ST.JOHN'S RESIDENTIAL PUBLIC SCHOOL

AFFILIATED TO C.B.S.E

SONAGOPALPUR, SAMPATCHAK, PATNA.7

ANSWERS OF ASSIGNMENT ....CHEMISTRY (2)

STD...XTH *PREPARED BY .....S.K.VERMA*

ACID BASE SALT

Solution 1

(a) Yellow.
(b) Blue.
(c) Green.

Solution 2

(a) Red.
(b) Red.

Solution 3
Litmus.

Solution 4
Phenolphthalein.

Solution 5

Base.

Solution 6

Base.

Solution 7

When Hydrochloric acid reacts with an active metal (like zinc), we observe that gas filled bubbles are formed on the surface of the metal. Pass the gas formed through soap solution. Then, bring a burning candle near the gas filled soap bubble. If the gas present in bubble burns with a 'pop' sound, then its hydrogen gas.

Solution 8

Carbon dioxide (CO_2) gas is evolved during the reaction. We pass this gas through lime water which turns milky because of the CO_2 passing through it. If we keep on passing the gas through the milky lime water, it would become clear again.

Solution 9

Hydrochloric acid (HCl) and Sulphuric acid (H_2SO_4) are strong acids.
Acetic acid (CH_3COOH) and Citric acid ($C_6H_8O_7$) are weak acids.

Solution 10

(a)Citric acid - Lemon.
(b)Oxalic acid - Tomatoes.
(c)Lactic acid - Sour milk or curd.
(d)Tartaric acid - Tamarind.

Solution 11

Ant sting and Nettle leaf sting.

Solution 12

On diluting an acid, the concentration of hydronium ions (H_3O^+) in it decreases.

Solution 13

(*a*)	Sulphuric acid	+	Zinc	⟶	Zinc sulphate	+	Hydrogen
	H_2SO_4	+	Zn	⟶	$ZnSO_4$	+	H_2
(*b*)	Hydrochloric acid	+	Magnesium	⟶	Magnesium chloride	+	Hydrogen
	2HCl	+	Mg	⟶	$MgCl_2$	+	H_2
(*c*)	Sulphuric acid	+	Aluminium	⟶	Aluminium sulphate	+	Hydrogen
	$3H_2SO_4$	+	2Al	⟶	$Al_2(SO_4)_3$	+	$3H_2$
(*d*)	Hydrochloric acid	+	Iron	⟶	Iron (II) chloride	+	Hydrogen
	2HCl	+	Fe	⟶	$FeCl_2$	+	H_2

Solution 14

(a) $Zn\ (s) + 2HCl\ (aq) \rightarrow ZnCl_2 + H_2$
(b) $Na_2CO_3\ (s) + 2HCl\ (aq) \rightarrow 2NaCl\ (aq) + CO_2\ (g) + H_2O\ (l)$
(c) $NaHCO_3\ (s) + HCl\ (aq) \rightarrow NaCl\ (aq) + CO_2\ (g) + H_2O\ (l)$
(d) $NaOH\ (aq) + HCl\ (aq) \rightarrow NaCl\ (aq) + H_2O\ (l)$
(e) $CuO\ (s) + 2HCl\ (aq) \rightarrow CuCl_2\ (aq) + H_2O\ (l)$

Solution 15

(a) Sour; blue; red.
(b) Water.
(c) Hydrogen.
(d) Olfactory.
(e) Olfactory.

Solution 16

(a)An indicator is a 'dye' that changes colour when it is put in an acid or a base. The three most common indicators are:
Litmus, Methyl orange and Phenolphthalein.

(b) Litmus.

(c) Red.

Solution 17

Those substances whose smell (or odour) changes in acidic or basic solutions are called olfactory indicators.

Onion and vanilla extracts are olfactory indicators.

When a basic solution like sodium hydroxide solution is added to a cloth strip treated with onions (or onion extract), then the onion smell cannot be detected.

Solution 18

(a) When an acid reacts with a metal, then a salt and hydrogen gas is formed.

$$\underset{\text{Zinc}\ (\text{A metal})}{Zn(s)} + \underset{\text{Hydrochloric acid}\ (\text{Dilute})}{2HCl} \rightarrow \underset{\text{Zinc chloride}\ (\text{A salt})}{ZnCl_2} + \underset{\text{Hydrogen}}{H_2(g)}$$

(b) Hydrogen gas is liberated when an acid reacts with a metal. When reaction between an acid and a metal occurs, we observe formation of gas bubbles. When these gas bubbles are passed through soap solution, gas filled soap bubbles rise into the air. When a burning candle is brought near a gas-filled soap bubble, the gas present in the soap-bubble burns with a 'pop' sound. Only hydrogen gas burns making a 'pop' sound. This shows that hydrogen gas is evolved in the process.

