INTEXT - QUESTION- 1

Question 1:

What do you understand by the terms, acid and base?

Solution 1:

(a) Acids are defined as compounds which contain one or more hydrogen atoms, and when dissolved in water, they produce hydronium ions (H_3O^+), the only positively charged ions.

(b) Hydronium ion

(c) H_3O^+

Question 2:

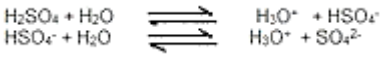
Explain the formation of hydronium ion. Write the ionization of sulphuric acid showing the formation of hydronium ion.

Solution 2:

Hydronium ions: They are formed by the reaction of H^+ (from acid) and water. It reacts with water to form H_3O^+ (Hydronium ion).

$H^+ + H_2O \longrightarrow H_3O^+$

Ionization of sulphuric acid showing the formation of hydronium ion:



Question 3:

Water is never added to acid in order to dilute it why?

Solution 3:

If water is added to a concentrated acid, the heat generated causes the mixture to splash out and cause severe burns. Thus, water is never added to acid in order to dilute it.

Question 4:

Define the term 'basicity' of an acid. Give the basicity of: nitric acid, sulphuric acid and phosphoric acid.

Solution 4:

Basicity: The basicity of an acid is defined as the number of hydronium ions (H_3O^+) that can be produced by the ionization of one molecule of that acid in aqueous solution.

The basicity of following compounds are:
Nitric acid: Basicity = 1
Sulphuric acid: Basicity =2
Phosphoric acid: Basicity =3

Question 5:
Give two examples of each of the following:
(a) oxy-acid
(b) hydracids
(c) monobasic acid
(d) dibasic acid
(e) tribasic acid

Solution 5:
(a) Oxyacids: - HNO_3, H_2SO_4
(b) Hydracid:- HCl, HBr
(c) Monobasic acid:- HCl, HBr
(d) Dibasic acid: - H_2SO_4 , H_2CO_3
(e) Tribasic acid:- H_3PO_4, H_3PO_3

Question 6:
Name the:
(a) acidic anhydride of the following acids:
(i) sulphurous acid
(ii) nitric acid
(iii) phosphoric acid
(iv) carbonic acid
(b) acids present in vinegar, grapes and lemon
(c) (i) ion that turns blue litmus red,
(ii) ion that turns red litmus blue.

Solution 6:
(a) The anhydride of following acids are:
(i) Sulphurous acid: SO_2
(ii) Nitric acid: N_2O_5
(iii) Phosphoric acid: P_2O_5
(iv) Carbonic acid : CO_2
(b) Acids present in following are:

Vinegar: Acetic acid
Grapes: Tartaric acid and Malic acid
Lemon: Citric acid

(c) (i) H^+ ion turns blue litmus red.
(ii) OH^- ion turns red litmus blue.

Question 7:
What do you understand by the statement 'acetic acid is a monobasic acid?
Solution 7:
Acetic acid is a monobasic acid which on ionization in water produce one hydronium ion per molecule of the acid.

Question 8:
(a) Give a balanced equation for reaction of nitrogen dioxide with water.
(b) How many types of salts does dibasic acid produce when it reacts with caustic soda solution? Give equation(s)
Solution 8:
(a) $2NO_2 + H_2O \longrightarrow HNO_2 + HNO_3$
(b) Two types of salts are produced when dibasic acid reacts with caustic soda. One is acidic salt and other normal salt.

Acid salts:
$H_2SO_4 + NaOH \longrightarrow NaHSO_4 + H_2O$
Normal salts:
$H_2SO_4 + 2NaOH \longrightarrow Na_2SO_4 + 2H_2O$

Question 9:
Carbonic acid gives an acid salt but hydrochloric acid does not. Explain.
Solution 9:
The strength of an acid is the extent to which the acid ionizes or dissociates in water.
The strength of an acid depends on the degree of ionization and concentration of hydronium ions $[H_3O^+]$ produced by that acid in aqueous solution.

Question 10:

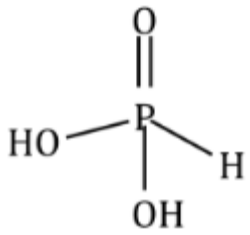
What do you understand by the strength of an acid? On which factor does the strength of an acid depend?

Solution 10:

(a) Carbonic acid is a dibasic acid with two replaceable hydrogen ions; therefore it forms one acid salt or one normal salt.
Hydrochloric acid is a monobasic acid with one replaceable hydrogen ion and so forms only one normal salt.

(b) Strength of an acid is the measure of concentration of hydronium ions it produces in its aqueous solution. Dil. HCl produces high concentration of hydronium ion compared to that of concentrated acetic acid. Thus, dil. HCl is stronger acid than highly concentrated acetic acid.

(c) H_3PO_3 is not a tribasic acid because in oxyacids of phosphorus, hydrogen atoms which are attached to oxygen atoms are replaceable. Hydrogen atoms directly bonded to phosphorus atoms are not replaceable.



(d) The salt produced is insoluble in the solution so the reaction does not proceed. Hence, we do not expect lead carbonate to react with hydrochloric acid.

(e) NO_2 is called double acid anhydride because two acids – nitrous acid and nitric acid – are formed when it reacts with water.
$2NO_2 + H_2O \rightarrow HNO_2 + HNO_3$

Question 11:

Dil. HCl acid is stronger than highly concentrated acetic acid. Explain.

Solution 11:

Acid rain is a by-product of a variety of human activities which release oxides of sulphur and nitrogen in the atmosphere. Burning of fossil fuels, coal, oil, petrol and diesel produces sulphur

dioxide and nitrogen oxide which pollute the air. Polluted air also contains many oxidising agents which produce oxygen because of excessive heat. This oxygen combines with the oxides of sulphur and nitrogen and rain water to form acids.

