

Chapter – 2 Acids, Bases and Salts

Multiple Choice Questions

Q1. 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) Only i)**
 - b) i) and iii)**
 - c) ii) and iii)**
 - d) i) and iv)**

Answer: Option d)

Neutralisation reaction takes place to form salt and water, when an acid reacts with a base, it is also an exothermic reaction. Hence, the temperature of the solution increases.

Q2. 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: Option d)

The aqueous solution turns into red litmus solution blue, so, it's a basic compound. An *HCl* acid solution would reverse the change, that is, *HCl* would turn blue litmus into red.

Q3. 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: Option c)

Calcium chloride ($CaCl_2$) absorbs moisture from the gas, since calcium chloride is a good dehydrating agent.

Q4. Which of the following salts does not contain water of crystallisation?

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

Answer: Option b)

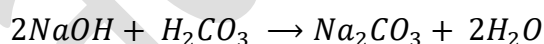
$NaHCO_3$ (sodium hydrogen carbonate) is the chemical formula of baking soda.

Q5. Sodium carbonate is a basic salt because it is a salt of

- a) Sodium acid and strong base
- b) Weak acid and weak base
- c) Strong acid and weak base
- d) Weak acid and strong base

Answer: Option d)

Na_2CO_3 is sodium carbonate, the salt of weak carbonic acid, H_2CO_3 and a strong sodium hydroxide ($NaOH$) base.



Q6. Calcium phosphate is present in tooth enamel. Its nature is

- a) Basic
- b) Acidic
- c) Neutral
- d) Amphoteric

Answer: Option a)

$Ca_3(PO_4)_2$ Calcium phosphate is a basic salt, as it is salt of weak acid and with stronger base, and when pH of our mouth falls below 5.5 due to eating of sweets etc, that is, mouth is acidic, the dissolution of enamel starts which shows that calcium phosphate is basic in nature.

Q7. 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: Option d)

For weak basic compound and antacids pH paper turns greenish blue and it contains weak base like $Mg(OH)_2$. Hence, an antacid would change the colour of this pH paper to greenish blue.

Q8. Which of the following gives the correct increasing order of acid 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

Answer: a)

Hydrochloric acid is a mineral acid and ionises in water, so it is a strong acid. Acetic acid is an organic acid and ionises partially in water, so, it is a weak acid. Water is neutral in nature; so the order of acidity is;

Water < acetic acid < hydrochloric acid

Q9. 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 solution of sodium hydroxide on the hand
- d) Neutralise the acid with a strong alkali

Answer: Option b)

We wash the hand immediately with plenty of water to wash away the acid and then apply a paste of baking soda ($NaHCO_3$) to neutralise the little acid left.

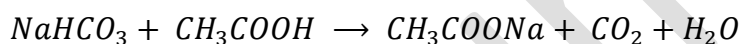
Q10. Sodium hydrogen when added to acetic acid evolves a gas. Which of the following statements are true about the gas evolved?

- i) It turns lime water milky.
- ii) It extinguishes a burning splinter.
- iii) It dissolves in solution of sodium hydroxide.
- iv) It has a pungent odour.

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

Answer: Option b)

Whenever sodium hydrogen carbonate is added to acetic acid then carbon dioxide (CO_2) gas is evolved.



CO_2 turns lime water milky, it is absorbed by strong alkalies like $NaOH$.

Q11. Common salt besides 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), ii) and iii)
- d) i), iii) and iv)

Answer: Option c)

Sodium chloride, that is, common salt is used as a raw material for making a large number of chemicals in industry such as sodium hydroxide, washing soda, baking soda, hydrochloric acid, hydrogen, chloride and sodium metal. Chlorine gas is used for making bleaching powder.

Q12. One of the constituents of baking powder is sodium carbonate, the other constituent is

- a) hydrochloric acid
- b) tartaric acid

- c) acetic acid
- d) sulphuric acid

Answer: Option b)

Baking powder is a mixture of baking soda $NaHCO_3$ and mild edible acid like tartaric acid. So, when we mix baking powder with water for preparing cake or bread, the sodium hydrogen carbonate reacts with tartaric acid to evolve carbon dioxide gas.

Q13. To protect tooth decay, we are advised to brush our teeth regularly. The nature of the tooth pastes commonly used is

- a) acidic
- b) neutral
- c) basic
- d) corrosive

Answer: Option c)

The tooth-paste is used as basic so that the extra acid formed during tooth decay is neutralised and prevent tooth-decay.