Solution 19

When a concentrated acid is added to water for preparing a dilute acid, then the heat is evolved gradually and easily absorbed by the large amount of water (to which the acid is being added) however if water is added to concentrated acid, then large amount of heat is evolved at once. This heat changes some of the water to steam explosively which can splash the acid on our face or clothes and cause acid burns. Even the glass container may break due to the excessive heating.

Solution 20

When an acid reacts with a metal hydrogen carbonate, then a salt, carbon dioxide gas and water are formed.

Solution 21

(a)When dilute hydrochloric acid reacts with sodium carbonate, then sodium chloride, carbon dioxide and water are formed.

$$Na_2CO_3(s) + 2HCl(aq) \rightarrow 2NaCl(aq) + CO_2(g) + H_2O(l)$$

(b) CO_2 gas is liberated during the reaction.

When carbon dioxide gas formed in the form of brisk effervescence is passed through lime water, it turns the lime water milky. If excess of carbon dioxide gas is passed through the milky lime water, the solution becomes clear again. This confirm the presence of carbon dioxide gas.

Solution 22

When an acid reacts with a base, then a salt and water are formed. When hydrochloric acid reacts with sodium hydroxide solution, then a neutralization reaction takes place to form sodium chloride and water.

$$NaOH(aq) + HCl(aq) \rightarrow NaCl(aq) + H_2O(l)$$

Such a reaction is termed as neutralization reaction.

Solution 23

Acids react with metal oxides to form salt and water.
For example: Copper (II) Oxide, a metal oxide reacts with dilute hydrochloric acid to form copper chloride and water

$$CuO(s) + 2HCl(aq) \rightarrow CuCl_2(aq) + H_2O(l)$$

Solution 24

(a)Organic acids are acids present in plant materials and animals. These are naturally occurring acids.

A mineral acid (or inorganic acid) is an acid derived from one or more minerals of the earth

(b) *Organic acids:* Citric acid, lactic acid;
Mineral acids: Hydrochloric acid, sulphuric acid.

(c) Uses of mineral acids in industry:
(i) Sulphuric acid is used in the manufacturing of fertilizers, paints, dyes, detergents etc.

(ii) Nitric acid is used for making fertilizers, explosives, dyes and plastics.

(iii) Hydrochloric acid is used for removing oxide film from steel objects, in textile, food and leather industries.

Solution 25

A strong acid is one that completely ionizes in water to form a large amount of hydrogen ions whereas a weak acid only partially ionizes in water and thus produces a small amount of hydrogen ions.

HCl, H_2SO_4, HNO_3 are strong acids;

CH_3COOH, H_2CO_3, H_2SO_3 are weak acids.

Solution 26

The acidic character of a substance is due to the presence of hydrogen ions [H^+(aq) ions] in its aqueous solution. HCl, H_2SO_4 etc show acidic properties because they produce hydrogen ions when dissolved in water.

The solution of compounds like alcohol and glucose do not show acidic character because they do not ionize in water to produce hydrogen ions or any other ions in the solution.

Solution 27

The reaction between an acid and a base to form salt and water is called a neutralization reaction.
When hydrochloric acid reacts with sodium hydroxide solution, then a neutralization reaction takes place to form sodium chloride and water.

$$NaOH(aq) + HCl(aq) \rightarrow NaCl(aq) + H_2O(l)$$

Solution 28

Curd and other sour substances contains acids which can react with the metals of brass and copper vessels to form toxic (poisonous) metal compounds which can cause food poisoning and damage our health.

Solution 29

(a) Salt and water.
(b) Because dry HCl gas has no hydrogen ions (H^+ ions) in it which can impart acidic properties to it.
(c) Pink.

Solution 30

(a)The acidic behavior of an acid is due to the presence of hydrogen ions [H^+ (aq) ions] which are produced only when acids are dissolved in water. In the absence of water, acids do not produce hydrogen ions and hence do not show acidic behavior.

(b) The aqueous solution of an acid conducts electricity due to the presence of charged particles called 'ions' in it. These ions carry electric current.

(c) Distilled water does not conduct electricity because it does not contain any ionic compounds dissolved in it whereas rain water does.

Reason: When rain water falls on earth through the atmosphere, it dissolves an acidic gas 'carbon dioxide' from the air and forms carbonic acid (H_2CO_3). The

carbonic acid provides some hydrogen and carbonate ions to the rain water. Due to the presence of these ions, rain water conducts electricity.

Solution 31

(a)When an acid reacts with a metal carbonate, then a salt, carbon dioxide and water are produced.