$2SO_2 + O_2 + 2H_2O \rightarrow 2H_2SO_4$
$4NO_2 + O_2 + 2H_2O \rightarrow 4HNO_3$

Question 12:
How is an acid prepared from a
(a) Non-metal
(b) Salt?
Give an equation for each.
Solution 12:
Acids are prepared from non-metals by their oxidation. For example :
Sulphur or phosphorus is oxidized by conc. Nitric acid to form sulphuric acid or phosphoric acid.

$S + 6HNO_3 \longrightarrow H_2SO_4 + 2H_2O + 6NO_2$
$P + 5HNO_3 \longrightarrow H_3PO_4 + H_2O + 5NO_2$

Acids are prepared from salt by displacement reaction. For example :
Nitric acid is prepared by using H_2SO_4 and sodium chloride.

$NaCl + H_2SO_4 \longrightarrow NaHSO_4 + HNO_3$

Question 13:
Name an acid used:
(a) to flavor and preserve food,
(b) in a drink,
(c) to remove ink spots,
(d) as an eyewash
Solution 13:
(a) $SO_2 + H_2O \longrightarrow H_2SO_3$
(b) $P_2O_5 + 3H_2O \longrightarrow 2H_3PO_4$
(c) $CO_2 + H_2O \longrightarrow H_2CO_3$
(d) $SO_3 + H_2O \longrightarrow H_2SO_4$

Question 14:
Give equations to show how the following are made from their corresponding anhydrides.
(a) sulphurous acid
(b) phosphoric acid,
(c) carbonic acid
(d) sulphuric acid
Solution 14:
(a) Citric acid
(b) Carbonic acid
(c) Oxalic acid
(d) Boric acid

INTEXT - QUESTION - 2

Question 1:
What do you understand by an alkali? Give two examples of:
(a) strong alkalis
(b) weak alkalis
Solution 1:
An alkali is a basic hydroxide which when dissolved in water produces hydroxyl ions (OH^-) as the only negatively charged ions.
(a) Strong alkalis: Sodium hydroxide , Potassium hydroxide
(b) Weak alkalis: Calcium hydroxide , Ammonium hydroxide

Question 2:
What is the difference between:
(a) an alkali and a base,
(b) an alkali and a metal hydroxide?
Solution 2:
(a) An alkali and a base:
1. Alkalis are soluble in water whereas bases may be or may not be soluble in water.
2. All alkalis are bases but all bases are not alkalis.

(b) An alkali and metal hydroxide :
1. Alkalis are soluble in water whereas metal hydroxides may be or may not be soluble in water

Question 3:
Define in terms of ionization:
(a) an acid
(b) an alkali
Solution 3:
(a) An acid: Acids are defined as compounds which when dissolved in water produce hydronium ions.
(b) An alkali: Alkalis are compounds which when dissolved in water produces hydroxyl ions.

Question 4:
Name the ions furnished by:
(a) bases in solution,
(b) a weak alkali
(c) an acid
Solution 4:
(a) Bases in solution give hydroxide ion.
(b) Weak alkali gives hydroxide ions.
(c) An acid gives a hydronium ion.

Question 5:
Give one example in each case:
(a) A basic oxide which is soluble in water,
(b) A hydroxide which is highly soluble in water,
(c) A basic oxide which is insoluble in water,
(d) a hydroxide which is insoluble in water,
(e) A weak mineral acid,
(f) a base which is not an alkali
(g) An oxide which is a base,
(h) A hydrogen containing compound which is not an acid,
(i) A base which does not contain a metal ion.
Solution 5:
(a) Barium oxide
(b) Sodium hydroxide
(c) Manganese oxide
(d) Cupper hydroxide
(e) Carbonic acid
(f) Ferric hydroxide
(g) Copper oxide

(h) Ammonia
(i) Ammonium hydroxide

Question 6:
You have been provided with three test tubes. One of them contains distilled water and the other two have an acidic solution and a basic solution respectively. If you are given only red litmus paper, how will you identify the contents of each test tube?
Solution 6:
The test tube containing distilled water does not affect the red litmus paper.
The test tube containing acidic solution does not change the red litmus paper.
But the test tube containing basic solution turns red litmus paper blue.

Question 7:
HCl, HNO_3, C_2H_5OH, $C_6H_{12}O_6$ all contain H atoms but only HCI and HNO_3 show acidic character. Why?
Solution 7:
It is because HCl and HNO_3 ionize in aqueous solution whereas ethanol and glucose do not ionize in aqueous solution

Question 8:
Dry HCI gas does not change the colour of dry litmis paper. Why?
Solution 8:
It is because HCl ionizes only in aqueous solution.

Question 9:
Is PbO_2 a base or not? Comment.
Solution 9:
Lead oxide is not a base because when it reacts with acid it forms chlorine along with salt and water. Thus, it is excluded from the class bases.
$PbO_2 + 4HCl \rightarrow PbCl_2 + Cl_2 + 2H_2O$

Question 10:

(a) what effect does the concentration of $[H_3O^+]$ ion have on solution?

(b) Do basic solutions also have $H^+(aq)$? Why are they basic?

Solution 10:

(a) As the concentration of $[H_3O^+]$ increases in solution, the pH decreases. Consequently, the acidity of the solution increases.

(b) Yes, basic solutions also have H + (aq) ions. Basic solutions have lower concentration of H + (aq) in comparison to concentration of OH − (aq) ions.

