Acids,Bases And Salts

Question 1:

What colour do the following indicators turn when added to a base or alkali (such as sodium hydroxide) ?

(a) methyl orange

(b) litmus

(c) red cabbage extract

Solution :

(a) Yellow.

(b) Blue.

(c) Green.

Question 2:

What colours do the following indicators turn when added to an acid (such as hydrochloric acid) ?

(a) litmus

(b) methyl orange

Solution :

(a) Red.

(b) Red.

Question 3:

Name an indicator which is red in acid solution but turns blue in basic solution.

Solution :

Litmus.

Question 4:

Name an indicator which is pink in alkaline solution but turns colourless in acidic solution.

Solution :

Phenolphthalein.

Base.

Question 5:

When a solution is added to a cloth strip treated with onion extract, then the smell of onion cannot be detected. State whether the given solution contains an acid or a base.

Solution :

Base.

Question 6:

When a solution is added to vanilla extract, then the characteristic smell of vanilla cannot be detected. State whether the given solution is an acid or a base.

Solution :

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.

Question 7:

How will you test for the gas which is liberated when hydrochloric acid reacts with an active metal ?

Solution :

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.

Question 8:

Name the gas evolved when dilute HCl reacts with sodium hydrogencarbonate. How is it recognised ?

Solution :

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.

Question 9:

Give the names and formulae of two strong acids and two weak acids.

Solution :

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

Question 10:

Name one natural source of each of the following acids :
(a) Citric acid
(b) Oxalic acid
(c) Lactic acid
(d) Tartaric acid

Solution :

Ant sting and Nettle leaf sting.

Question 11:

Name one animal and one plant whose stings contain formic acid (or methanoic acid).

Solution :

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

Question 12:

How is the concentration of hydronium ions (H_3O^+) affected when the solution of an acid is diluted ?

Solution :

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

Question 13:

Write word equations and then balanced equations for the reactions taking place when :

(a) dilute sulphuric acid reacts with zinc granules.

(b) dilute hydrochloric acid reacts with magnesium ribbon.

(c) dilute sulphuric acid reacts with aluminium powder.

(d) dilute hydrochloric acid reacts with iron filings.

Solution :

(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

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Question 14:

Complete and balance the following chemical equations :

(a) Zn (s) + HCl (aq) ——- >

(b) Na_2C0_3 (s) + HCl (aq) ———>

(c) $NaHC0_3$ (s) + HCl (aq) ———>

(d) NaOH (aq) + HCl (aq) ———>

(e) CuO(s) + HCl (aq) ———->

Solution :

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

Question :15

Fill in the blanks in the following sentences :

(a) Acids have a…… taste and they turn…… litmus to……

(b) Substances do not show their acidic properties without……

(c) Acids produce…… ions on dissolving in water.

(d) Those substances whose smell (or odour) changes in acidic or basic solutions are called

(e) Onion and vanilla extract are……

Solution :

(a) Sour; blue; bed.

(b) Water.

(c) Hydrogen.

(d) Olfactory.

(e) Olfactory.

Question 16:

(a) What is an indicator ? Name three common indicators.

(b) Name the acid-base indicator extracted from lichen.

(c) What colour does the turmeric paper turn when put in an alkaline solution ?

Solution :

(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.

Question 17:

What is an olfactory indicator ? Name two olfactory indicators. What is the effect of adding sodium hydroxide solution to these olfactory indicators ?

Solution :

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.

Question 18:

(a) What happens when an acid reacts with a metal ? Give chemical equation of the reaction involved.

(b) Which gas is usually liberated when an acid reacts with a metal ? How will you test for the presence of this gas ?

Solution :

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

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

(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.

Question 19:

While diluting an acid, why is it recommended that the acid should be added to water and not water to the acid ?

Solution :

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 causeacid burns. Even the glass container may break due to the excessive heating.

Question 20:

What happens when an acid reacts with a metal hydrogencarbonate ? Write equation of the

reaction which takes place.

Solution :

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

$NaHCO_3(s) + HCl(aq) \rightarrow NaCl(aq) + CO_2(g) + H_2O(l)$

Sodium hydrogen carbonate — Hydrochloric acid — Sodium chloride — Carbon dioxide — Water

Question 21:

(a) What happens when dilute hydrochloric acid is added to sodium carbonate ? Write a balanced chemical
equation of the reaction involved.

(b) Which gas is liberated when dilute hydrochloric acid reacts with sodium carbonate ? How will you test for the presence of this gas ?

Solution :

(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 confirms the presence of carbon dioxide gas.

Question 22:

What happens when an acid reacts with a base ? Explain by taking the example of hydrochloric acid and sodium hydroxide. Give equation of the chemical reaction which takes place. What is the special name of such a reaction ?

Solution :

When an acid reacts with a base, then a salt and water are formed. When hydrochloric acid reacts with sodium hydroxide solution, then a neutralisation 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 neutralisation reaction.

Question 23:

What happens when an acid reacts with a metal oxide ? Explain with the help of an example. Write a balanced equation for the reaction involved.

Solution :

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

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

Question 24:

(a) What are organic acids and mineral acids ?

(b) Give two examples each of organic acids and mineral acids.

(c) State some of the uses of mineral acids in industry.

Solution :

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

1. Sulphuric acid is used in the manufacture of fertilizers, paints, dyes, detergents etc.
2. Nitric acid is used for making fertilizers, explosives, dyes and plastics.
3. Hydrochloric acid is used for removing oxide film from steel objects, in textile, food and leather industries.

Question 25:

What is meant by strong acids and weak acids ? Classify the following into strong acids and weak acids :

HCl, CH_3COOH, H_2SO_4, HNO_3, H_2CO_3, H_2SO_3

Solution :

A strong acid is one that completely ionises in water to form a large amount of hydrogen ions whereas a weak acid only partially ionises 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.

Question 26:

Why do HCl, H_2SO_4, HNO_3, etc., show acidic character in aqueous solutions while solutions of compounds like $C_6H_{12}O_6$ (glucose) and C_2H_5OH (alcohol) do not show acidic character ?