Example: When dilute hydrochloric acid reacts with sodium carbonate, then sodium chloride, carbon dioxide and water are formed.

$$Na_2CO_3(s) + 2HCl(aq) \rightarrow 2NaCl(aq) + CO_2(g) + H_2O(l)$$

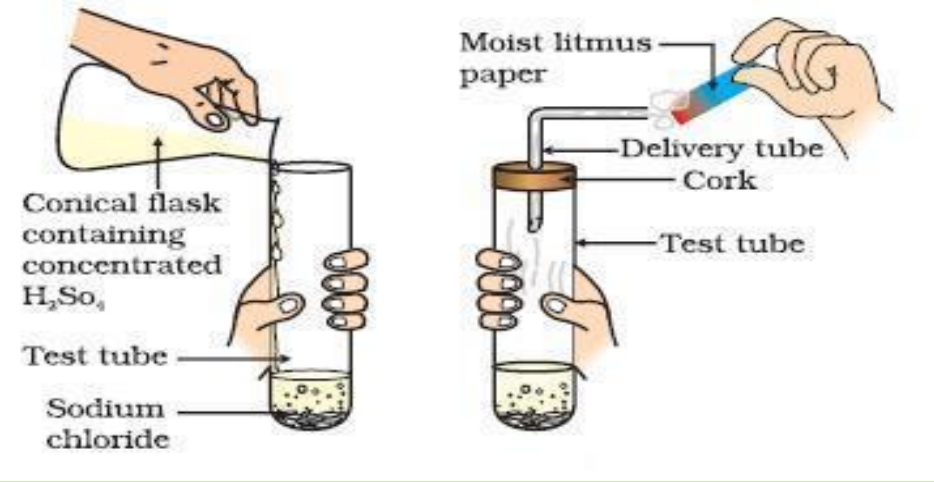
(b) (i) Lime water turns milky.
(ii) Lime water solution becomes clear.

$$CaCO_3(s) + CO_2(g) + H_2O(l) \rightarrow Ca(HCO_3)_2(aq)$$

Solution 32

***Activity*:**

Take about 1g solid NaCl in a clean and dry test tube and add some concentrated sulphuric acid to it. Fit a rubber cork with a small delivery tube in the mouth of the test tube. Concentrated sulphuric acid reacts with sodium chloride to form hydrogen chloride gas. The hydrogen chloride gas starts coming out of the open end of the glass tube.



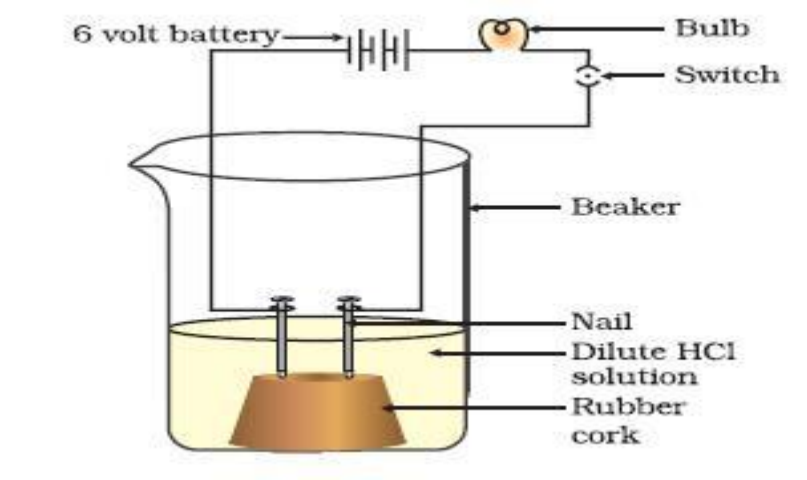
Now, hold a 'dry' blue litmus paper in HCl gas. There is no change in colour of the 'dry' blue litmus paper. This shows that HCl gas does not behave as an acid in the absence of water. However, when we hold a 'moist' blue litmus paper in HCl gas, we will see that the 'moist' blue litmus paper turns red. This indicates that HCl gas shows acidic behavior in the presence of water as hydrogen ions are formed. This proves that acids produce ions only in aqueous solutions or in presence of water.

Solution 33

(a)Hydrogen.

(b) ***Activity***:

Take ***solutions of glucose, alcohol, hydrochloric acid and sulphuric acid***. Fix two nails on a cork, and place the cork in a 100 ml beaker. Connect the nails to the two terminals of a 6 volt battery through a bulb and a switch. Now pour some dilute HCl in the beaker and switch on the current. The bulb starts glowing. This shows that HCl solution taken in the beaker conducts electricity. If we replace hydrochloric acid with sulphuric acid and perform the experiment, the bulb would glow again. This shows that an aqueous solution of an acid conducts electricity due to the presence of charged particles called ions in it.



Now, if we take glucose solution in the beaker and switch on the current, the bulb would not glow. If we repeat the experiment by taking alcohol solution in the beaker, the bulb would not glow again. This shows that due to the absence of ions, glucose and alcohol solutions do not conduct electricity. From this activity,

we conclude that the hydrogen containing compounds such as glucose and alcohol are not categorized as acids because they do not dissociate (or ionize) in water to produce hydrogen ions [H^+(aq) ions].

Solution 34

(a)X is carbon dioxide;
Y is calcium carbonate;
Z is calcium hydrogen carbonate.