Question 11:

How would you obtain:

(a) a base from other base

(b) an alkali from a base,

(c) salt from another salt?

Solution 11:

(a) We can obtain a base from another base by double decomposition. The aqueous solution of salts with base precipitates the respective metallic hydroxide.

$FeCl_3 + 3NaOH \longrightarrow Fe(OH)_3 + 3NaCl$

(b) An alkali from a base

$Na_2CO_3 + Ca(OH)_2 \xrightarrow{\Delta} 2NaOH + CaCO_3$

(c) Salt from another salt

$NH_4CI + NaOH \longrightarrow NaCI + H_2O + NH_3$

Question 12:

Write balanced equations to satisfy each statement:

(a) Acid + Active metal ⟶ Salt + hydrogen

(b) Acid + Base ⟶ Salt + water

(c) Acid + carbonate Or bicarbonate ⟶ Salt + water + carbon dioxide

(d) Acid + sulphite Or bisulphite ⟶ Salt + water + sulphur dioxide

(e) Acid + sulphide ⟶ Salt + Hydrogen sulphide

Solution 12:

(a) $Mg + 2HCl \longrightarrow MgCl_2 + H_2$

(b) $HCl + NaOH \longrightarrow NaCl + H_2O$

(c) $CaCO_3 + 2HCl \longrightarrow CaCl_2 + H_2O + CO_2$

(d) $CaSO_3 + 2HCl \longrightarrow CaCl_2 + H_2O + SO_2$

(e) $ZnS + 2HCl \longrightarrow ZnCl_2 + H_2S$

Question 13:

The skin has and needs natural oils. Why is it advisable to wear gloves while working with strong allkalis?

Solution 13:

As we know that alkalis react with oil to form soap. As our skin contains oil so when we touch strong alkalis, a reaction takes place and soapy solution is formed. Hence we should wear gloves

Question 14:

Why are alkalis soapy to touch? What do you understand by PH value?

Solution 14:

Alkalis are soapy to touch as they react with oils of our skin to form soaps.

pH of a solution is the negative logarithm to the base 10 of hydrogen ion concentration expressed in moles per litre.

Question 15:

Complete the table:

Indicator	Neutral	Acidic	Alkaline
Litmus	Purple	----------	----------
Phenolphthalein	Colourless	----------	----------

Solution 15:

Indicator	Neutral	Acidic	Alkaline
Litmus	Purple	Blue to red	Red to blue
Phenolphthalein	Colourless	Colourless	Pink

Question 16:

Two solutions X and Y have Ph values of 4 and 10 respectively. Which one of these two will give a pink colour with phenolphthalein indicator?

Solution 16:

The solution Y will give a pink colour with phenolphthalein.

Question 17:

You are supplied with five solutions: A, B, C, D and E with Ph values as follows:
A= 1.8, B = 7, C= 8.5, D = 13, and E=5
Classify these solutions as neutral, slightly or strongly acidic and slightly or strongly alkaline.
Which solution would be most likely to liberate hydrogen with:
(a) magnesium powder,
(b) powdered zinc metal. Give a word equation for each reaction.

Solution 17:

A = Strongly acidic
B = neutral
C = Weakly alkaline
D = Strongly alkaline
E = Weakly acidic

(a) Solution A (acidic solution) + Mg $\longrightarrow$ H_2 + Mg salt
(b) Solution A (acidic solution) + Zn $\longrightarrow$ H_2 + Zn salt

Question 18:

(a) what are the acidic range and the alkaline range in the Ph scale?
(b) State one advantage of using 'Ph paper' for measuring the Ph value of an unknown solution.

Solution 18:

(a) The p H scale ranges from 0 to 14.
p H = 7 , Solution is neutral
p H <7 , Solution is acidic
p H >7 , Solution is basic

(b) One advantage of measuring the pH of unknown solution by using pH paper is that we can come to know whether the solution is acidic, basic or neutral without wasting the solution.

Question 19:

Distinguish between:

(a) a common acid base indicator and a universal indicator,

(b) acidity of bases and basicity of acids,

(c) acid and alkali (other than indicators).

Solution 19:

(a) A common acid base indicator and a universal indicator:

Acid base indicator like litmus tells us only whether a given substance is an acid or a base. Universal indicator gives an idea as to how acidic or basic a substance is. An universal indicator gives different colours with solutions of different p H values.

(b) Acidity of bases and basicity of acids

Acidity of bases: The number of hydroxyl ions which can be produced per molecule of the base in aqueous solution.

Basicity of acid: The basicity of an acid is defined as the number of hydronium ions that can be produced by the ionization of one molecule of that acid in aqueous solution.

(c) Acid and alkali:

An acid is that substance which gives H^+ ions when dissolved in water

An alkali is that substance which gives OH^- ions when dissolved in water.

Question 20:

How does tooth enamel get damaged? What should be done to prevent it?

Solution 20:

Substances like chocolates and sweets are degraded by bacteria present in our mouth. When the p H falls to 5.5 tooth decay starts. Tooth enamel is the hardest substance in our body and it gets corroded. The saliva produced by salivary glands is slightly alkaline, it helps to increase the p H , to some extent, but tooth paste which contain basic substance is used to neutralize excess acid in the mouth.

INTEXT - QUESTION - 3

Question 1:

Define an acidic salt, a normal salt and a mixed salt. Give two examples in each case of: (a) a normal salt, (b) an acid salt, (c) a mixed salt.

Solution 1:

Acidic salt: Acid salts are formed by the partial replacement of the ionizable hydrogen atoms of a polybasic acid by a metal or an ammonium ion.

Normal salt: Normal salts are the salts formed by the complete replacement of the ionizable hydrogen atoms of an acid by a metallic or an ammonium ion.