Q14. Which of the following statements is correct about an aqueous solution of an acid and a base?

- i) Higher the pH, stronger the acid
- ii) Higher the pH, weaker the acid
- iii) Lower the pH, stronger the base
- iv) Lower the pH, weaker the base

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

Answer: Option d)

It depends on the aqueous solution, that means, higher the pH, weaker the acid and lower the pH weaker is the base.

Q15. 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: Option a)

Stomach of a human being produces hydrochloric acid (of pH about 1.4). the dilute *HCl* acid helps in digestion of our food.

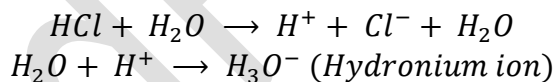
Q16. Which of the following phenomena occur, when a small amount of acid is added to water?

- i) Ionization
- ii) Neutralisation
- iii) Dilution
- iv) Formation

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

Answer: Option b)

- i) As we add water to an acid, their molecules dissociate to form ions.



- ii) Mixing an acid with water is dilution, it will result in decrease in the concentration of ions, (H_3O^+) per unit volume.

Q17. 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: Option c)

Vanilla essence is an olfactory indicator, so, it's smell is of different in acid and basic media which can be detected easily by a visually impaired student. Vanilla extract has a pleasant smell.

Q18. Which of the following substances will not give carbon dioxide on treatment with dilute acid?

- a) Marble
- b) Limestone
- c) Baking soda
- d) Lime

Answer: Option d)

Lime, whose chemical formula is CaO (calcium oxide) does not evolve CO_2 when reacted with dilute acid.

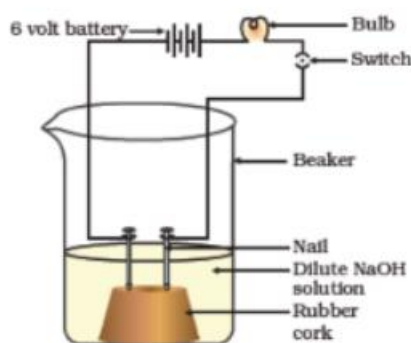
Q19. Which of the following is acidic in nature?

- a) Lime juice
- b) Human blood
- c) Lime water
- d) Antacid

Answer: Option a)

Lime juice is acidic in nature since it contains citric acid.

Q20. In an attempt to demonstrate electrical conductivity through an electrolyte, the following apparatus (figure) was set up.



Which among the following statements is/are correct?

- i) Bulb will not glow because electrolyte is not acidic.
- ii) Bulb will glow because $NaOH$ is a strong base and furnishes ions for conduction.
- iii) Bulb will not glow because circuit is incomplete.
- iv) Bulb will not glow because it depends upon the type of electrolytic solution.

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

Answer: Option c)

Bulb will glow since $NaOH$ being a strong furnishes OH^- and Na^+ ions.

Q21. Which of the following is used for dissolution of gold?

- a) Hydrochloric acid
- b) Sulphuric acid
- c) Nitric acid
- d) Aqua-regia

Answer: Option d)

Aqua-regia is basically used for the dissolution of gold, since gold dissolves only in the aqua-regia. Aqua-regia is a mixture of concentrated HNO_3 and concentrated HCl in the ratio 1 : 3.

Q22. Which of the following is not a mineral acid?

- a) Hydrochloric acid
- b) Citric acid
- c) Sulphuric acid
- d) Nitric acid

Answer: Option b)

Citric acid is an example of organic acid or edible acid.

Q23. Which among the following is not a base?

- a) $NaOH$
- b) KOH
- c) NH_4OH
- d) C_2H_5OH

Answer: Option d)

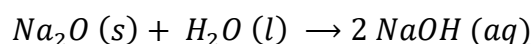
C_2H_5OH is not a base, its an example of an organic compound called as ethyl alcohol which has acidic nature. Also, it does not give OH^- ions in the solution, hence it is not a base.

Q24. 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 acid to give salt and hydrogen
- d) Some non-metal oxides react with water to form an acid

Answer: Option b)

Metal oxides are insoluble in water but few dissolve in water to form alkalies e.g.,



Q25. Match the chemical substances given in Column I with their appropriate application given in Column II.

