remaining traces of the acid can be neutralized by applying a paste of Hydrogen carbonate which is basic in nature.

Though NaOH is also a base but it is corrosive in nature hence it is not used to neutralize the acid.

Question 10

Sodium hydrogen carbonate, when added to acetic acid, evolves a gas. Which of the following statements are true about the gas evolved?

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

A.

It turns lime water milky

B.

It extinguishes a burning splinter

C.

It dissolves in a solution of sodium hydroxide

D.

It has a pungent odour

Solution

The answer is (a) (i) and (ii)

Explanation:

Reaction between Sodium hydrogen carbonate and acetic acid leads to the evolution of carbon-dioxide gas. CO_2 turns the lime water milky and extinguish a burning splinter.

Question 11

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

- (a) (i) and (ii)

(b) (i), (ii) and (iv)

(c) (i) and (iii)

(d) (i), (iii) and (iv)

A.

washing soda

B.

bleaching powder

C.

baking soda

D.

slaked lime

Solution

The answer is (a) (i) and (ii)

Question 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

Answer

Correct option: B

Solution

The answer is (b) tartaric acid

Explanation:

A mild edible acid along with Sodium Hydrogen Carbonate is used to prepare baking powder. Here, acetic acid or citric acid can also be used in place of tartaric acid.

Question 13

To protect tooth decay we are advised to brush our teeth regularly. The nature of the toothpaste commonly used is

A.

acidic

B.

neutral

C.

basic

D.

corrosive

Answer

Correct option: C

Solution

The answer is c) Basic

Explanation:

Teeth will be acidic in nature because of bacterial activity in the mouth. To neutralize the acid, toothpaste will be neutral in nature.

Question 14

Which of the following statements is correct about an aqueous solution of an acid and of a base?

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

A.

Higher the pH, stronger the acid

B.

Higher the pH, weaker the acid

C.

Lower the pH, stronger the base

D.

Lower the pH, weaker the base

Solution

The answer is (d) (ii) and (iv)

Explanation:

On a P^H scale acids are those whose P^H is below 7 lower is the P^H stronger will be acid and similarly Bases are those whose P^H is more than 7. Higher is the P^H strong will be acid.

Question 15

The pH of the gastric juices released during digestion is

A.

less than 7

B.

more than 7

C.

equal to 7

D.

equal to 0

Answer

Correct option: A

Solution

The answer is (a) less than 7

Explanation:

The P^H is acidic to below 7 to ensure an easy breakdown of food particles. PH of stomach juices is usually 3.

Question 16

Which of the following phenomena occur, when a small amount of acid is added to water?

(a) (i) and (ii)

(b) (i) and (iii)

(c) (ii) and (iii)

(d) (ii) and (iv)

A.

Ionisation

B.

Neutralisation

C.

Dilution

D.

Salt formation

Solution

The answer is (b) (i) and (iii)

Question 17

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

Answer

Correct option: C

Solution

The answer is (c) Vanilla essence

Explanation:

Vanilla essence can be used as an olfactory indicator hence it can be used as an acid-base indicator by visually impaired students.

Question 18

Which of the following substance will not give carbon dioxide on treatment with dilute acid?

A.

Marble

B.

Limestone

C.

Baking soda

D.

Lime

Answer

Correct option: D

Solution

The answer is (d) Lime

Explanation:

Marble, Limestone and baking soda have carbonates which produces CO_2 gas. Lime contains Hydroxide which will not produce CO_2 .

Question 19

Which of the following is acidic?

A.

Lime juice

B.

Human blood

C.

Lime water

D.