Solution :

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 solution.

Question 27:

What is a neutralisation reaction ? Explain with an example. Give the chemical equation of the reaction which takes place.

Solution :

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

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

Question 28:

Why should curd and other sour foodstuffs (like lemon juice, etc.) not be kept in metal containers (such as copper and brass vessels) ?

Solution :

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.

Question 29:

(a) What is produced if an acid is added to a base ?
(b) Why does dry HCl gas not change the colour of dry litmus paper ?
(c) What colour does phenolphthalein indicator turn when added to an alkali (such as sodium hydroxide) ?

Solution :

(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.

Question 30:

(a) Why do acids not show acidic behaviour in the absence of water ?

(b) Why does an aqueous solution of an acid conduct electricity ?

(c) Why does distilled water not conduct electricity whereas rain water does ?

Solution :

(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.

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Question 31:

(a) What happens when an acid reacts with a metal carbonate ? Explain with the help of an example. Write

chemical equation of the reaction involved.

(b) What happens when carbon dioxide gas is passed through lime water :

(i) for a short time ?

(ii) for a considerable time ?

Write equations of the reactions involved.

Solution :

(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.

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

Calciumhydroxide (Limewater) | Carbon dioxide | Calciumcarbonate (White ppt.) (Makes limewater milky) | Water

(ii) Lime water solution becomes clear.

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

Question 32:

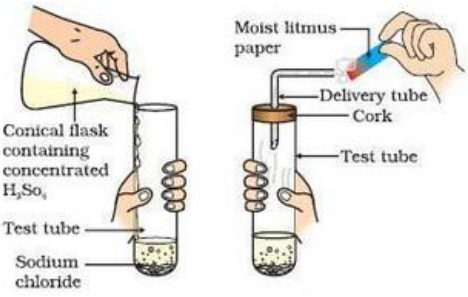
With the help of labelled diagrams, describe an activity to show that acids produce ions only in aqueous solutions.

Solution :

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.

Question 33:

(a) Which element is common to all acids ?

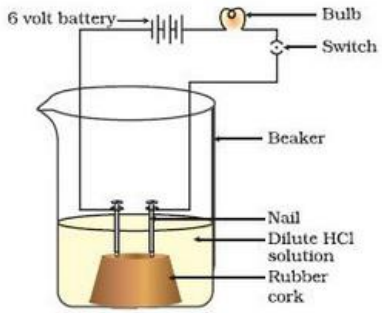
(b) Compounds such as alcohol and glucose also contain hydrogen but are not categorised as acids. Describe an activity to prove it.

Solution :

(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 categorised as acids because they do not dissociate (or ionise) in water to produce hydrogen ions [H^+(aq) ions].

Question 44:

When a piece of limestone reacts with dilute HCl, a gas X is produced. When gas X is passed through lime water then a white precipitate Y is formed. On passing excess of gas X, the white precipitate dissolves forming a soluble compound Z.

(a) What are X, Y and Z ?

(b) Write equations for the reactions which take place :

1. when limestone reacts with dilute HCl
2. when gas X reacts with lime water to form white precipitate Y
3. when excess of gas X dissolves white precipitate Y to form a soluble compound Z

Solution :

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

Question 45:

If someone is suffering from the problem of acidity after overeating, which of the following would you suggest as remedy ?

Lemon juice, Vinegar, Baking soda solution Give reason for your choice.

Solution :

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

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Question 46:

On adding dilute hydrochloric acid to copper oxide powder, the solution formed is blue-green.

(a) Predict the new compound formed which imparts a blue-green colour to solution.

(b) Write a balanced chemical equation of the reaction which takes place.

(c) On the basis of the above reaction, what can you say about the nature of copper oxide ?

Solution :

(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

Question 47:

A white shirt has a yellow stain of curry. When soap is rubbed on this shirt during washing, the yellow stain turns reddish-brown. On rinsing the shirt with plenty of water, the reddish-brown stain turns yellow again.

(a) Name the natural indicator present in curry stain.

(b) Explain the changes in colour of this indicator which take place during washing and rinsing the shirt.

(c) What is the nature of soap (acidic/basic) as shown by the indicator present in curry stain ?

Solution :

(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.

Question 48:

You have been provided with three test-tubes. One of these test-tubes contains distilled water and the other two contain an acidic and a basic solution respectively. If you are given only blue litmus paper, how will you identify the contents of each test-tube ?

Solution :

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.

Question 49:

A substance X which is used as an antacid reacts with dilute hydrochloric acid to produce a gas Y which is used in one type of fire-extinguisher. Name the substance X and gas Y. Write a balanced equation for the chemical reaction which takes place.

Solution :

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

$NaHCO_3\ (s) + HCl\ (aq) \rightarrow CO_2\ (g) + NaCl\ (aq) + H_2O\ (l)$

Question 50:

How is the neutralisation of a carbonate with an acid different from the neutralisation of an oxide or a hydroxide ?

Solution :

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

Question 51:

What happens to (a) the H^+ ions, and (b) temperature of the solution, when an acid is neutralised ?

Solution :

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

(b) Temperature of the solution rises.

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Question 1:

Name the gas evolved when zinc granules are treated/heated with :

(a) hydrochloric acid solution

(b) sodium hydroxide solution

Solution :

(a) Hydrogen

(b) Hydrogen

Question 2:

What is the common name of water soluble bases ?

Solution :

Alkalis

Question 3:

What is common in all the water soluble bases (or alkalis) ?

Solution :

They all produce hydroxide ions when dissolved in water.

Question 4:

Why does tooth decay start when the pH of mouth is lower than 5.5 ?

Solution :

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.

Question 5:

What is the pH of a neutral solution ?

Solution :

7

Question 6:

Which is more acidic : a solution of pH = 2 or a solution of pH = 6 ?

Solution :

Solution of pH = 2 is more acidic.

Question 7:

Which is more basic (or more alkaline) : a solution of pH = 8 or a solution of pH = 11 ?

Solution :

Solution of pH = 11

Question 8:

Name the scientist who developed the pH scale.