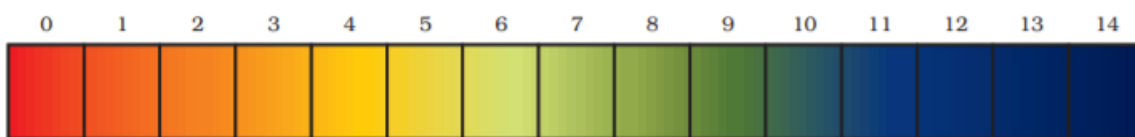
Column (A)	Column (B)
(A) Bleaching powder	(i) Preparation of glass
(B) Baking soda	(ii) Production of H_2 and Cl_2
(C) Washing soda	(iii) Decolourisation
(D) Sodium chloride	(iv) Antacid

- (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: Option c)

- A) Bleaching powder bleaches the clothes and other coloured substances.
- B) Baking soda is a constituent of antacid.
- C) Washing soda is used in the preparation of glass and sodium chloride which electrolyses to give H_2 and Cl_2 gases.

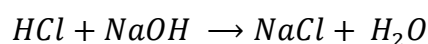
Q26. Equal volumes of hydrochloric acid and sodium hydroxide solutions of same concentration are mixed and the pH of the resulting solution is checked with a pH paper. What would be the colour obtained?



- a) Red
- b) Yellow
- c) Yellowish green
- d) Blue

Answer: Option c)

The reason behind this is the resulting solution is obtained as a result of neutralisation reaction.



Colour of the neutral solution, that is with pH = 7 obtained is yellowish green.

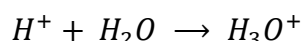
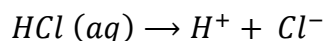
Q27. Which of the following is/are true when $HCl (g)$ is passed through water?

- i) It does not ionise in the solution as it is a covalent compound.
- ii) It ionises in the solution.
- iii) It gives hydrogen and hydroxyl ion in the solution
- iv) It forms hydronium ion in the solution due to the combination of hydrogen ion with water molecule.

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

Answer: Option c)

When HCl is passed through water then HCl being a polar covalent compound, ionises in the water;



Q28. Which of the following statement 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: Option c)

Acids are sour in taste and they turn blue litmus solution to red. Bases are bitter in taste, soapy to touch and turn red litmus blue.

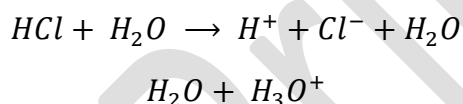
Q29. Which of the following are present in a dilute aqueous solution of hydrochloric acid?

- a) $H_3O^+ + Cl^-$
- b) $H_3O^+ + OH^-$
- c) $Cl^- + OH^-$
- d) *Unionised HCl*

Answer: Option a)

When acid mix with water, their molecules separate to form ions.

The H^+ ions combine with H_2O to form H_3O^+ ions.



Q30. Identify the correct representation of reaction occurring during chloralkali process.

- a) $2NaCl(l) + 2H_2O(l) \rightarrow 2NaOH(l) + Cl_2(g) + H_2(g)$
- b) $2NaCl(aq) + 2H_2O(aq) \rightarrow 2NaOH(aq) + Cl_2(l) + H_2(aq)$
- c) $2NaCl(aq) + 2H_2O(l) \rightarrow 2NaOH(aq) + Cl_2(aq) + H_2(aq)$
- d) $2NaCl(aq) + 2H_2O(l) \rightarrow 2NaOH(aq) + Cl_2(g) + H_2(g)$

Answer: Option d)

$2NaCl(aq) + 2H_2O(l) \rightarrow 2NaOH(aq) + Cl_2(g) + H_2(g)$ because state of Cl_2 and H_2 is gaseous, H_2O is liquid and that of $NaCl$ and $NaOH$ is aqueous.

Short Answer Type Questions

Q31. Match the acids given in Column I with their correct source give in Column II

Column I	Column II
A. Lactic acid	1. Tomato
B. Acetic acid	2. Lemon
C. Citric acid	3. Vinegar
D. Oxalic acid	4. Curd

Answer:

Column I	Column II
A. Lactic acid	Curd
B. Acetic acid	Vinegar
C. Citric acid	Lemon
D. Oxalic acid	Tomato

Q32. Match the important chemicals given in Column I with the chemical formulae given in Column II.