Antacid

Answer

Correct option: A

Solution

The answer is (a) Lime juice

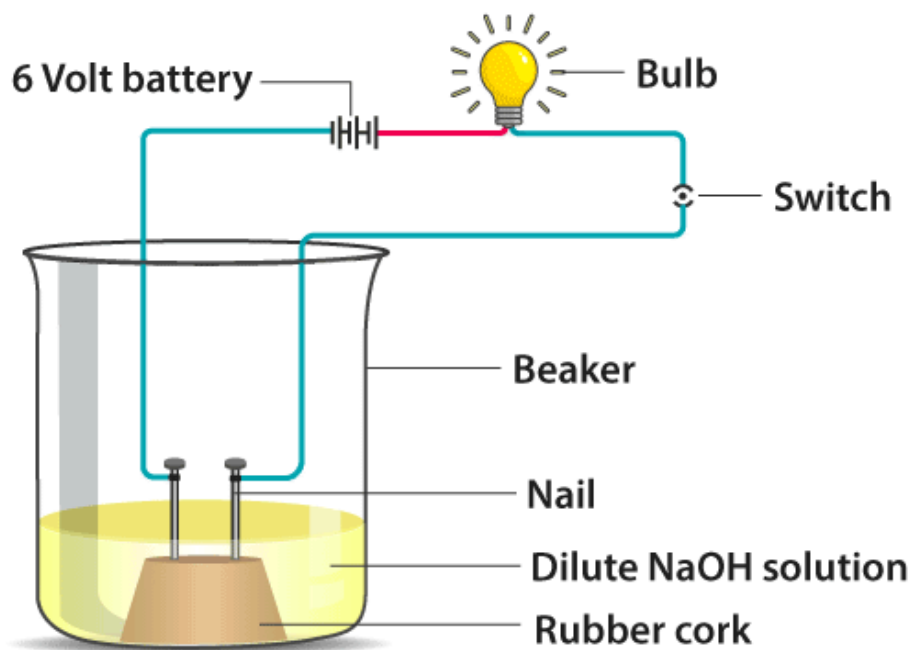
Explanation:

Lime juice has citric acid in it. Hence it is acidic in nature.

Question 20

In an attempt to demonstrate electrical conductivity through an electrolyte, the following apparatus (Figure 2.1) was set up. Which among the following statement(s) is(are) correct?

1. Bulb will not glow because the electrolyte is not acidic
2. Bulb will glow because NaOH is a strong base and furnishes ions for conduction.
3. Bulb will not glow because the circuit is incomplete
4. Bulb will not glow because it depends upon the type of electrolytic solution



- A.
(i) and (iii)
- B.
(ii) and (iv)
- C.
(ii) only
- D.
(iv) only

Answer

Correct option: C

Solution

The answer is (c) (ii) only

Question 21

Which of the following is used for dissolution of gold?

A.

Hydrochloric acid

B.

Sulphuric acid

C.

Nitric acid

D.

Aqua regia

Answer

Correct option: D

Solution

The answer is (d) Aqua regia

Explanation:

Gold is a noble metal which will not react even with strong acids, hence aqua regia, which is a mixture of Nitric and Hydrochloric acid in the ratio 1:3 is used for dissolution of gold.

Question 22

Which of the following is not a mineral acid?

A.

Hydrochloric acid

B.

Citric acid

C.

Sulphuric acid

D.

Nitric acid

Answer

Correct option: B

Solution

The answer is (b) Citric acid

Explanation:

Citric acid is the organic acid hence it is the answer

Question 23

Which among the following is not a base?

A.

NaOH

B.

KOH

C.

NH₄OH

D.

C₂H₅ OH

Answer

Correct option: D

Solution

The answer is (d) C₂H₅ OH

Explanation:

$\text{C}_2\text{H}_5\text{OH}$ is alcohol, not a base

Question 24

Which of the following statements is not correct?

A.

All metal carbonates react with acid to give a salt, water and carbon dioxide

B.

All metal oxides react with water to give salt and acid

C.

Some metals react with acids to give salt and hydrogen

D.

Some non-metal oxides react with water to form an acid

Answer

Correct option: B

Solution

The answer is (b) All metal oxides react with water to give salt and acid

Explanation:

Metal oxides are basic in nature hence they give alkaline solution when dissolved in water.