Solution :

Sorenson

Question 9:

Name the indicator which can give us an idea of how strong or weak an acid or base is.

Solution :

Universal indicator

Question 10:

The pH of soil A is 7.5 while that of soil B is 4.5. Which of the two soils, A or B, should be treated with powdered chalk to adjust its pH and why ?

Solution :

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

Question 11:

What is the name of the indicator which can be used for testing the pH of a solution ?

Solution :

Universal indicator

Question 12:

What colour will universal indicator show if you add it to the following substances ?

(a) potassium hydroxide, pH = 12

(b) soda water, pH = 5

(c) sulphuric acid, pH = 2

Solution :

(a) Dark Purple

(b) Orange Yellow

(c) Red

Question 13:

A beaker of concentrated hydrochloric acid has a pH of 1. What colour will full range universal indicator turn if it is added to this beaker ? Is it a strong or a weak acid ?

Solution :

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

Question 14:

Two solutions X and Y are tested with universal indicator. Solution X turns orange whereas solution Y turns red. Which of the solutions is a stronger acid ?

Solution :

Solution Y is a stronger acid.

Question 15:

Two solutions A and B have pH values of 3.0 and 9.5 respectively. Which of these will turn litmus solution from blue to red and which will turn phenolphthalein from colourless to pink ?

Solution :

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.

Question 16:

Two drinks P and Q gave acidic and alkaline reactions, respectively. One has a pH value of 9 and the other has a pH value of 3. Which drink has the pH value of 9 ?

Solution :

Drink Q has a pH value of 9.

Question 17:

Two solutions X and Y have pH = 4 and pH = 8, respectively. Which solution will give alkaline reaction and which one acidic ?

Solution :

Alkaline reaction: Solution Y (pH = 8)

Acidic reaction: Solution X (pH = 4)

Question 18:

Fill in the following blanks with suitable words :

(a) Acids have a pH…… than 7.

(b) Alkalis have a pH……. than 7.

(c) Neutral substances have a pH of……

(d) The more acidic a solution, the…… the pH.

(e) The more alkaline a solution, the…… the pH.

Solution :

(a) Lower.

(b) Higher.

(c) 7.

(d) Lower.

(e) Higher.

Question 19:

Fresh milk has a pH of 6. When it changes into curd (yogurt), will its pH value increase or decrease ? Why ?

Solution :

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

Question 20:

(a) What is a universal indicator ? For what purpose is it used ?

(b) How does a universal indicator work ?

(c) Water is a neutral substance. What colour will you get when you add a few drops of universal indicator to a test-tube containing water ?

Solution :

(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.

Question 21:

Which chemical is injected into the skin of a person :

(a) during an ant's sting ?

(b) during the nettle leaf hair sting ?

How can the effect of these stings be neutralised ?

Solution :

(a) Methanoic acid.

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

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Question 22:

(a) Explain the pH change as the cause of tooth decay. How can tooth decay caused by pH change be

prevented ?

(b) Explain how pH change in the lake water can endanger the lives of aquatic animals (like fish). What can be done to lessen the danger to the lives of aquatic animals in the lake ?

Solution :

(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. (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 neutralise the acid and this prevents the fish from being killed.

Question 23:

(a) What happens during a bee sting ? What is its remedy ?

(b) What happens during a wasp sting ? What is its remedy ?

Solution :

(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.

Question 24:

(a) Why is it wrong to treat a bee sting with vinegar ?

(b) Why is it wrong to treat a wasp sting with baking soda solution ?

Solution :

(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.

Question 25:

(a) What does the pH of a solution signify ? Three solutions A, B and C have pH values of 6, 4 and 10
respectively. Which of the solutions is highly acidic ?
(b) A farmer has found that the pH of soil in his fields is 4.2. Name any two chemical materials which he can mix with the soil to adjust its pH.

Solution :

(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.

Question 26:

(a) The pH values of six solutions A to F are given below :
A = 0, B = 11, C = 6, D = 3, E = 13, F = 8
Which of the above solutions are (i) acids (ii) alkalis ?
(b) Name the acids or alkalis used to make (i) car batteries (ii) explosives (iii) soaps (iv) fertilisers.

Solution :

(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.

Question 27:

(a) The pH of a cold drink is 5. What will be its action on blue and red litmus solutions ?
(b) The pH values of three acids A, B and C having equal molar concentrations are 5.0,2.8 and 3.5 respectively. Arrange these acids in order of the increasing acid strengths.

Solution :

(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.

Question 28:

Under what soil conditions do you think a farmer would treat the soil of his fields with quicklime (calcium oxide), Or slaked lime (calcium hydroxide) or chalk (calcium carbonate) ?

Solution :

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

Question 29:

Which acid is produced in our stomach ? What happens if there is an excess of acid in the stomach ? How can its effect be cured ?

Solution :

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.

Question 30:

The soil in a field is highly acidic. Name two materials which can be added to this soil to reduce its acidity. Give the reason for your choice.

Solution :

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.

Question 31:

What is meant by strong bases and weak bases ? Classify the following into strong bases and weak bases :

NH_4OH, $Ca(OH)_2$, NaOH, KOH, $Mg(OH)_2$

Solution :

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

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

Strong bases: NaOH , KOH

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

Question 32:

What ions are present in the solutions of following substances ? (write the symbols only)

1. Hydrochloric acid
2. Nitric acid
3. Sulphuric acid
4. Sodium hydroxide
5. Potassium hydroxide
6. Magnesium hydroxide

Solution :

1. H^+, Cl^-
2. H^+, NO_3^{2-}
3. H^+, SO_4^{2-}
4. Na^+, OH^-
5. K^+, OH^-
6. Mg^{2+}, OH^-

Question 33:

(a) What would you expect the pH of pure water to be ?

(b) What colour would the universal indicator show in an aqueous solution of sugar ? Why ?

(c) A sample of rain water turned universal indicator paper yellow. What would you expect its pH to be ? Is it a strong or a weak acid ?

Solution :

(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.