Column I	Column II
A. Plaster of Paris	$Ca(OH)_2$
B. Gypsum	$CaSO_4 \cdot \frac{1}{2} H_2O$
C. Bleaching powder	$CaSO_4 \cdot 2H_2O$
D. Slaked lime	$CaOCl_2$

Answer:

Column I	Column II
A. Plaster of Paris	$CaSO_4 \cdot \frac{1}{2} H_2O$
B. Gypsum	$CaSO_4 \cdot 2H_2O$
C. Bleaching powder	$CaOCl_2$
D. Slaked lime	$Ca(OH)_2$

Q33. 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:

- i) **Dry HCl gas** – There will be no change on the litmus paper.
- ii) **Moistened NH₃ gas** – The red litmus paper will turn into blue.
- iii) **Lemon juice** – it contains citric acid, so it will turn blue litmus paper into red.
- iv) **Carbonated soft drinks** – it contains carbonic acid, blue litmus paper will turn into red.
- v) **Curd** – it contains lactic acid, so blue litmus paper will turn into red.
- vi) **Soap solution** – it will turn red litmus paper into blue.

Q34. 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:

In an ant sting, the Formic acid or methanoic acid is present.

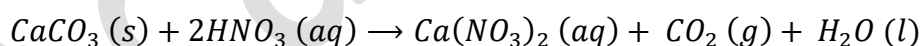
The chemical formula is given as $HCOOH$.

When we apply some wet baking soda on the affected part, it gives relief.

Q35. What happens when nitric acid is added to egg shell?

Answer:

Egg shells contain calcium carbonate ($CaCO_3$). When we add nitric acid to it, brisk effervescence due to the formation of CO_2 gas will be observed.



Q36. A student prepared solution 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:

When there is an absence of litmus, any other indicator like methyl orange, phenolphthalein, etc, can be used. Else, a natural indicator like turmeric can also be used.

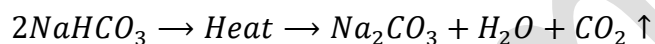
S/No.	Indicator	Colour in acidic solution	Colour in neutral solution	Colour in basic solution
1.	Litmus	Red	Purple	Blue

2.	Phenolphthalein	Colourless	Colourless	Pink
3.	Methyl orange	Red/Pink	Orange	Yellow
4.	Turmeric juice	Yellow	Yellow	Reddish brown

Q37. How would you distinguish between baking powder and washing soda by heating?

Answer:

On heating $NaHCO_3$ (baking soda), CO_2 (carbon dioxide) gas is given out that turns lime water to milky.



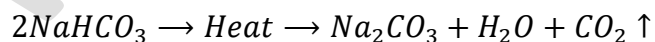
On heating washing soda $Na_2CO_3 \cdot 10H_2O$ water of the crystallization is given out and salt becomes anhydrous. The presence of crystallization water gives us the product that can be tested by testing it with anhydrous $CuSO_4$ which becomes blue in colour in its contact.



Q38. 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.

Answer:

Salt A is sodium bicarbonate $NaHCO_3$ which is used in bakery products. Salt B is sodium carbonate Na_2CO_3 which is used for the removal of hardness of the water. Gas C is the carbon dioxide CO_2 as it will turn lime water into milky.



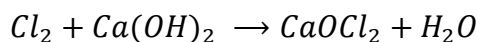
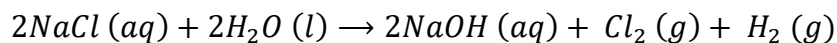
Q39. In one of the industrial processes for manufacturing of sodium hydroxide, a gas X is formed as by-product. The gas X reacts with lime water to give a compound Y which is used as a bleaching agent in chemical industry. Identify X and Y giving the chemical equation of the reactions involved.

Answer:

While manufacturing the sodium hydroxide, hydrogen gas and chlorine gas (X) are formed as by-product. Chlorine gas reacts with lime water to give bleaching powder. So, X is chlorine gas (Cl_2).

Y is calcium oxychloride or bleaching powder ($CaOCl_2$).

The equation for the preparation of sodium hydroxide –



Q40. Fill in the missing data in the given table.