Question 25

Match the chemical substances given in Column (A) with their appropriate application given in Column (B)

Column (A)	Column (B)
(A) Bleaching powder	(i) Preparation of glass

(B) Baking soda	(ii) Production of H_2 and Cl_2
(C) Washing soda	(iii) Decolourisation
(D) Sodium chloride	(iv) Antacid

A.

A—(ii), B—(i), C—(iv), D—(iii)

B.

A—(iii), B—(ii), C—(iv), D—(i)

C.

A—(iii), B—(iv), C—(i), D—(ii)

D.

A—(ii), B—(iv), C—(i), D—(iii)

Answer

Correct option: C

Solution

The answer is (c) A—(iii), B—(iv), C—(i), D—(ii)

Question 26

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? (You may use colour guide given in Figure 2.2)

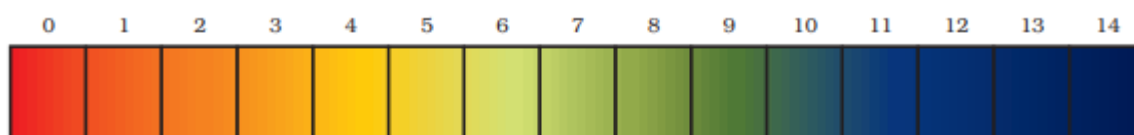


Figure 2.2

A.

Red

B.

Yellow

C.

Yellowish green

D.

Blue

Answer

Correct option: C

Solution

The answer is (c) Yellowish green

Explanation:

Here neutralization takes place between HCL and NaOH solution hence P^H will remain neutral which will be in

the yellowish-green zone in P^H paper.

Question 27

Which of the following is(are) true when HCl (g) is passed through water?

(a) (i) only

(b) (iii) only

(c) (ii) and (iv)

(d) (iii) and (iv)

A.

It does not ionise in the solution as it is a covalent compound.

B.

It ionises in the solution

C.

It gives both hydrogen and hydroxyl ion in the solution

D.

It forms hydronium ion in the solution due to the combination of hydrogen ion with water molecule

Solution

The answer is (c) (ii) and (iv)

Explanation:

HCL is a strong acid which ionizes completely in water to produce Hydrogen as well as Hydrogen and chlorine. Hydrogen produces combine with water molecules to give Hydronium ions.

Question 28

Which of the following statements is true for acids?

A.

Bitter and change red litmus to blue

B.

Sour and change red litmus to blue

C.

Sour and change blue litmus to red

D.

Bitter and change blue litmus to red

Answer

Correct option: C

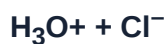
Solution

The answer is (c) Sour and change blue litmus to red

Question 29

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

A.



B.



C.



D.

unionised HCl

Answer

Correct option: A

Solution

The answer is (a) $\text{H}_3\text{O}^+ + \text{Cl}^-$

Explanation:

Acid produces Hydrogen which will combine with a water molecule to produce Hydronium ion.

Question 30

Identify the correct representation of reaction occurring during the chloralkali process

A.



B.



C.



D.



Answer

Correct option: D

Solution

The answer is (d) $2\text{NaCl}(\text{aq}) + 2\text{H}_2\text{O}(\text{l}) \rightarrow 2\text{NaOH}(\text{aq}) + \text{Cl}_2(\text{g}) + \text{H}_2(\text{g})$

Short Answer Questions

Question 31

Match the acids given in Column (A) with their correct source given in Column (B)

Column (A)	Column (B)
(a) Lactic acid	(i) Tomato
(b) Acetic acid	(ii) Lemon
(c) Citric acid	(iii) Vinegar
(d) Oxalic acid	(iv) Curd

Solution

Column (A)	Column (B)
(a) Lactic acid	(iv) Curd
(b) Acetic acid	(iii) Vinegar

(c) Citric acid	(ii) Lemon
(d) Oxalic acid	(i) Tomato

Column (A) Column (B)

(a) Lactic acid (iv) Curd

(b) Acetic acid (iii) Vinegar

(c) Citric acid (ii) Lemon

(d) Oxalic acid (i) Tomato

Question 32

Match the important chemicals given in Column (A) with the chemical formulae given in Column (B)