Question 34:

(a) What do you think will be the pH in the stomach of a person suffering from indigestion : less than 7 or

more than 7 ?
(b) What do you think will be the pH of an antacid solution : less than 7 or more than 7 ?
(c) How does an antacid work ?
(d) Name two common antacids.

Solution :

(a) The pH in the stomach of a person suffering from indigestion will be l ess 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 neutralise it.
(d) Antacids: Magnesium hydroxide and Sodium hydrogencarbonate.

Question 35:

Separate the following into substances having pH values above and below 7. How do these influence litmus paper ?

1. Lemon juice
2. Solution of washing soda
3. Toothpaste
4. Vinegar
5. Stomach juices

Solution :

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.

Question 36:

(a) Do basic solutions also have H^+ (aq) ions ? If yes, then why are they basic ?
(b) When a solution becomes more acidic, does the pH get higher or lower ?

Solution :

(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.

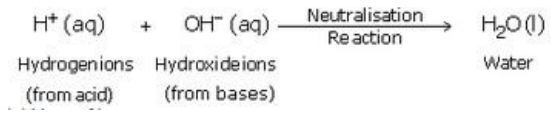
Question 37:

(a) Define an acid and a base. Give two examples of each.
(b) Give the names and formulae of two strong bases and two weak bases.
(c) What type of ions are formed :
(i) when an acid is dissolved in water ?
(ii) when a base (or alkali) is dissolved in water ?
(d) Write the neutralisation reaction between acids and bases in terms of the ions involved.
(e) Write any two important uses of bases.

Solution :

(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)



(e) Uses of bases:

(i) Sodium hydroxide is used in the manufacture of soap, paper and rayon.

(ii) Calcium hydroxide is used in the manufacture of bleaching powder.

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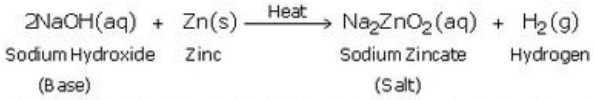
Question 38:

(a) What happens when zinc granules are heated with sodium hydroxide solution ? Write equation of the
reaction which takes place.

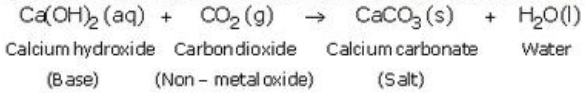
(b) What happens when bases react with non-metal oxides ? Explain with the help of an example. What does this reaction tell us about the nature of non-metal oxides ?

Solution :

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



(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.



Question 39:

(a) What effect does the concentration of H^+ (aq) ions have on the nature of a solution ?

(b) What effect does the concentration of H^- ions have on the nature of a solution ?

(c) Someone put some universal indicator paper into vinegar. The pH is 3. What does this tell you about the vinegar ?

(d) Someone put some universal indicator paper onto wet soap. The pH is 8. What does this tell you about the soap ?

(e) State whether a solution is acidic, alkaline or neutral if its pH is :

(i) 9 (ii) 4 (iii) 7 (iv) 1 (v) 10 (vi) 3

Solution :

(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.

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Question 54:

A milkman adds a very small amount of baking soda to fresh milk.

(a) Why does he shift the pH of the fresh milk from 6 to slightly alkaline ?

(b) Why does this milk take a long time to set as curd ?

Solution :

(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 neutralise the alkali present in it.

Question 55:

Which of the following elements would form oxides which would indicate pH values less than seven, using moist pH paper ?

Magnesium, Carbon, Sulphur, Hydrogen , Copper

Solution :

Carbon and Sulphur being non-metals form acidic oxides.

Question 56:

The pH values of five solutions A, B, C, D and E are given below :

A	1
B	5
C	7
D	11
E	13

Which solution is

1. weakly alkaline
2. neutral
3. strongly acidic
4. strongly alkaline, and
5. weakly acidic ?

Solution :

1. Weakly alkaline: D (pH = 11)
2. Neutral : C (pH = 7)
3. Strongly acidic: A (pH = 1)
4. Strongly alkaline: E (pH = 13)
5. Weakly acidic : B (pH = 5)

Question 57:

Potatoes grow well on Anhad's farm which has soil with a pH of 5.5. Anhad decides to add lot of lime to soil so that he can grow broccoli in the same farm :

(a) Do potatoes grow better in acidic or alkaline soil ?

(b) Does broccoli grow better in acidic or alkaline soil ?

Solution :

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

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

Question 58:

Here are some results of solutions tested with universal indicator paper :

Sulphuric acid : Red

Metal polish : Dark blue

Washing-up liquid : Yellow
Milk of magnesia : Light blue
Oven cleaner : Purple
Car battery acid : Pink
Arrange the solutions in order of their increasing pH values (starting with the one with the lowest pH).

Solution :

Sulphuric acid < car battery acid < washing up liquid < milk of magnesia < metal polish < oven cleaner since:
Red : pH = 1
Pink : pH = 3-4
Yellow: pH = 5-6
Light blue : pH = 9
Dark blue : pH = 10
Purple: pH = 11

Question 59:

Solution A turns universal indicator blue to purple whereas solution B turns universal indicator orange to red.
(a) What will be the action of solution A on litmus ?
(b) What will be action of solution B on litmus ?
(c) Name any two substances which can give solutions like A.
(d) Name any two substances which can give solutions like B.
(e) What sort of reaction takes place when solution A reacts with solution B ?

Solution :

(a) Solution A turns universal indicator blue to purple so it is basic in nature and will turn litmus blue.
(b) Solution B turns universal indicator orange to red so it is acidic in nature and will turn litmus red.
(c) Milk of magnesia and sodium hydroxide solution are bases like solution A.
(d) Lemon juice and hydrochloric acid are acids like solution B.
(e) Neutralisation reaction.

Question 60:

A first-aid manual suggests that vinegar should be used to treat wasp stings and baking soda for bee stings. What does this information tell you about the chemical nature of:
(a) wasp stings ?
(b) bee stings ?

Solution :

(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.