Mixed salt: Mixed salts are those salts that contain more than one basic or acid radical.

Examples:

(a) A Normal salt : Na_2SO_4 , NaCl
(b) An acid salt : $NaHSO_4$, Na_2HPO_4
(c) A mixed salt : $NaKCO_3$, $CaOCl_2$

Question 2:

Answer the following questions related to salts and their preparations:

(a) What is a 'salt'?
(b) What kind of salt prepared by direct combination. Write an equation for the reaction that takes place in preparing the salt you have named.
(c) Name a salt prepared by direct combination. Write an equation for the equation for the reaction that takes place in preparing the salt you have named.
(d) Name the procedure used to prepare a sodium salt such as sodium sulphate.

Solution 2:

(a) Salt is a compound formed by the partial or total replacement of the ionizable hydrogen atoms of an acid by a metallic ion or an ammonium ion.
(b) An insoluble salt can be prepared by precipitation.
(c) A salt prepared by direct combination is Iron (III) chloride.
Reaction:
$2Fe + 3Cl_2 \rightarrow 2FeCl_3$
(d) The name of the procedure used to prepare a sodium salt such as sodium sulphate is Neutralization of acid with base.

Question 3:

How are the following salts prepared:

(a) Calcium sulphate from calcium carbonate,
(b) Lead (II) oxide from lead,

(c) Lead carbonate from lead nitrate,
(d) Sodium nitrate from sodium hydroxide,
(e) Magnesium carbonate from magnesium chloride,
(f) Copper (II) sulphate from copper (II) oxide?

Solution 3:

(a) Calcium sulphate from calcium carbonate:
By decomposition of calcium carbonates by acids.

(b) Lead (II) oxide from lead:
Lead oxide can be prepared from lead by Direct combination.

(c) Lead carbonate from lead nitrate:
Lead carbonate is prepared from lead nitrate by precipitation (double decomposition) with Sodium carbonate.

(d) Sodium nitrate from sodium hydroxide:
Sodium nitrate is prepared from sodium hydroxide by neutralizing it with nitric acid.

(e) Magnesium carbonate from Magnesium chloride:
Magnesium carbonate from Magnesium chloride can be prepared by double decomposition with Sodium carbonate.

(f) Copper (II) sulphate from copper (II) oxide:
Copper sulphate can be prepared from copper oxide by action with sulphuric acid

Question 4:

(a) How is lead sulphate prepared in the aboratory?
(b) Why lead sulphate cannot be prepared by the action of dilute H_2SO_4 on lead oxide?

Solution 4:

(a) Lead sulphate is prepared from insoluble lead oxide, by first converting lead oxide into soluble lead nitrate with dilute nitric acid and then treating the resulting solution with sulphuric acid to obtain white ppt. of Lead sulphate.

$PbO + 2HNO_3 \rightarrow Pb(NO_3)_2 + H_2O$
$Pb(NO_3)_2 + H_2SO_4 \rightarrow PbSO_4 + 2HNO_3$

(b) Lead sulfate is insoluble, when lead is added to sulfuric acid it only reacts on the surface. The lead becomes coated with insoluble lead sulfate and the lead in the interior can't react. Therefore lead sulfate cannot be prepared by adding dilute sulfuric acid.

Question 5:

Describe giving all practical details, how would you prepare:

(a) Copper sulphate crystals from a mixture of charcoal and black copper oxide,

(b) zinc sulphate crystals from zinc dust (powdered zinc and zinc oxide),

(c) lead sulphate from metallic lead,

(d) sodium hydrogen carbonate crystals.

Solution 5:

(a) Copper sulphate crystals from mixture of charcoal and black copper oxide:

The carbon in the charcoal reduces the black copper oxide to reddish-brown copper. The lid must not be removed until the crucible is cool or the hot copper will be re-oxidized by air.

Take dilute sulphuric acid in a beaker and heat it on wire gauze. Add cupric oxide in small quantities at a time, with stirring till no more of it dissolves and the excess compound settles to the bottom.

Filter it hot and collect the filtrate in china dish. Evaporate the filtrate by heating to the point of crystallization and then allow it to cool and collect the crystals of copper sulphate penta-hydrate.

Reaction: $CuO + H_2SO_4 \rightarrow CuSO_4 + H_2O$

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

(b) Zinc sulphate crystals from Zinc dust:

Take dilute sulphuric acid in a beaker and heat it on wire gauze. Add some granulated zinc pieces with constant stirring. Add till the Zinc settles at base of the beaker. Effervescences take place because of liberation of hydrogen gas. When effervescence stops, it indicates that all the acid has been used up. The excess of zinc is filtered off. Collect the solution in china dish and evaporate the solution to get crystals. Filter, wash them with water and dry them between the folds of paper. The white needle crystals are of hydrated Zinc sulphate.

Reaction: $Zn + H_2SO_4 \rightarrow ZnSO_4 + H_2$

$ZnSO_4 + 7\ H_2O \rightarrow ZnSO_4.\ 7\ H_2O$

(c) Lead sulphate from metallic lead:

Metallic lead is converted to lead oxide by oxidation. Then lead sulphate is prepared from insoluble lead oxide, by first converting it into soluble lead nitrate. Then the lead nitrate solution is treated with sulphuric acid to obtain white ppt. of Lead sulphate.