(b) (i) $CaCO_3 + 2HCl \rightarrow CaCl_2 + H_2O + CO_2$

(ii) $Ca(OH)_2(aq) + CO_2(g) \rightarrow CaCO_3(s) + H_2O(l)$

(iii) $CaCO_3(s) + CO_2(g) + H_2O(l) \rightarrow Ca(HCO_3)_2(aq)$

Solution 35

Baking soda solution. Being basic in nature, it neutralizes excess acid in the stomach.

Solution 36

(a) Copper (II) chloride, $CuCl_2$

(b) $CuO(s) + 2HCl(aq) \rightarrow CuCl_2(aq) + H_2O(l)$

(c) Copper oxide is basic in nature

Solution 37

(a)Turmeric.

(b) The yellow stain of curry turns reddish-brown when soap is scrubbed on it because of the fact that soap solution is basic in nature which changes the colour of turmeric in the curry stain to red-brown. This stain turns yellow again when the cloth is rinsed with water because then the basic soap gets removed with water.

(c) Basic.

Solution 38

Acidic solution will turn blue litmus red; This red litmus will turn blue in basic solution; Distilled water will have no effect on any type of litmus paper.

Solution 39

Substance X is sodium hydrogen carbonate; Gas Y is carbon dioxide.

Solution 40

Neutralization of a carbonate with an acid produces carbon dioxide gas but not with an oxide or hydroxide.

Solution 41

(a) H^+ ions of acid combine with OH^- ions of alkali to form water, H_2O.
(b) Temperature of the solution rises.

Solution 42

(a) Hydrogen
(b) Hydrogen

Solution 43

Alkalis

Solution 44

They all produce hydroxide ions when dissolved in water.

Solution 45

Tooth decay start when the pH of mouth is lower than 5.5 because the acid becomes strong enough to attack the enamel of the teeth and corrode it.

Solution 46

7

Solution 47

Solution of pH = 2 is more acidic.

Solution 48

Solution of pH = 11

Solution 49

Sorenson

Solution 50

Universal indicator

Solution 51

Soil B.
Soil B is acidic in nature so its treated with powdered chalk to reduce its acidity.

Solution 52

Universal indicator

Solution 53

(a) Dark Purple
(b) Orange Yellow
(c) Red

Solution 54

pH = 1 will turn the scale red; strong acid.

Solution 55

Solution Y is a stronger acid.

Solution 56

Solution A (pH = 3.0) will turn litmus from solution blue to red
Solution B (pH = 9.5) will turn phenolphthalein from colourless to pink.

Solution 57

Drink Q has a pH value of 9.

Solution 58

Alkaline reaction: Solution Y (pH = 8)

Acidic reaction: Solution X (pH = 4)

Solution 59

(a) Lower.
(b) Higher.
(c) 7.
(d) Lower.
(e) Higher.

Solution 60

pH value will decrease when milk changes to curd. Curd contains lactic acid hence the pH decreases.

Solution 61

(a) Universal indicator is a mixture of many different indicators which gives different colours at different pH values of the entire pH scale. It is used to obtain an idea of how acidic or basic a substance is.

(b) When an acid or base solution is added to the universal indicator, it produces a new colour which is used to find the pH value of the acid or the base solution by matching the colour with the colours on pH colour chart.

(c) Green colour.

Solution 62

(a) Methanoic acid.
(b) Methanoic acid.
The effect of methanoic acid can be neutralized by rubbing a mild base like baking soda solution on the stung area of the skin.

Solution 63

(a)Tooth decay starts when the pH of the acid formed in the mouth falls below 5.5 because the acid becomes strong enough to
attack the enamel of the teeth and corrode. It can by prevented by using Toothpaste.

(b) The pH of lake water becomes lower because of too much acid rain. The high acidity of lake water can kill the aquatic animals like fish since they can survive within a narrow range of pH change.
Calcium carbonate is added to acidic lake water to neutralize the acid and this prevents the fish from being killed.

Solution 64

(a) When a bee stings a person, it injects an acidic liquid into the skin which causes immense pain and irritation. Its remedy is to rub a mild base like baking soda solution on the stung are of the skin.
(b) When a wasp stings, it injects an alkaline liquid into the skin. Rubbing a mild acid like vinegar on the stung area of the skin gives relief.

Solution 65

(a) Since vinegar is acetic acid so it can't be used to treat bee sting because bee injects acid into the skin.
(b) Since baking soda is basic in nature so it can't be used to treat wasp sting because wasp injects alkaline liquid into the skin.

Solution 66

(a) pH of a solution signifies the concentration of hydrogen ions in it.

Solution B is highly acidic since it has the lowest pH (pH = 4).

(b) Slaked lime or Chalk can be used to treat acidic soil.