Question 61:

(a) Explain why the pH in a person's mouth becomes lower after each meal.
(b) What damage could be caused while the pH is low ?
(c) How could the person change his eating habits to lessen chances of suffering from tooth decay ?

Solution :

(a) T he 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 lessen 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.

Question 62:

A group of students measured the pH of some substances they found in their homes. Their results are given in the following table :

Substance	*pH*	*Substance*	*pH*
Apples	3.0	Salt	7.0
Baking soda	8.5	Sugar	7.0
Black coffee	5.0	Toothpaste	9.0
Household ammonia	12.0	Vinegar	3.0
Lemon juice	2.5	Washing soda	11.5
Milk	6.5		

(a) What would the students have used to measure the pH ?

(b) Which solution is the most acidic

(c) Which solution is the most alkaline ?

(d) Which solutions are neutral ?

(e) Which solution can be used to treat wasp stings ?

(f) Which solution can be used to treat bee stings ?

Solution :

(a) Universal indicator paper is used to measure the pH.

(b) Lemon juice with pH = 2.5 is the most acidic.

(c) Household ammonia with pH = 12 is the most alkaline.

(d) Salt solution and sugar solution with pH = 7 are neutral.

(e) Vinegar (acid) can be used to treat wasp stings since it injects an alkaline liquid into the skin.

(f) Baking soda can be used to treat bee stings since it injects methanoic acid into the skin.

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Question 63:

Hydrochloric acid reacts with a metal X to form a gas Y which bums with a 'pop' sound. Sodium hydroxide solution also reacts with the same metal X (on heating) to form the same gas Y.

(a) Name X and Y

(b) Write the chemical equation of the reaction of metal X with (i) hydrochloric acid, and (ii) sodium hydroxide solution.

Solution :

(a) X is zinc metal; Gas Y is hydrogen gas.

(b) (i)

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

(ii)

$$\underset{\text{Sodium Hydroxide (Base)}}{2NaOH(aq)} + \underset{\text{Zinc}}{Zn(s)} \xrightarrow{\text{Heat}} \underset{\text{Sodium Zincate (Salt)}}{Na_2ZnO_2(aq)} + \underset{\text{Hydrogen}}{H_2(g)}$$

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Question 1:

What is the chemical formula of (a) baking soda, and (b) washing soda ?

Solution :

(a) $NaHCO_3$.

(b) Na_2CO_3.

Question 2:

Write the chemical formula of (i) soda ash, and (ii) sodium carbonate decahydrate.

Solution :

(i) Na_2CO_3.

(ii) $Na_2CO_3.10H_2O$.

Question 3:

State whether the following statement is true or false :

Copper sulphate crystals are always wet due to the presence of water of crystallisation in them.

Solution :

False.

Question 4:

Which of the following salt has a blue colour and why ?

$CuSO_4.5H_2O$ or $CuSO_4$

Solution :

$CuSO_4.5H_2O$

has blue colour due to the presence of water of crystallization.

Question 5:

What would be the colour of litmus in a solution of sodium carbonate ?

Solution :

Blue.

Question 6:

State the common and chemical names of the compound formed when plaster of Paris is mixed with water.

Solution :

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

Question 7:

With which substance should chlorine be treated to get bleaching powder ?

Solution :

Calcium hydroxide.

Question 8:

What is the commercial name of calcium sulphate hemihydrate ?

Solution :

Plaster of Paris.

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Question 9:

Name the product formed when Cl_2 and H_2 produced during the electrolysis of brine are made to combine.

Solution :

Hydrochloric acid.

Question 10:

Name a calcium compound which hardens on wetting with water.

Solution :

Plaster of Paris

Question 11:

Name a sodium compound which is a constituent of many dry soap powders.

Solution :

Sodium carbonate.

Question 12:

Name a metal carbonate which is soluble in water.

Solution :

Sodium carbonate.

Question 13:

Name an acid which is present in baking powder.

Solution :

Tartaric acid.

Question 14:

Name the metal whose carbonate is known as washing soda.

Solution :

Sodium.

Question 15:

Which compound is used as an antacid in medicine : $NaHCO_3$ or Na_2CO_3 ?

Solution :

$NaHCO_3$.

Question 16:

What is the common name of (a) $NaHCO_3$ and (b) $Na_2CO_3.10H_2O$?

Solution :

(a) Baking soda.

(b) Washing soda.

Question 17:

Write the chemical name and formula of (a) common salt, and (b) caustic soda.

Solution :

(a) Sodium chloride- NaCl.

(b) Sodium hydroxide- NaOH.

Question 18:

What are the two main ways in which common salt (sodium chloride) occurs in nature ?

Solution :

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

Question 19:

Name the major salt present in sea-water.

Solution :

Sodium chloride.

Question 20:

How is common salt obtained from sea-water ?

Solution :

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

Question 21:

Why is sodium chloride required in our body ?

Solution :

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.

Question 22:

Name three chemicals made from common salt (or sodium chloride).

Solution :

Sodium hydroxide, sodium carbonate and sodium hydrogencarbonate.

Question 23:

Give any two uses of common salt (sodium chloride).

Solution :

(a) It is used in the manufacture of soap.

(b) It is used in cooking food.

Question 24:

What name is given to the common salt which is mined from underground deposits ? How was this salt formed ?

Solution :

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

Question 25:

Name the salt which is used as a preservative in pickles, and in curing meat and fish.

Solution :

Sodium chloride.

Question 26:

Name the raw material used for the production of caustic soda.

Solution :

Sodium chloride.

Question 27:

The electrolysis of an aqueous solution of sodium chloride gives us three products. Name them.

Solution :

Sodium hydroxide, chlorine and hydrogen.

Question 28:

During the electrolysis of a saturated solution of sodium chloride, where is :

(a) chlorine formed ?

(b) hydrogen formed ?

(c) sodium hydroxide formed ?

Solution :

(a) Anode.

(b) Cathode.

(c) Near the
cathode.

Question 29:

Fill in the following blanks :

(a) Common salt is obtained from sea-water by the process of.....

(b) Rock salt is mined just like.....

(c) Chemical formula of washing soda is.....