Column (A)	Column (B)
(a) Plaster of Paris	(i) Ca(OH)_2
(b) Gypsum	(ii) $\text{CaSO}_4 \cdot \frac{1}{2} \text{H}_2\text{O}$
(c) Bleaching Powder	(iii) $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$
(d) Slaked Lime	(iv) CaOCl_2

Solution

Column (A)	Column (B)
(a) Plaster of Paris	(ii) $\text{CaSO}_4 \cdot \frac{1}{2} \text{H}_2\text{O}$
(b) Gypsum	(iii) $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$
(c) Bleaching Powder	(iv) CaOCl_2
(d) Slaked Lime	(i) Ca(OH)_2

Question 33

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.

Solution

Dry HCl gas- No effect

Moistened NH₃ gas- Turns litmus paper to blue colour

Lemon juice- Turns litmus paper to red colour

Carbonated soft drink- Turns litmus paper to red colour

Curd- Turns litmus paper to red colour

Soap solution- Turns litmus paper to blue colour

Question 34

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.

Solution

Ant sting release methanoic acid. The chemical formula of methanoic acid is HCOOH. If we rub baking soda on the affected area, it can give relief from the discomfort caused by ant sting.

Question 35

What happens when nitric acid is added to eggshell?

Solution

Nitric acid dissolved eggshell, which is made up of Calcium carbonate. Calcium carbonate on reacting with nitric acid yield Calcium Nitrate and carbon-di-oxide gas.

Question 36

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?

Solution

Student can use Phenolphthalein indicator to check the nature of the solution.

Question 37

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

Solution

When we heat baking powder CO_2 is released which can be confirmed by passing evolved gas into lime water which will turn milky. This reaction will not happen when you heat washing soda.

Question 38

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. Identify A, B and C.

Solution

Salt A is Baking soda (Sodium Hydrogen Carbonate) which will turn to Sodium carbonate (Salt B) on heating. Gas C turns lime water milky; hence it must be CO_2 .

Question 39

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

Solution

X = Chlorine (Cl_2)

Y = Bleaching powder (CaOCl_2)

$\text{Ca(OH)}_2 (\text{s}) + \text{Cl}_2 (\text{g}) \rightarrow \text{CaOCl}_2 (\text{s}) + \text{H}_2\text{O}$ — Calcium oxychloride (bleaching powder)

Question 40

Fill in the missing data in the following table

		Salted Obtained from	
Name of the Salt	Formula	Base	Acid
Ammonium chloride	NH_4Cl	NH_4OH	—

Copper sulphate	–	–	H₂SO₄
Sodium chloride	NaCl	NaOH	–
Magnesium nitrate	Mg(NO₃)₂	–	HNO₃
Potassium sulphate	K₂SO₄	–	–
Calcium nitrate	Ca(NO₃)₂	Ca(OH)₂	–

Solution

		Salted Obtained from	
Name of the Salt	Formula	Base	Acid
Ammonium chloride	NH ₄ Cl	NH ₄ OH	HCl
Copper sulphate	CuSO₄	Cu(OH)₂	H ₂ SO ₄
Sodium chloride	NaCl	NaOH	HCl
Magnesium nitrate	Mg(NO ₃) ₂	Mg(OH)₂	HNO ₃
Potassium sulphate	K ₂ SO ₄	KOH	H₂SO₄
Calcium nitrate	Ca(NO ₃) ₂	Ca(OH) ₂	HNO₃

Question 41

What are strong and weak acids? In the following list of acids, separate strong acids from weak acids. Hydrochloric acid, citric acid, acetic acid, nitric acid, formic acid, sulphuric acid.

Solution

Strong acids are those that get completely ionized and weak acids are those that get partially ionized.

Hydrochloric acid- Strong Acid

citric acid- Weak Acid

acetic acid- Weak Acid

nitric acid – Strong Acid

formic acid- Weak Acid

sulphuric acid- Strong Acid

Question 42

When zinc metal is treated with a dilute solution of a strong acid, a gas is evolved, which is utilised in the hydrogenation of oil. Name the gas evolved. Write the chemical equation of the reaction involved and also write a test to detect the gas formed.