Solution 67

(a) (i) Acids; A, C and D.
(ii) Alkalis; B, E and F.
(b) (i) Sulphuric acid.
(ii) Sulphuric acid.
(iii) Sodium hydroxide.
(iv) Nitric acid.

Solution 68

(a) The cold drink turns blue litmus red because of its acidic nature. It will have no action on red litmus.
(b) A < C < B.
B will have maximum acid strength because pH is inversely proportional to concentration of hydrogen ions in a solution.

Solution 69

When the soil is too acidic, it is treated with bases like quicklime or slaked lime or chalk.

Solution 70

Our stomach produces hydrochloric acid. If there is excess of hydrochloric acid in the stomach, it causes indigestion which produces pain and irritation. Its effect can be cured by taking antacids.

Solution 71

If the soil is too acidic, then it can be treated with materials like quicklime or slaked lime as these materials are bases and hence react with the excess acids present in the soil to reduce its acidity.

Solution 72

Strong base: A base which completely ionizes in water and produces a large amount of hydroxide ions.

Weak base: A base which is partially ionized in water and produces a small amount of hydroxide ions.

Strong bases: NaOH, KOH
Weak bases: NH_4OH, $Ca(OH)_2$, $Mg(OH)_2$

Solution 73

(i) H^+, Cl^-
(ii) H^+, NO_3^{2-}
(iii) H^+, SO_4^{2-}
(iv) Na^+, OH^-
(v) K^+, OH^-
(vi) Mg^{2+}, OH^-

Solution 74

(a)pH of pure water = 7

(b) Aqueous solution of sugar will turn the color of universal indicator green because sugar solution is neutral in nature.

(c) pH of the sample of rain water will be between 5 and 6. It is a weak acid.

Solution 75

(a) The pH in the stomach of a person suffering from indigestion will be less than 7 since indigestion is caused due to formation of excess acid in the stomach.

(b) Antacids are a group of mild bases so they have pH more than 7.
(c) Antacids react with excess acid in the stomach and neutralize it.
(d) *Antacids*: Magnesium hydroxide and Sodium hydrogen carbonate.

Solution 76

Substances having pH values above 7:
Solution of washing soda and toothpaste; They will turn red litmus paper blue due to their basic nature.
Substances having pH values less than 7:

Lemon juice, vinegar and stomach juices; They will turn blue litmus paper red due to their acidic nature.

Solution 77

(a) Yes, all basic solutions have H^+ ions. They are basic because the concentration of hydrogen ions is much less than that of hydroxide ions.
(b) When a solution becomes more acidic, pH gets lower.

Solution 78

(a) Acids are those chemical substances which have a sour taste. *Example*: Acetic acid and citric acid.
Base is a chemical substance which has a bitter taste. *Example*: Caustic soda and washing soda.

(b) **Strong bases** - Sodium hydroxide, NaOH, potassium hydroxide (KOH).
Weak bases - Calcium hydroxide, $Ca(OH)_2$, ammonium hydroxide, NH_4OH.

(c) (i) Hydrogen ions.
(ii) Hydroxide ions.
(d) $HCl + NaOH \longrightarrow NaCl + H_2O$

(e) *Uses of bases:*

(i) *Sodium hydroxide* is used in the manufacturing of soap, paper and rayon.
(ii) *Calcium hydroxide* is used in the manufacturing of bleaching powder.

Solution 79

(a)When zinc granules are heated with sodium hydroxide solution, then sodium zincate salt and hydrogen gas are formed.

$$2NaOH(aq) + Zn(s) \xrightarrow{Heat} Na_2ZnO_2(aq) + H_2(g)$$

Sodium Hydroxide (Base) | Zinc | Sodium Zincate (Salt) | Hydrogen

(b) When bases react with non-metal oxides, then salt and water are formed.
Example: Calcium hydroxide reacts with carbon dioxide to form calcium carbonate and water.

$$Ca(OH)_2(aq) + CO_2(g) \rightarrow CaCO_3(s) + H_2O(l)$$

Calcium hydroxide (Base) | Carbon dioxide (Non – metal oxide) | Calcium carbonate (Salt) | Water

Solution 80

(a) As the concentration of hydrogen ions increases, the solution becomes more acidic.

(b) As the concentration of hydroxide ions increases, the solution becomes more basic.
(c) Vinegar is acidic in nature.
(d) Soap is basic in nature.

(e) (i) pH = 9 : Alkaline.
(ii) pH = 4 : Acidic.
(iii) pH = 7 : Neutral.
(iv) pH = 1 : Acidic.
(v) pH = 10 : Alkaline.
(vi) pH = 3 : Acidic.

Solution 81

(a) Milk is made slightly alkaline so that it may not become sour easily due to the formation of lactic acid in it.
(b) The alkaline milk takes a longer time to set into curd because the lactic acid being formed has to first neutralize the alkali present in it.

Solution 82

Carbon and Sulphur being non-metals form acidic oxides.