(d) Sodium hydrogen carbonate is..... soda whereas sodium carbonate is.....

(e) The chemical formula of plaster of Paris is.....

Solution :

(a) Evaporation.

(b) Coal.

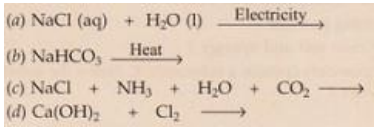
(c) $Na_2CO_3.10H_2O$.

(d) Baking; washing.

(e) $CaSO_4$. $?H_2O$

Question 30:

Complete and balance the following chemical equations :



Solution :

(a) $NaCl\ (aq) + H_2O\ (l) \xrightarrow[\text{Electrolysis}]{\text{Electricity}} 2NaOH\ (aq) + Cl_2\ (g) + H_2\ (g)$

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

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

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

Question 31:

What is washing soda ? State two properties and two uses of washing soda.

Solution :

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 manufacture of glass, soap and paper.

Question 32:

Write the formulae of sodium chloride and sodium carbonate. Explain why an aqueous solution of sodium chloride is neutral but an aqueous solution of sodium carbonate is basic (or alkaline). Write chemical equations of the reactions involved.

Solution :

Sodium chloride – NaCl.

Sodium carbonate – Na_2CO_3.

The aqueous solution of sodium chloride is neutral because it is formed from a strong acid and a strong base. The aqueous solution of sodium carbonate is basic because it gets hydrolysed to some extent and forms sodium hydroxide which is a strong base and carbonic acid which is a weak acid.

Question 33:

Write the chemical formula of ammonium chloride. Explain why an aqueous solution of ammonium chloride is acidic in nature ? Illustrate your answer with the help of a chemical equation.

Solution :

The chemical formula of ammonium chloride is NH_4Cl. Since, ammonium chloride is the salt of a strong acid HCl and a weak base NH4OH, so an aqueous solution of ammonium chloride is acidic in nature.

When dissolved in water, it gets hydrolysed to some extent to form HCl and NH4OH. HCl being a strong acid is fully ionised and gives a large amount of hydrogen ions whereas NH4OH is only slightly ionised. So, NH_4Cl contains more of hydrogen ions than hydroxide ions and is hence acidic in nature.

$$NH_4Cl\ (s) + H_2O\ (l) \xrightarrow{\text{Hydrolysis}} NH_4OH\ (aq) + HCl\ (aq)$$

Question 34:

What is baking soda ? Write the chemical name of baking soda. Give the important uses of baking soda. How does baking soda differ chemically from washing soda ?

Solution :

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 hydrogencarbonate whereas washing soda is sodium carbonate decahydrate.

Question 35:

Describe how sodium hydrogencarbonate (baking soda) is produced on a large scale. Write equation of the reaction involved.

Solution :

Sodium hydrogencarbonate is produced on large scale by reacting a cold and concentrated solution of sodium chloride with ammonia and carbon dioxide.

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

Question 36:

What happens when a cold and concentrated solution of sodium chloride reacts with ammonia and carbon dioxide ? Write the chemical equation of the reaction which takes place.

Solution :

When a cold and concentrated solution of sodium chloride reacts with ammonia and carbon dioxide, sodium hydrogencarbonate and ammonium chloride are formed.

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

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Question 37:

(a) What is meant by "water of crystallisation" in a substance ? Explain with an example.

(b) How would you show that blue copper sulphate crystals contain water of crystallisation ?

(c) Explain how anhydrous copper sulphate can be used to detect the presence of moisture (water) in a liquid.

Solution :

(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.

(c) 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.

Question 38:

(a) What is the common name of sodium hydrogencarbonate ?

(b) What happens when a solution of sodium hydrogencarbonate is heated ? Write equation of the reaction involved.

(c) Explain why, sodium hydrogencarbonate is used as an antacid.

Solution :

(a) Baking soda.

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

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

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

Question 39:

(a) What will happen if heating is not controlled while preparing plaster of Paris ?

(b) Write an equation to show the reaction between plaster of Paris and water.

Solution :

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

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

Question 40:

(a) What happens when copper sulphate crystals are heated strongly ? Explain with the help of an equation.

(b) What happens when a few drops of water are added to anhydrous copper sulphate ? Explain with the
help of an equation.

Solution :

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

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

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

$$CuSO_4 + 5H_2O \rightarrow CuSO_4.5H_2O$$

Question 41:

(a) Name two constituents of baking powder.

(b) How does baking powder differ from baking soda ?

(c) Explain the action of baking powder in the making of cake (or bread). Write equation of the reaction involved.

Solution :

(a)Sodium hydrogencarbonate and tartaric acid.

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

(c)When baking powder mixes with water, then sodium hydrogencarbonate 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.

Question 42:

(a) What is the chemical name of bleaching powder ?

(b) What is the chemical formula of bleaching powder ?
(c) What are the materials used for the preparation of bleaching powder ?
(d) State one use of bleaching powder (other than bleaching).

Solution :

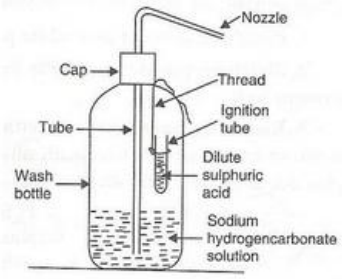
(a) Calcium oxychloride.
(b) $CaOCl_2$
(c) Calcium hydroxide and chlorine.
(d) It is used for disinfecting drinking water supply.

Question 43:

What does a soda-acid type fire extinguisher contain ? How does it work ? Explain the working of a soda- acid fire extinguisher with the help of a labelled diagram.

Solution :

Working:
A soda-acid type fire extinguisher contains a solution of sodium hydrogencarbonate and sulphuric acid in separate containers in separate containers inside them. When the knob of the fire extinguisher is pressed, then sulphuric acid mixes with sodium hydrogencarbonate solution to produce carbon dioxide gas 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.