Solution

When Zinc reacts with Dilute acid solution, the following reaction takes place, and hydrogen gas is evolved

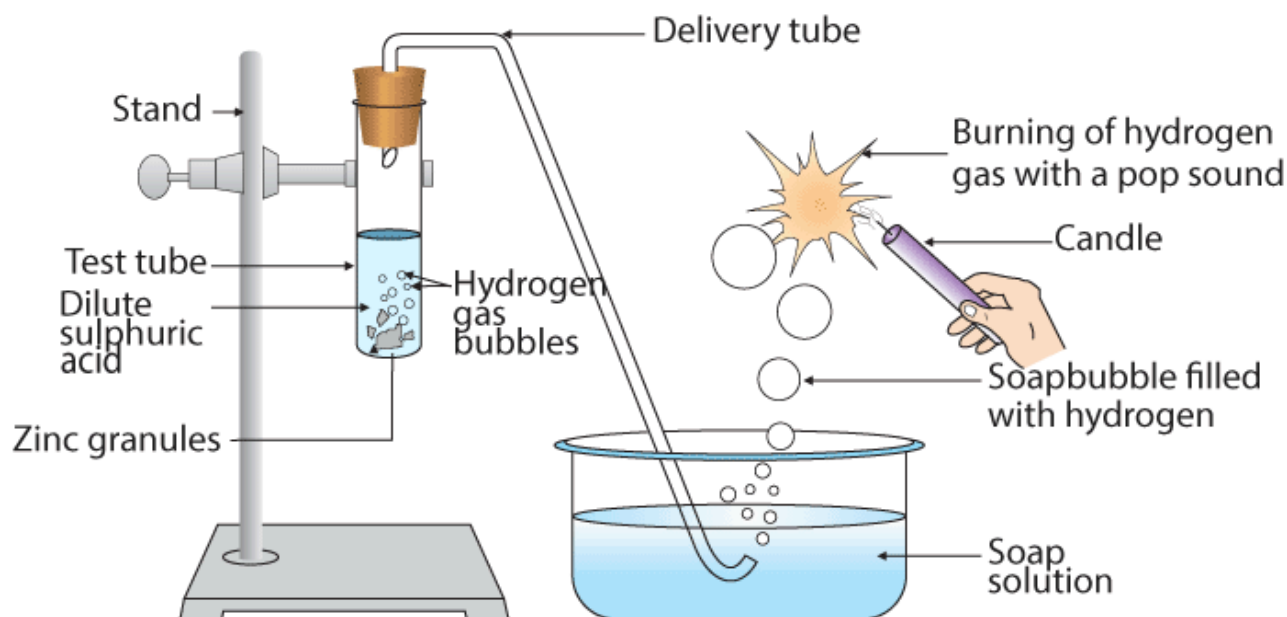


When Hydrogen gas is brought near a burning flame, it burns with a popping sound, which is the confirmation for the evolution of Hydrogen gas.

Long Answer Questions

Question 43

In the following schematic diagram for the preparation of hydrogen gas, as shown in Figure 2.3, what would happen if the following changes are made?



(a) In place of zinc granules, the same amount of zinc dust is taken in the test tube

(b) Instead of dilute sulphuric acid, dilute hydrochloric acid is taken

(c) In place of zinc, copper turnings are taken

(d) Sodium hydroxide is taken in place of dilute sulphuric acid, and the tube is heated.

Solution

1. In place of Zinc granules if we use Zinc dust reaction speed increases
2. Instead of dilute sulphuric acid if we use dilute hydrochloric acid ZINC Chloride is formed

$$\text{Zn} + 2\text{HCl} \rightarrow \text{ZnCl}_2 + \text{H}_2$$
3. If we use copper in place of Zinc there will be no reaction as copper will not react with dilute acids
4. Sodium Zincate is produced if we use NaOH solution in place of acid

$$\text{Zn} + 2\text{NaOH} \rightarrow \text{Na}_2\text{ZnO}_2 + \text{H}_2$$

Question 44

For making a cake, baking powder is taken. If at home, your mother uses baking soda instead of baking powder in cake,

(a) how will it affect the taste of the cake and why?