Solution 83

(i) Weakly alkaline: D (pH = 11)

(ii) Neutral: C (pH = 7)

(iii) Strongly acidic: A (pH = 1)

(iv) Strongly alkaline: E (pH = 13)

(v) Weakly acidic: B (pH = 5)

Solution 84

(a) Potatoes grow better in acidic soil having pH = 5.5

(b) Broccoli grows better in alkaline soil since adding a lot of lime to acidic soil will make it basic in nature.

Solution 85

(a) Wasp stings are alkaline in nature since they are treated using acids like vinegar.

(b) Bee stings are acidic in nature since they are treated using bases like baking soda.

Solution 86

(a) The pH in a person's mouth becomes lower after each meal because bacteria present in the mouth breaks down the sugar to form acids.
(b) If the pH is low, the tooth starts decaying.

(c) A person can reduce the chances of suffering from tooth decay by changing his eating habits such as eating less of sugary foods like *ice-creams, candies, sweets* etc.

Solution 87

(a) $NaHCO_3$.
(b) $Na_2CO_3.10H_2O$

Solution 88

(i) Na_2CO_3.
(ii) $Na_2CO_3.10H_2O$.

Solution 89

False.

Solution 90

$CuSO_4.5H_2O$ has blue colour due to the presence of water of crystallization.

Solution 91

Blue.

Solution 92

The common name is Gypsum and the chemical name is calcium sulphate dihydrate.

Solution 93

Calcium hydroxide.

Solution 94

Plaster of Paris.

Solution 95

Hydrochloric acid.

Solution 96

Plaster of Paris

Solution 97

Sodium carbonate.

Solution 98

Sodium carbonate.

Solution 99

Tartaric acid.

Solution 100

Sodium.

Solution 101

$NaHCO_3$.

Solution 102

(a) Baking soda.
(b) Washing soda.

Solution 103

(a) *Sodium chloride* - NaCl.
(b) *Sodium hydroxide* - NaOH.

Solution 104

Common salt occurs naturally in sea water and as rock salt.

Solution 105

Sodium chloride.

Solution 106

Common salt is obtained from sea water by the process of evaporation.

Solution 107

Sodium chloride is required in our body for the working of nervous system, the movement of muscles, and the production of hydrochloric acid in the stomach.

Solution 108

Sodium hydroxide, sodium carbonate and sodium hydrogen carbonate.

Solution 109

(a) It is used in the manufacturing of soap.
(b) It is used in cooking food.

Solution 110

Rock salt. It is mined from the underground deposits just like coal.

Solution 111

Sodium chloride.

Solution 112

Sodium chloride.

Solution 113

Sodium hydroxide, chlorine and hydrogen.

Solution 114

(a) Anode.
(b) Cathode.
(c) Near the cathode.

Solution 115

Complete and balance the following equations :

(a) $2NaCl(aq) + 2H_2O(l) \xrightarrow{\text{electricity}} 2NaOH(aq) + Cl_2(g) + H_2(g)$

(b) $2NaHCO_3 \xrightarrow{\text{heat}} Na_2CO_3 + + CO_2 + H_2O$

(c) $NaCl + NH_3 + H_2O + CO_2 \longrightarrow NH_4Cl + NaHCO_3$

(d) $Ca(OH)_2 + Cl_2 \longrightarrow CaOCl_2 + H_2O$

Solution 116

Washing soda is sodium carbonate decahydrate.
Properties:
(i) It is transparent crystalline solid.
(ii) It is soluble in water.
Uses:
(i) It is used for removing permanent hardness of water.
(ii) It is used in the manufacturing of glass, soap and paper.

Solution 117

Baking soda is a substance added to food for its faster cooking. Its chemical name is sodium *hydrogen carbonate.*
Uses:
(i) It is used as an antacid to remove acidity of stomach.
(ii) It is used in fire extinguishers.

Baking soda is sodium hydrogen carbonate whereas washing soda is sodium carbonate decahydrate.

Solution 118

(a) The water molecules which form part of the structure of a crystal are called water of crystallization.
Example: $CuSO_4.5H_2O$

(b) The blue copper sulphate crystals contain water of crystallization as it is blue in colour.
Anhydrous copper sulphate turns blue on adding water. This property of anhydrous copper sulphate is used to detect the presence of moisture in a liquid.

Solution 119

(a) Baking soda.

(b) When a solution of sodium hydrogen carbonate is heated, then it decomposes to give sodium carbonate with the evolution of carbon dioxide gas.

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

(c) Sodium hydrogen carbonate is used as an antacid because it neutralizes the excess acid present in the stomach and relieves indigestion.

Solution 120

(a) If heating is not controlled while preparing POP, then all the water of crystallization of gypsum is eliminated and it turns into a dead burnt plaster.