Question 44:

(a) Name a sodium compound used for softening hard water.
(b) Which compound of calcium is used for disinfecting drinking water supply ?
(c) Name a metal compound which has detergent properties (cleansing properties).
(d) Name one compound of calcium which is used for removing the colour of a coloured cloth.
(e) State a peculiar (or remarkable) property of plaster of Paris.
(f) Name the substance obtained by the action of chlorine on solid (dry) slaked lime.

Solution :

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

Question 45:

(a) What is gypsum ? What happens when gypsum is heated to 100°C (373 K) ?
(b) Name a sodium compound which is used for making borax and glass.

(c) Name the compound which is used in hospitals for setting fractured bones.
(d) Which is the real bleaching agent present in bleaching powder ?

Solution :

(a) Gypsum is calcium sulphate dihydrate, $CaSO_4.2H_2O$. When gypsum is heated to a temperature of 100?C, it loses 3/4th of its water of crystallisation and forms plaster of Paris.
(b) Sodium carbonate.
(c) Plaster of Paris.
(d) Chlorine.

Question 46:

(a) What is "baking powder"? How does it make the cake soft and spongy ?
(b) In addition to sodium hydrogencarbonate, baking powders contain a substance X. Name the substance X. What is the role of substance X in the baking powder ?

Solution :

(a) Baking powder is a mixture of baking soda and tartaric acid. When baking powder mixes with water, then sodium hydrogencarbonate 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 any sodium carbonate formed and neutralise it otherwise cakes and bread will taste bitter.

Question 47:

State two uses each of the following compounds :
(a) Sodium hydroxide
(b) Chlorine
(c) Hydrogen
(d) Hydrochloric acid

Solution :

(a) Sodium hydroxide:
(i) It is used for making soaps and detergents.
(ii) It is used in the manufacture 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.

Question 48:

(a) What is the common name of the compound $CaOCl_2$?
(b) Name the raw material used for the preparation of plaster of Paris.
(c) Which property of plaster of Paris is utilised in making casts for broken limbs in hospitals ?
(d) Explain why chlorine is used for sterilising drinking water supply.

Solution :

(a) Bleaching powder.
(b) Gypsum.
(c) It sets into a hard mass in about 30 mins.
(d) Chlorine is used for sterilising drinking water supply because it is a disinfectant which kills germs or bacteria.

Question 49:

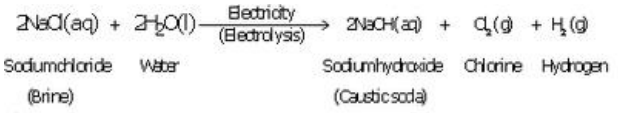
(a) What happens when a concentrated solution of sodium chloride (brine) is electrolysed ? Write the equation
of the reaction involved.

(b) Why is the electrolysis of a concentrated solution of sodium chloride known as chlor-alkali process ?

(c) Name three products of the chlor-alkali process. State two uses of each of these products.

Solution :

(a) When a concentrated solution of sodium chloride is electrolysed, 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.

Question 50:

(a) Describe how washing soda is produced starting from sodium chloride (common salt). Write equations
of all the reactions involved.

(b) State whether an aqueous solution of washing soda is acidic or alkaline ? Give reason for your answer.

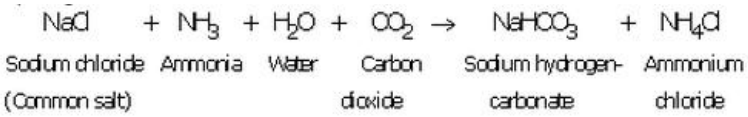
(c) What is meant by saying that washing soda has detergent properties ?

(d) Give two important uses of washing soda (or sodium carbonate).

Solution :

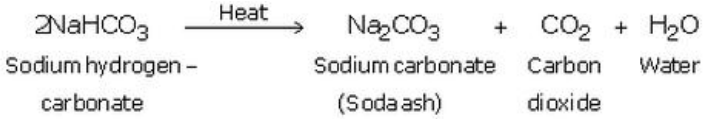
(a) Production of washing soda: Washing soda is produced from sodium chloride (or common salt) in the following three steps:

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



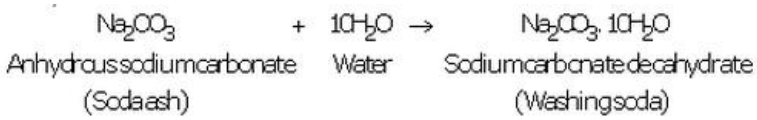
Sodium hydrogen carbonate formed is only slightly soluble in water, so it precipitates out as a solid.

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



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 crystallisation :



(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.

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Question 51:

(a) What is bleaching powder ? How is bleaching powder prepared ? Write chemical equation of the reaction
involved in the preparation of bleaching powder.

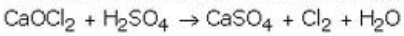
(b) What happens when bleaching powder reacts with dilute sulphuric acid ? Give equation of the reaction involved.

(c) State two important uses of bleaching powder.

Solution :

(a) Bleaching powder is Calcium oxychloride ($CaOCl_2$). It is prepared by passing chlorine gas over dry slaked lime.

(b) When bleaching powder reacts with dilute sulphuric acid , it produces chlorine gas.



(c) (i) It is used for disinfecting drinking water supply.

(ii) It is used in the manufacture of chloroform.

Question 52:

(a) What is plaster of Paris ? Write the chemical formula of plaster of Paris.

(b) How is plaster of Paris prepared ? Write chemical equation of the reaction involved.

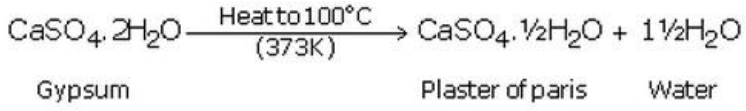
(c) Explain why plaster of Paris should be stored in a moisture-proof container.

(d) State two important uses of plaster of Paris.

Solution :

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

(b) 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.



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

(d) 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.

Question 53:

(a) What is a salt ? Give the names and formulae of any two salts. Also name the acids and bases from which these salts may be obtained.

(b) What is meant by 'a family of salts' ? Explain with examples.