(b) how can baking soda be converted into baking powder?

(c) what is the role of tartaric acid added to baking soda?

Solution

a) If we use baking soda instead of baking powder taste of the cake will be bitter. Upon heating baking, soda sodium carbonate will be formed, which will make the cake taste bitter.



b) Baking soda can be converted into baking powder by adding an edible weak acid like tartaric acid.

c) When tartaric acid is dissolved in water, it gives out Hydrogen ions. Hydrogen ions react with Sodium Carbonate to produce carbon dioxide, which will make the cake fluffy.

Question 45

A metal carbonate X on reacting with acid gives a gas which when passed through a solution Y gives the carbonate back. On the other hand, a gas G that is obtained at the anode during electrolysis of brine is passed on dry Y, and it gives a compound Z, used for disinfecting drinking water. Identity X, Y, G and Z.

Solution

X is Calcium. When calcium carbonate reacts with HCl, it gives out CO_2 gas.



When CO_2 is passed into lime water, it turns milky due to the formation of Calcium carbonate.

Hence, solution Y is lime water

When chlorine gas is passed on dry lime water, it gives bleaching powder which is used for disinfecting water.

Question 46

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

Solution

A compound which is a byproduct of the chloralkali process is NaOH. Hence compound B is NaOH.

When NaOH is treated with acidic oxide neutralization process occurs. For example, If NaOH is treated with carbon-di-oxide, it gives Sodium carbonate.



Question 47

A sulphate salt of Group 2 element of the Periodic Table is a white, soft substance, which can be moulded into different shapes by making its dough. When this compound is left in the open for some time, it becomes a solid mass and cannot be used for moulding purposes. Identify the sulphate salt, and why does it show such behaviour? Give the reaction involved.

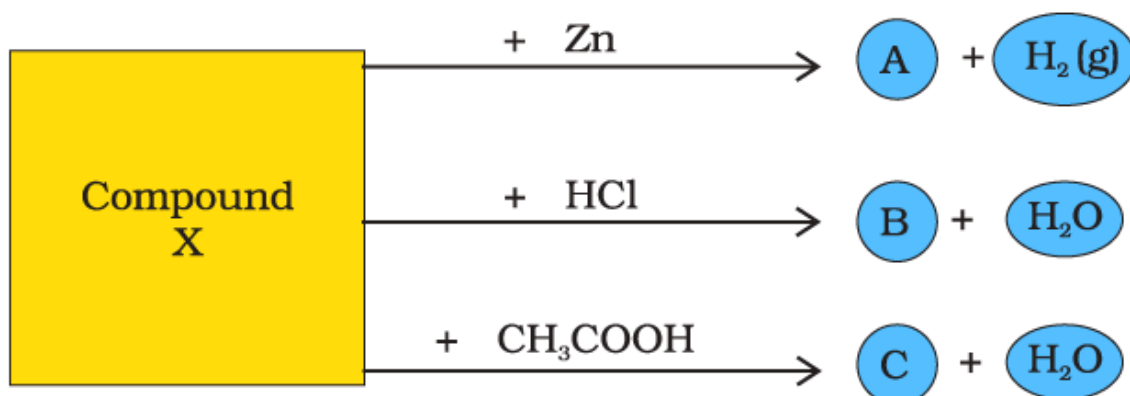
Solution

The sulphate salt should be calcium sulphate which is white and soft substance. Calcium sulphate is popularly known as plaster of Paris.

Plaster of Paris has half molecule of water of crystallization. When we leave plaster of Paris open for some time, it absorbs moisture to gain a number of molecules of crystallization. This newly formed compound is called Gypsum, which is hard to make moulds.

Question 48

Identify the compound X on the basis of the reactions given below. Also, write the name and chemical formulae of A, B and C.



Solution

Solution coming soon.