Reaction:

$PbO + 2HNO_3 \rightarrow Pb(NO_3)_2 + H_2O$

$Pb(NO_3)_2 + H_2SO_4 \rightarrow PbSO_4 + 2HNO_3$

(d) Sodium hydrogen carbonate crystals:
Dissolve 5 grams of anhydrous sodium carbonate in about 25 ml of distilled water in a flask. Cool the solution by keeping the flask in a freezing mixture. Pass carbon dioxide gas in the solution. Crystals of sodium bicarbonate will precipitate out after sometime. Filter the crystals and dry it in folds of filter paper.

Reaction: $Na_2CO_3 + CO_2 + H_2O \rightarrow 2NaHCO_3$

Question 6:

The following is a list of methods for the preparation of salts.
A – direct combination of two elements
B – reaction of a dilute acid with a metal.
C – reaction of a dilute acid with an insoluble base.
D – titration of a dilute acid with a solution of soluble base.
E – reaction of two solutions of salts to form a precipitate.

Choose from the above list A to E, the best method of preparing the following salts by giving a suitable equation in each case:

1. Anhydrous ferric chloride,
2. Lead chloride,
3. Sodium sulphate.
4. Copper sulphate.

Solution 6:

1. Anhydrous ferric chloride: - A (Direct combination of two elements)
   $2Fe + 3Cl_2 \rightarrow 2FeCl_3$

2. Lead chloride: - E (Reaction of two solutions of salts to form a precipitate
   $Pb(NO_3)_2 + 2HCl \rightarrow PbCl_2 + 2HNO_3$

3. Sodium sulphate: - D (Titration of dilute acid with a solution of soluble base)
   $2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$

4. Copper sulphate:- C (reaction of dilute acid with an insoluble base)
   $Cu(OH)_2 + H_2SO_4 \rightarrow CuSO_4 + 2H_2O$

Question 7:

Name:

(a) a chloride which is insoluble in cold water but dissolves in hot water,

(b) a chloride which is insoluble,

(c) two sulphates which are insoluble,

(d) a basic salt,

(e) an acidic salt,

(f) a mixed salt,

(g) a complex salt,

(h) a double salt,

(i) two salts whose solubility increases with temperature,

(j) a salt whose solubility decreases with temperature.

Solution 7:

(a) Lead chloride

(b) Silver chloride

(c) Barium sulphate and lead sulphate

(d) Basic lead chloride

(e) Sodium hydrogen sulphate

(f) Sodium potassium carbonate

(g) Sodium argentocyanide

(h) Potash alum

(i) Potassium bromide and potassium chloride

(j) Calcium sulphate

Question 8:

Explain ‘salt hydrolysis’ name two salts which are:

(a) acidic

(b) basic

(c) neutral, when dissolved in water.

Solution 8:

The phenomenon, due to which salt formed by a weak acid and a strong base, or by a strong acid and a weak base, reacts with water to give an acidic or an alkaline solution, is known as salt hydrolysis.

(a) Acidic : Iron chloride, Copper sulphate

(b) Basic: Sodium carbonate, potassium acetate

(c) Neutral: Sodium chloride, sodium sulphate

Question 9:

What would you observe when:

(a) blue litmus is introduced into a solution of ferric chloride,

(b) red litmus paper is introduced into a solution of sodium sulphate,

(c) red litmus paper is introduced in sodium carbonate solution?

Solution 9:

(a) Blue litmus will turn into red which will indicate the solution to be acidic.

(b) No change will be observed.

(c) Red litmus will turn into blue will indicate the solution to be basic

Question 10:

Write the balanced equations for the preparation of the following salts in the laboratory:

(a) A soluble sulphate by the action of an acid on an insoluble base,

(b) An insoluble salt by the action of an acid on another salt,

(c) An insoluble base by the action of a solube base on a soluble salt,

(d) A soluble sulphate by the action of an acid on a metal.

Solution 10:

(a) $MgCO_3 + H_2SO_4 \longrightarrow MsSO_4 + H_2O + H_2O + CO_2$

(b) $Pb(NO_3)_2 + H_2SO_4 \longrightarrow PbSO_4 + 2HNO_3$

(c) $Pb(NO_3)_2 + Na_2CO_3 \longrightarrow PbCO_3 + 2NaNO_3$

(d) $Zn + H_2SO_4 \longrightarrow ZnSO_4 + H_2$

Question 11:

Give the preparation of the salt shown in the left column by matching with the methods given in the right column. Write a balanced equation for each preparation.

Salt	Method of preparation
Zinc sulphate	Precipitation
Ferrous sulphide	Oxidation
Barium sulphate	Displacement
Ferric sulphate	Neutralisation
Sodium sulphate	synthesis

Solution 11:

Zinc Sulphate – Displacement

$Zn(OH)_2 + H_2SO_4 \longrightarrow ZnSO_4 + 2H_2O$

Ferrous sulphide – synthesis
$Fe + S \longrightarrow FeS$

Barium sulphate – Precipitation
$BaCI_2 + H_2SO_4 \longrightarrow BaSO_4 + 2HCI$

Ferric sulphate – Oxidation
$Fe + H_2SO_4 \longrightarrow FeSO_4 + H_2$

Sodium sulphate – Neutralisation
$2NaOH + H_2SO_4 \longrightarrow Na_2SO_4 + 2H_2O$

Question 12:

You are provided with the following chemicals:
$NaOH$, Na_2CO_3, H_2O, $Zn(OH)_2$, CO_2, HCI, Fe, H_2SO_4, CI_2, Zn.
Using the suitable chemicals from the given list only, state briefly how you would prepare:
(a) iron (III) chloride,
(b) sodium sulphate,
(c) sodium zincate
(d) iron (II) sulphate,
(e) sodium chloride?