Name of the salt	Formula	Salt obtained from	
		Base	Acid
(i) Ammonium chloride	NH_4Cl	NH_4OH	—
(ii) Copper sulphate	—	—	H_2SO_4
(iii) Sodium chloride	$NaCl$	$NaOH$	—
(iv) Magnesium nitrate	$Mg(NO_3)_2$	—	HNO_3
(v) Potassium sulphate	K_2SO_4	—	—
(vi) Calcium nitrate	$Ca(NO_3)_2$	$Ca(OH)_2$	—

Answer:

- i) Acid: HCl
- ii) Formula: $CuSO_4$, Base: $Cu(OH)_2$
- iii) Acid: HCl
- iv) Base: $Mg(OH)_2$
- v) Base: KOH , Acid: H_2SO_4
- vi) Acid: HNO_3

Q41. 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.

Answer:

Strong acid: Acids that ionises completely in an aqueous solution is called as strong acids, thus producing high concentration of H_3O^+ ions.

Example: HCl, H_2SO_4, HNO_3 etc.

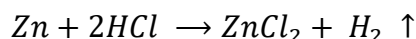
Weak acid: Acids that ionises partially in an aqueous solution and thus produces ions as well as molecules are called as weak acids.

Example: acetic acid, carbonic acid.

Q42. 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.

Answer:

When the zinc reacts with any dilute solution of strong acid such as hydrochloric acid HCl , it forms salt and hydrogen gas is evolved which is used in hydrogenation of oil.

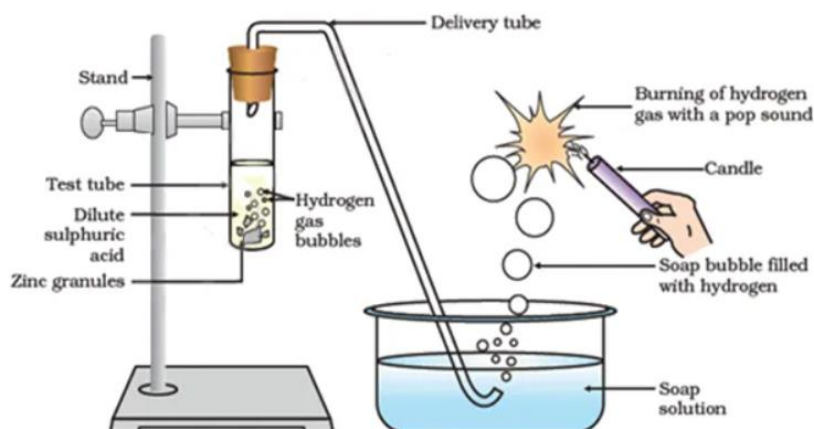


the presence of H_2 gas is tested by a burning splinter which is brought near the mouth of the test tube, the gas burns with a pop sound.

Long Answer Type Question

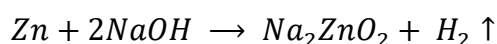
Q43. In the following schematic diagram for the preparation of hydrogen gas as shown in Figure, what would happen if the following changes are made?

- In place of zinc granules, same amount of zinc dust is taken in the test tube.
- Instead of dilute sulphuric acid, dilute hydrochloric acid is taken.
- In place of zinc, copper turnings are taken.
- Sodium hydroxide is taken in place of dilute sulphuric acid and the tube is heated.



Answer:

- If we take same amount of zinc dust in the test tube then the reaction will be faster and hydrogen gas will evolve with greater speed, since zinc dust has larger surface area compared to zinc granules.
- If we take dilute hydrochloric acid, the almost same amount of gas will be evolved.
- If we take copper turnings, then hydrogen gas will not evolve since copper is less reactive, so it will not react with dil. H_2SO_4 or dil. HCl . So, no reaction will take place.
- Since, zinc can react with $NaOH$. So, if sodium hydroxide is taken, then hydrogen gas will be evolved.



Q44. For making cake, baking powder is taken. If at home your mother uses baking soda instead of baking powder in cake.

- How will it affect the taste of the cake and why?
- How can baking soda be converted into baking powder?
- What is the role of tartaric acid added to baking soda?

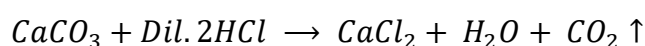
Answer:

- The tartaric acid present in baking powder reacts with sodium carbonate (Na_2CO_3) produced during decomposition of $NaHCO_3$ and neutralises it. If baking soda is used in making cake, sodium carbonate formed on heating will give bitter taste to cake.
- Baking soda convert into baking powder by adding tartaric acid into baking soda.
- Tartaric acid will neutralise the sodium carbonate formed during decomposition of $NaHCO_3$ hence, making the cake tasty and not bitter in taste.