(b) $CaSO_4.½H_2O + 1½H_2O \rightarrow CaSO_4.2H_2O$

Solution 121

(a) On strong heating, blue copper sulphate crystals turn white.

$$CuSO_4.5H_2O \xrightarrow{Heat} CuSO_4 + 5H_2O$$

(b) When water is added to anhydrous copper sulphate, it gets hydrated and turns blue.

$$CuSO_4\,(s) + 5H_2O(l) \longrightarrow CuSO_4.5H_2O(s)$$

Solution 122

(a) Sodium hydrogen carbonate and tartaric acid.

(b) Baking powder is a mixture of baking soda and tartaric acid whereas baking soda is only sodium hydrogen carbonate.

(c) When baking powder mixes with water, then sodium hydrogen carbonate reacts with tartaric acid to evolve carbon dioxide gas which gets trapped in the wet dough and bubbles out slowly making the cake soft and spongy.

$$2NaHCO_3 + H_2O + {}_{\text{Edible acid}} \xrightarrow{\text{heat}} Na_2CO_3 + CO_2 + H_2O$$

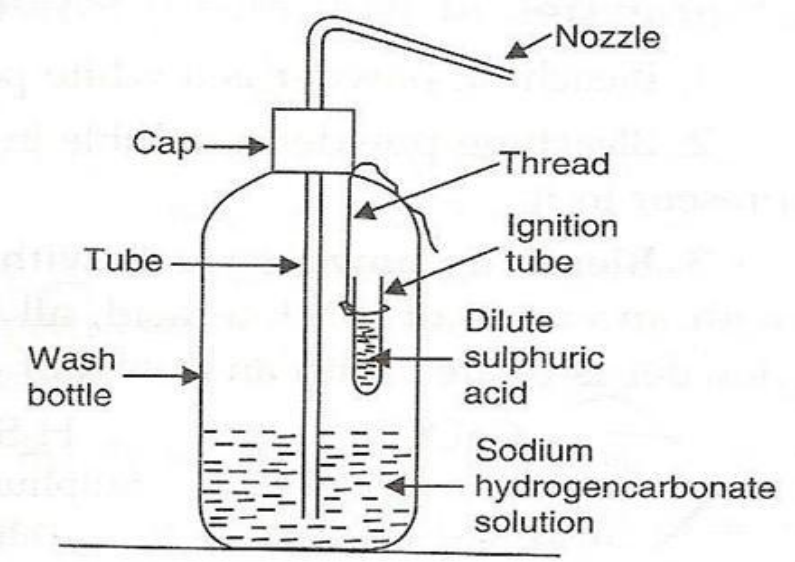
Solution 123

(a) Calcium Oxychloride.
(b) $CaOCl_2$
(c) Calcium hydroxide and chlorine.
(d) It is used for disinfecting drinking water supply.

Solution 124

Working:

A soda-acid type fire extinguisher contains a solution of sodium hydrogen carbonate and sulphuric acid in separate containers inside them. When the knob of the fire extinguisher is pressed, then sulphuric acid mixes with sodium hydrogen carbonate solution to produce carbon dioxide gas and water which forms a blanket around the burning substance and cuts off the supply of air to burning substance; this stops the process of burning and fire gets extinguished.



Making a soda-acid fire extinguisher.

Solution 125

(a) Sodium carbonate.
(b) Bleaching powder.
(c) Sodium carbonate.
(d) It sets into a hard mass on mixing with proper quantity of water.
(e) Bleaching powder.

Solution 126

(a) Baking powder is a mixture of baking soda and tartaric acid. When baking powder mixes with water, then sodium hydrogen carbonate reacts with tartaric acid to evolve carbon dioxide gas which gets trapped in the wet dough and bubbles out slowly making the cake soft and spongy.

(b) Substance X is tartaric acid. It can react with sodium hydrogen carbonate and neutralize it otherwise cakes and bread will taste bitter.

Solution 127

(a) Sodium hydroxide:

(i) It is used for making soaps and detergents.
(ii) It is used in the manufacturing of paper.

(b) Chlorine:

(i) It is used in the production of bleaching powder.
(ii) It is used in the production of hydrochloric acid.

(c) Hydrogen:

(i) It is used in the production of hydrochloric acid.
(ii) It is used in the hydrogenation of oils.

(d) Hydrochloric acid:

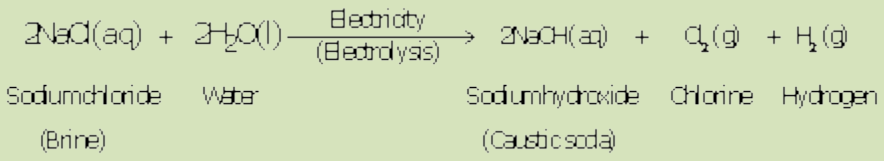
(i) It is used in medicines and cosmetics.
(ii) It is used in textile/dyeing and tanning industries.

Solution 128

It sets into a hard mass in about 30 mins.