Solution 12:

(a) Iron (III) Chloride: Iron chloride is formed by direct combination of elements.
$2Fe + 3Cl_2 \longrightarrow 2FeCI_3$

(b) Sodium sulphate: By neutralization of caustic soda with dilute sulphuric acid
$2NaOH + H_2SO_4 \longrightarrow Na_2SO_4 + 2H_2O$

(c) Sodium zincate: By the action of metals with alkalis
$Zn + 2NaOH \longrightarrow Na_2ZnO_2 + H_2$

(d) Iron (II) sulphate: Iron sulphate is prepared by the action of dilute acid on an active metal.
$Fe + H_2SO_4 \longrightarrow FeSO_4 + H_2$

(e) Sodium chloride: By the neutralization reaction of strong acid with strong base
$NaOH + HCI \longrightarrow NaCI + H_2O$

Question 13:

Define the term neutralization:

(a) Give a reaction, mentioning clearly acid and base used in the reaction.

(b) if one mole of a strong acid reacts with one mole of a strong base, the heat produced is always the same. Why?

Solution 13:

Neutralization is the process by which H^+ ions of an acid react completely with the $[OH]^-$ ions of a base to give salt and water only.

(a) $NaOH + HCl \longrightarrow NaCI + H_2O$

(b) Neutralization is simply a reaction between H^+ ions given by strong acid and OH^- ions given by strong base. In case of all strong acids and strong bases, the number of H^+ and OH^- ions produced by one mole of a strong acid or strong base is always same. Hence the heat of neutralization of a strong acid with strong base is always same.

Question 14:

Explain why:

(a) It is necessary to find out the ration of reactants required in the preparation of sodium sulphate.

(b) fused calcium chloride is used in the preparation of $FeCI_3$?

Solution 14:

(a) Since sodium hydroxide and sulphuric acid are both soluble, an excess of either of them cannot be removed by filtration. Therefore it is necessary to find out on small scale, the ratio of solutions of the two reactants.

(b) As iron chloride is highly deliquescent, so it is kept dry with the help of fused calcium chloride.

Question 15:

Give the Ph value of pure water. Does it change if common salt it added to it?

Solution 15:

pH of pure water is 7 at 25^oC. No, the pH does not change when common salt is added

Question 16:
Classify the following solutions as acids, bases or salts ammonium hydroxide, barium chloride, sodium chloride, sodium hydroxide, H_2SO_4 and HNO_3
Solution 16:
Acids: H_2SO_4 and HNO_3
Bases: Ammonium hydroxide and sodium hydroxide.
Salts: Barium chloride and sodium chloride.

INTEXT - QUESTION - 4

Question 1:
What do you understand by water of crystallization?
Give four substances which contain water of crystallization and write their common names.
Solution 1:
Some salts, while crystallizing out form their solutions, unite with definite quality of water which is known as water of crystallization.

Four substances which contain water of crystallization:
$Na_2CO_3.10H_2O$ Washing soda
$MgSO_4.7H_2O$ Epsom salt
$K_2SO_4.Al_2(SO_4)_3.24H_2O$ Potash alum
$Na_2SO_4.10H_2O$ Glauber's salt

Question 2:
(a) Define efflorescence. Give examples.
(b) define deliquescence. Give examples.
Solution 2:
(a) Efflorescence is the property of some substances to lose wholly, or partly their water of crystallization when their crystals are exposed to dry air even for a short time.
Examples are: Washing soda, Glauber's salt , Epsom salt

(b) Certain water - soluble substances, when exposed to the atmosphere at ordinary temperature, absorb moisture from the atmospheric air to become moist and ultimately dissolve in the absorbed water, forming a saturated solution.
For example: Caustic soda, Caustic potash

Question 3:

Distinguish between drying and dehydrating agent.

Solution 3:

Drying agent	Dehydrating agent
(a) They remove moisture from other substances. (b) They are used to dry gases like chlorine, Sulphur dioxide. They are used in desiccators to keep substances dry. (c) They represent physical change	i. They remove chemically combined elements of water in the ratio of 2:1 from a compound. ii. They prepare substances like carbon monoxide, sugar charcoal etc. iii. They represent chemical change

Question 4:

Explain clearly how conc, H_2SO_4 is used as dehydrating as well as drying agent.

Solution 4:

Conc. H_2SO_4 removes the moisture from gases and it can also remove water molecules from blue vitriol. So conc.H_2SO_4 is used as dehydrating as well as drying agent.

Question 5:

M is an element in the form of a powder. M burns in oxygen and the product obtained is soluble in water. The solution is tested with litmus. Write down only the word which will correctly complete each of the following sentences.

(i) If M is a metal, then the litmus will turn _____.

(ii) If M is a non-metal, then the litmus will turn _____.

(iii) If M is a reactive metal, then _____ will be evolved when M reacts with dilute sulphuric acid.

(iv) If M is a metal, it will form _____ oxide, which will form _____ solution with water.

(v) If M is a non-metal, it will not conduct electricity in the form of _____.

Solution 5:

(i) Blue

(ii) Red

(iii) Hydrogen

(iv) Basic ,Alkaline

(v) Graphite

Question 6:

Give reasons for the following:

(a) Sodium hydrogen sulphate is not an acid but it dissolves in water to give hydrogen ions, according to the equation

$NaHSO_4 \leftrightarrows H^+ + Na^+ + SO_4^{2-}$

(c) Anhydrous calcium chloride is used in a desiccator.

Solution 6:

(a) Sodium hydrogen sulphate is not an acid but undergoes partial replacement of the ionisable hydrogen atom and behaves as an acidic salt to give H+ ions.

(b) As calcium chloride absorbs moisture and keeps the compound dry, so it is used in desiccators as a drying agent.