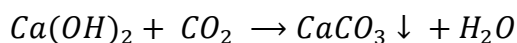
Q45. A metal carbonate X on reacting with an acid gives a gas which when passed through a solution Y gives the carbonate back. On the other hand, a gas G that is obtained at anode during electrolysis of brine is passed on dry Y, it gives a compound Z, used for disinfecting drinking water. Identify X, Y, G and Z.

Answer:

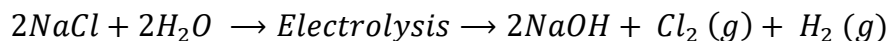
X is basically a calcium carbonate and the gas evolved carbon dioxide, when calcium carbonate reacts with acid.



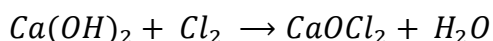
Y is the lime water solution $Ca(OH)_2$ because, when CO_2 is passed through it, it gives back the carbonate;



The gas at anode during electrolysis of brine is chlorine



As we pass chlorine gas through dry $Ca(OH)_2$ (Y), it will produce bleaching powder (Z), which is used for disinfecting drinking water.



So, Z is calcium oxy-chloride ($CaOCl_2$) or bleaching powder.

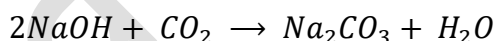
Q46. A dry pellet of a common base B, when kept in open absorbs moisture and turns sticky. The compound is also a by-product of chlor-alkali process. Identify B, what type of reaction occurs when B is treated with an acidic oxide? Write a balanced chemical equation for one such solution.

Answer:

Sodium hydroxide ($NaOH$) is a base, which is hygroscopic, so it absorbs moisture from the atmosphere and becomes sticky.

Base B is basically a $NaOH$, which is a by-product of chlor-alkali process. The acidic oxide taken reacts with base to give salt and water.

If CO_2 is the acidic oxide taken, the the reaction takes place will be:

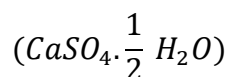


This type of reactions is called as Neutralisation reaction.

Q47. 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 open for some time, it becomes a solid mass and cannot be used for moulding purposes. Identify the sulphate and why does it show such a behaviour? Give the reaction involved.

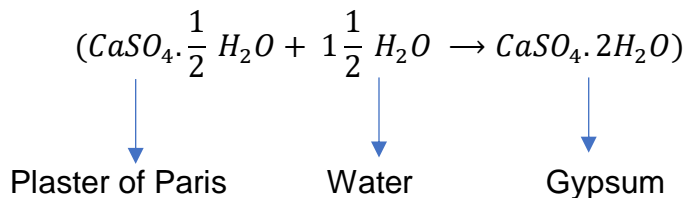
Answer:

The sulphate salt which can be used for making various shapes is plaster of Paris. It's chemical name is calcium sulphate hemihydrate,

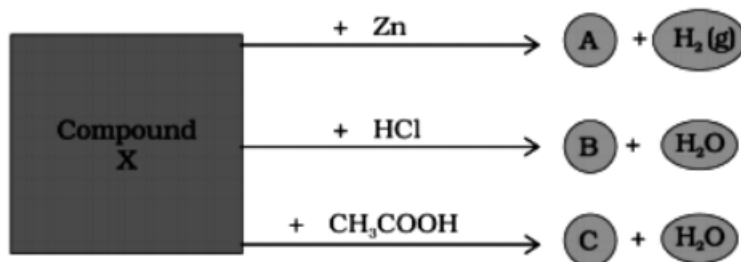


The two formula units of $CaSO_4$ share one molecule of water. It absorbs moisture from the atmosphere and forms gypsum, a hard solid mass.

So, gypsum sets as a hard solid mass and cannot be used for moulding purposes.

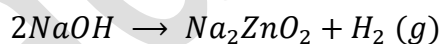


Q48. Identify the compound X on the basis of the reactions given below. Also, write the name and chemical formulae of A, B and C.

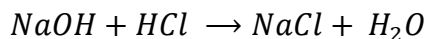


Answer:

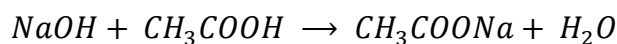
Compound X is sodium hydroxide, $NaOH$



Sodium zincate (A)



Sodium chloride (B)



Sodium acetate (C)