Solution 129

(a)When a concentrated solution of sodium chloride is electrolyzed, it decomposes to form sodium hydroxide, chlorine and hydrogen.



(b) Because of the products formed:
Chlor for chlorine and alkali for sodium hydroxide.

(c) Sodium hydroxide, chlorine and hydrogen.

Uses of Sodium hydroxide:

(i) It is used for making soaps and detergents.
(ii) It is used in the manufacture of paper.

Uses of chlorine:

(i) It is used in the production of bleaching powder.
(ii) It is used in the production of hydrochloric acid.

Uses of hydrogen:

(i) It is used in the production of hydrochloric acid.
(ii) It is used in the hydrogenation of oils.

Solution 130

(a)Production of washing soda:
Washing soda is produced from sodium chloride (or common salt) in the following three steps:

A cold and concentrated solution of sodium chloride (called brine) is reacted with ammonia and carbon dioxide to obtain sodium hydrogen carbonate:

$$NaCl + NH_3 + H_2O + CO_2 \rightarrow NaHCO_3 + NH_4Cl$$

Sodium chloride (Common salt) | Ammonia | Water | Carbon dioxide | Sodium hydrogen carbonate | Ammonium chloride

Sodium hydrogen carbonate formed is only slightly soluble in water, so it precipitates out as a solid.

(ii) Sodium hydrogen carbonate is separated by filtration, dried and heated. On heating, sodium hydrogen carbonate decomposes to form sodium carbonate:

$$\underset{\text{Sodium hydrogen – carbonate}}{2NaHCO_3} \xrightarrow{\text{Heat}} \underset{\text{Sodium carbonate (Soda ash)}}{Na_2CO_3} + \underset{\text{Carbon dioxide}}{CO_2} + \underset{\text{Water}}{H_2O}$$

The anhydrous sodium carbonate obtained here is called soda ash.

(iii) Anhydrous sodium carbonate (soda ash) is dissolved in water and recrystallised to get washing soda crystals containing 10 molecules of water of crystallization:

$$\underset{\text{Anhydrous sodium carbonate (Soda ash)}}{Na_2CO_3} + \underset{\text{Water}}{10H_2O} \rightarrow \underset{\text{Sodium carbonate decahydrate (Washing soda)}}{Na_2CO_3.10H_2O}$$

(b) An aqueous solution of washing soda is alkaline because it turns red litmus to blue.
(c) Washing soda has detergent properties because it can remove dirt and grease from dirty clothes.

(d) (i) It is used as cleansing agent for domestic purposes.
(ii) It is used for removing permanent hardness of water.

Solution 131

Plaster of paris is calcium sulphate hemihydrate. Its chemical formula is: $CaSO_4.1/2H_2O$.

It is prepared by heating gypsum to a temperature of 100°C in a kiln; it loses 3/4th of its water of crystallisation and forms plaster of paris.

$$\underset{\text{Gypsum}}{CaSO_4.2H_2O} \xrightarrow[(373K)]{\text{Heat to } 100^\circ C} \underset{\text{Plaster of paris}}{CaSO_4.\tfrac{1}{2}H_2O} + \underset{\text{Water}}{1\tfrac{1}{2}H_2O}$$

(a) This is because the presence of moisture can cause the slow setting of plaster of Paris by bringing about its hydration.

(b) Uses of plaster of Paris:

(i) It is used as a fire proofing material.
(ii) it is used in hospitals for setting fractured bones in the right position to ensure correct healing.

Solution 132

(a) $Ca(OH)_2$ and Cl_2
(b) NaCl, NH_3, H_2O and CO_2
(c) $2CaSO_4.H_2O$
(d) Na_2CO_3 , CO_2
(e) $NaHCO_3$

Solution 133

(a) Plaster of Paris.

(b)

$$\underset{\text{Gypsum}}{CaSO_4.2H_2O} \xrightarrow[(373K)]{\text{Heat to } 100^\circ C} \underset{\text{Plaster of paris}}{CaSO_4.\tfrac{1}{2}H_2O} + \underset{\text{Water}}{1\tfrac{1}{2}H_2O}$$

(c) POP is used in hospitals for setting fractured bones in the right position to ensure correct healing.

Solution 134

(a) NH_4Cl, $(NH_4)_2SO_4$
(b) NaCl, K_2SO_4
(c) Na_2CO_3, CH_3COONa

Solution 135

Bleaching powder, $CaOCl_2$.

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

Solution 136

Baking powder; When baking powder mixes with water, then sodium hydrogen carbonate reacts with tartaric acid to evolve carbon dioxide gas which gets trapped in the wet dough and bubbles out slowly making the cake soft and spongy.

Solution 137

(a) Gypsum - $CaSO_4.2H_2O$
(b) Copper sulphate crystals - $CuSO_4.5H_2O$
(c) Sodium carbonate crystals - $Na_2CO_3.10H_2O$

Solution 138

(a) 5.
(b) 10.
(c) 2.

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