Question 7:

State whether a sample of each of the following would increase or decrease in a mass if exposed to air.

(a) Solid NaOH

(b) Solid $CaCI_2$

(c) Solid $Na_2CO_3\,10H_2O$

(d) Conc, sulphuric acid

(e) Iron (III) Chloride

Solution 7:

(a) Increases

(b) Increase

(c) Decrease

(d) Increases

(e) Increases

Question 8:

(a) why does common salt get wet during the rainy season?

(b) How can this impurity be removed?

(c) Name a substance which changes the blue colour of copper sulphate crystals to white.

(d) Name two crystalline substances which do not contain water of crystallization.

Solution 8:

(a) Common salt contains impurities like magnesium chloride, which are deliquescent substances. So on exposure to air especially during the rainy season, table salt turns moist though sodium chloride is not deliquescent.

(b) This impurity can be removed by passing a current of dry hydrogen chloride gas through a saturated solution of the affected salt. Pure sodium chloride is produced as a precipitate, which can be recovered by filtering and washing first with water and then with alcohol.

(c) Conc. H_2SO_4 can change the blue colour of copper sulphate to white.

(d) Two crystalline substance which do not contain water of crystallization are:

Common salt, Nitre, Sugar.

MISCELLANEOUS QUESTIONS BASED ON ICSE EXAMINATIONS

Question 1:

For each of the salt: A, B, C and D, suggest a suitable method of its preparation.

(a) A is a sodium salt.

(b) B is an insoluble salt

(c) C is a soluble salt of copper

(d) D is a soluble salt of zinc

Solution 1:

(a) A is sodium salt: It is prepared by neutralization of a base with acids.

(b) B is an insoluble salt: An insoluble salt is obtained from another insoluble salt by double decomposition. The insoluble salt is first converted into a soluble salt which is then used to prepare the desired salt.

(c) C is soluble salt of copper: The soluble salt of copper can be prepared by the decomposition of carbonates by acids.

(d) D is soluble salt of Zinc: The soluble salt of Zinc can be prepared by decomposition of chlorides by conc. H_2SO_4.

Question 2:

(a) A solution has a Ph of 7. Explain how you would: (i) increase its Ph; (ii) decrease its pH.

(b) If a solution changes the colour of litmus from red to blue, what can you say about its Ph?

(c) What can you say about the Ph of a solution that liberates carbon dioxide from sodium carbonate?

Solution 2:

(a)

(i) The pH increases by the addition of base.

(ii) The pH decreases by the addition of acid.

(b) If the solution changes the colour of litmus from red to blue, the pH indicates the presence of base.
(c) The solution that liberates carbon dioxide from sodium carbonate has pH less than 7.

Question 3:

Answer the questions below, relating your answers only to salts in the following list: sodium chloride, anhydrous calcium chloride, copper sulphate - water.

(a) What name is given to the water in the compound copper sulphate -5- water?
(b) If copper sulphate 5- water is heated, anhydrous copper sulphate is formed. What is its colour?
(c) By what means, other than heating, could you dehydrate copper sulphate -5- water and obtain anhydrous copper sulphate?
(d) Which one of the salts in the given list is deliquescent?

Solution 3:

(a) The name given to the water in the compound copper sulphate-5-water is water of crystallization.
(b) The anhydrous copper sulphate is white in colour.
(c) By adding dehydrating substances such as conc. sulphuric acid as they remove the water of crystallisation.
(d) anhydrous calcium chloride

Question 4:

Solution P has a PH of 13, solution Q had a PH OF 6 and solution R has a PH of 2.
Which solution:

(a) will liberate ammonia from ammonium sulphate on heating?
(b) is a strong acid?
(c) contains molecules as well as ions?

Solution 4:

(a) P
(b) R
(c) Q

Question 5:

(a) Outline the steps that would be necessary to convert insoluble lead (II) oxide into soluble lead chloride.

(b) write the balanced equations for the reactions, to convert insoluble lead (II) oxide into soluble lead choride.

(c) A solution of iron (III) chloride has a PH less than 7. Is the solution acidic or alkaline?

Solution 5:

(a) Lead oxide is treated with dilute nitric acid to get soluble Lead nitrate. This Lead nitrate is treated with soluble Metallic chloride or dilute hydrochloric acid to get insoluble Lead chloride.

(b) $PbO + 2HNO_3$ (dil) $\longrightarrow Pb(NO_3)_2 + H_2O$

$Pb(NO_3)_2 + 2NaCl \longrightarrow PbCl_2 + 2NaNO_3$.

(c) Acidic

Question 6:

Choosing only substances from the list given in the box below, write equations which you would use in the laboratory to obtain:

(a) Sodium sulphate,

(b) Copper sulphate

(c) Iron (II) sulphate

(d) Zinc carbonate

Dilute Sulphuric acid	**Copper**	**Copper Carbonate**
	Iron	Sodium Carbonate
	Sodium	
	Zinc	

Solution 6:

(a) Sodium sulphate:

$Na_2CO_3 + H_2SO_4$ (dil) $\longrightarrow Na_2SO_4 + H_2O + CO_2$

(b) Copper sulphate:

$CuCO_3 + H_2SO_4$ (dil) $\longrightarrow CuSO_4 + H_2O + CO_2$

(c) Iron (II) sulphate:

$Fe + H_2SO_4$ (dil) $\longrightarrow FeSO_4 + H_2$

(d) Zinc Carbonate:

$Zn + H_2SO_4$(dil) $\longrightarrow ZnSO_4 + H_2$

$ZnSO_4 + Na_2CO_3 \longrightarrow ZnCO_3 + Na_2SO_4$

Question 7:

From the formula listed below, choose one, in each case corresponding to the salt having the given description:-

AgCl, $CuCO_3$, $CuSO_4$, $5H_2O$, KNO_3, NaCI, $NaHSO_4$, $Pb(NO_3)_2$, $ZnCO_3$, $ZnSO_4$, $7H_2O$

(a) an acid salt

(b) an insoluble chloride

(c) on treating with concentrated sulphuric acid, this salt changes from blue to white.