(c) What is meant by 'hydrated' and 'anhydrous' salts ? Explain with examples.

(d) Write the names, formulae and colours of any two hydrated salts.

(e) What will be the colour of litmus in an aqueous solution of ammonium chloride salt ?

Solution :

(a) A salt is a compound formed from an acid by the replacement of the hydrogen in the acid by a metal.

Example: Sodium chloride – NaCl; It is obtained from hydrochloric acid and sodium metal.

Ammonium chloride – NH_4Cl; It is obtained from ammonia and hydrochloric acid.

(b) The salts having the same positive ions are said to belong to a family of salts.

Example: Sodium chloride and sodium sulphate belong to the same family of salts called sodium salts.

(c) The salts which contain water of crystallisation are called hydrated salts.

Example: Copper sulphate crystals contain 5 molecules of water of crystallisation.

The salts which have lost their water of crystallisation are called anhydrous salts.

Example: On strong heating, copper sulphate crystals lose all the water of crystallisation and form anhydrous copper sulphate.

(d) Copper sulphate pentahydrate salt – Its chemical formula is $CuSO_4.5H_2O$. It is blue in colour.

Iron sulphate heptahydrate salt – Its chemical formula is $FeSO_4.7H_2O$. It is green in colour.

(e) The aqueous solution of ammonium chloride salt turns blue litmus red.

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Question 69:

P and Q are aqueous solutions of sodium chloride and sodium hydroxide, respectively. Which of these will turn :

(a) blue litmus red ?

(b) red litmus blue ?

Solution :

(a) No solution will turn blue litmus to red.

(b) Solution Q (sodium hydroxide) will turn red litmus blue.

Question 70:

The metal salt A is blue in colour. When salt A is heated strongly over a burner, then a substance B is eliminated and a white powder C is left behind. When a few drops of a liquid D are added to powder C, it becomes blue again. What could be A, B, C and D ?

Solution :

A is copper sulphate pentahydrate, $CuSO_4.5H_2O$

B is water, H_2O

C is anhydrous copper sulphate, $CuSO_4$

D is water, H_2O

Question 71:

When the concentrated aqueous solution of substance X is electrolysed, then NaOH, Cl_2 and H_2 are produced. Name the substance X. What is the special name of this process ?

Solution :

X is Sodium chloride. The process is called Chlor-alkali process.

Question 72:

Consider the following substances :

$NaCl$, $Ca(OH)_2$, $NaHCO_3$, NH_3, Na_2CO_3, H_2O, Cl_2, CO_2, $CaSO_4.2H_2O$, $2CaSO_4.H_2O$, $CaOCl_2$

(a) Which two substances combine to form bleaching powder ?

(b) Which four substances are utilised in the production of washing soda ?

(c) Which compound represents plaster of Paris ?

(d) Which compound is a part of baking powder ?

(e) Which compound is used as an antacid ?

Solution :

(a) $Ca(OH)_2$ and Cl_2

(b) NaCl, NH_3, H_2O and CO_2

(c) $2CaSO_4.H_2O$

(d) $NaHCO_3$

(e) $NaHCO_3$

Question 73:

Give one example each of a salt which gives an aqueous solution having :

(a) pH less than 7

(b) pH equal to 7

(c) pH more than 7

Solution :

(a) Ammonium chloride, NH_4Cl

(b) Sodium chloride, NaCl

(c) Sodium carbonate, Na_2CO_3

Question 74:

A compound X which is prepared from gypsum has the property of hardening when mixed with a proper quantity of water.

(a) Identify the compound X ,

(b) Write the chemical equation for its preparation

(c) For what purpose is it used in hospitals ?

Solution :

(a) Plaster of Paris.

(b)

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

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

Question 75:

Consider the following salts :

Na_2CO_3, NaCl, NH_4Cl, CH_3COONa, K_2SO_4, $(NH_4)_2SO_4$ Which of these salts will give :

(a) acidic solutions ?

(b) neutral solutions ?

(c) basic solutions (or alkaline solutions) ?

Solution :

(a) NH_4Cl, $(NH_4)_2SO_4$

(b) NaCl, K_2SO_4

(c) Na_2CO_3, CH_3COONa

Question 76:

A white powdery substance having strong smell of chlorine is used for disinfecting drinking water supply at waterworks. Identify the substance. Give its chemical name and write the chemical reaction for its preparation.

Solution :

Bleaching powder, $CaOCl_2$.

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

Question 77:

A salt X when dissolved in distilled water gives a clear solution which turns red litmus blue. Explain the phenomenon.

Solution :

Salt X is like sodium carbonate, Na_2CO_3, which is made from a strong base and a weak acid. On dissolving in water, salt X gets hydrolysed to form some strong base and some weak acid. The strong base thus formed makes the solution alkaline which turns red litmus blue.

Question 78:

A person found that the cake prepared by him is hard and small in size. Which ingredient has he forgotten to add that would have caused the cake to rise and become light ? Explain your answer.

Solution :

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.

Question 79:

A white chemical compound becomes hard on mixing with proper quantity of water. It is also used in surgery to maintain joints in a fixed position. Name the chemical compound.

Solution :

Plaster of Paris.

Question 80:

When chlorine and sodium hydroxide being produced during the electrolysis of brine are allowed to mix, a new chemical is formed. Name this chemical and write its uses.

Solution :

Sodium hypochlorite, NaClO; used in making household bleaches and for bleaching fabrics.

Question 81:

Write the name and formula of one salt each which contains :

(a) two molecules of water of crystallisation

(b) five molecules of water of crystallisation

(c) ten molecules of water of crystallisation

Solution :

(a) Gypsum – $CaSO_4.2H_2O$

(b) Copper sulphate crystals – $CuSO_4.5H_2O$

(c) Sodium carbonate crystals – $Na_2CO_3.10H_2O$

Question 82:

How many molecules of water of crystallisation (per formula unit) are present in :

(a) copper sulphate crystals ?

(b) washing soda ?

(c) gypsum ?

Solution :

(a) 5.

(b) 10.

(c) 2.

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