(d) On heating, this salt changes from green to black

(e) this salt gives nitrogen dioxide on heating.

Solution 7:

(a) $NaHSO_4$

(b) AgCl

(c) $CuSO_4.5H_2O$

(d) $CuCO_3$

(e) $Pb(NO_3)_2$

Question 8:

$Ca(H_2PO_4)_2$ is an example of a compound called _____ (acid salt/ basic salt/ normal salt)

Solution 8:

Acid salt

Question 9:

Write the balanced equation for the reaction of: A names acid and a named alkali.

Solution 9:

$2NaOH + H_2SO_4 \longrightarrow Na_2SO_4 + 2H_2O$

Question 10:

State the terms defined by the following sentences:

(a) A soluble base

(b) The insoluble solid formed when two solutions are mixed together.

(c) An acidic solution in which there is only partial ionization of the solute molecules.

Solution 10:

(a) Alkali

(b) Precipitate

(c) Weak acid

Question 11:

Differentiate between the chemical nature of an aqueous solution of HCI and an aqueous solution of NH_3.

Solution 11:

Aqueous solution of HCl	Aqueous solution of NH_3
1. It is acidic in nature. 2. It turns blue litmus to red. 3. It gives Hydronium ions in the solution.	4. It is basic in nature. 5. It turns red litmus to blue. 6. It gives hydroxyl ions in the solution.

Question 12:

Write the balanced equations for the preparation of the following compounds (as the major product) starting from iron and using only one other substance:

(a) Iron (II) chloride

(b) Iron (III) chloride

(c) Iron (II) sulphate

(d) Iron (II) Sulphide.

Solution 12:

(a) $Fe + 2HCl\ (dil) \longrightarrow FeCl_2 + H_2$

(bi) $2Fe\ (heated) + 3Cl_2\ (dry) \longrightarrow 2FeCl_3$

(c) $Fe + H_2SO_4\ (dil) \longrightarrow FeSO_4 + H_2$

(d) $Fe + S \xrightarrow{\Delta} FeS$

Question 2004:

Which of the following methods, A, B, C, D or E is generally used for preparing the chlorides listed below from (i) to (v), Answer by writing down the chloride and the letter pertaining to the corresponding method each letter is to be used only once.

A Action of acid on metal

B Action of an acid on an oxide or carbonate

C Direct combination

D Neutralization of an alkali by an acid

E Precipitation (double decomposition)

(i) Copper (II) chloride
(ii) Iron (II) chloride
(iii) Iron (III) chloride
(iv) Lead (II) chloride
(v) Sodium chloride

Solution 2004:

(i) Copper (II) chloride - (B) Action of an acid on an oxide or carbonate
(ii) Iron (II) chloride - (A) Action of acid on metal
(iii) Iron (III) chloride - (C) Direct combination
(iv) Lead (II) chloride - (E) Precipitation (double decomposition)
(v) Sodium chloride - (D) Neutralization of an alkali by an acid

Question 2005:

The preparation of lead sulphate from lead carbonate is a two-step process. (lead sulphate cannot be prepared by adding dilute sulphuric acid to lead carbonate.)

(a) What is the first step that is required to prepare lead sulphate from lead carbonate?
(b) Write the equation for the reaction that will take place when this first step is carried out.
(c) Why is the direct addition of dilute sulphuric acid to lead carbonate an impractical method of preparing lead sulphate?

Solution 2005:

(a) The first step is to convert insoluble lead carbonate into soluble lead nitrate by treating lead carbonate with dilute nitric acid.

(b) $PbCO_3$ (s) + $2HNO_3$(dil) ⟶ $Pb(NO_3)_2$ (aq) + H_2O (l) + CO_2 ↑

(c) When dilute sulphuric acid is added directly to lead carbonate, the lead sulphate thus formed will be deposited on solid lead carbonate disconnecting lead carbonate from sulphuric acid.

Question 2(2005):

Fill in the blanks with suitable words:
An acid is a compound which when dissolved in water forms hydronium ions as the only ……. Ions, A base is a compound which is soluble in water contains …….. ions. A base reacts with an acid to form a …… and water only. This type of reaction is known as ……..

Solution 2(2005):
Positively charged
Negatively charged
Salt

Neutralization reaction

Question 1(2007):
From the list given below, select the word (s) required to correctly complete blanks (a) to (e) in the following passage:
Ammonia, ammonium, carbonate, carbon dioxide, hydrogen, hydronium, hydroxide, precipitate, salt, water.
A solution X turns blue litmus red, so it must contain
(a) …….. ions; another solution Y turns red litmus blue and therefore, must contain.
(b) …… ions, When solutions X and Y are mixed together, the products will be
(c) ……. And
(d) …….. if a piece of magnesium were put into solution X.
(e) ……. Gas would be evolved.
(Note: words chosen from the list are to be used only once. Write the answers as (1) (a), (b), (c) and so on. Do not copy the passage).

Solution 1(2007):
(a) hydronium
(b) hydroxide
(c) salt
(d) water
(e) Hydrogen

Question 2(2007):
Match the following:

Column A	**Column B**
(a) acid salt	A. Sodium potassium carbonate
(b) Mixed salt	B. Alum
(c) complex salt	C. Sodium carbonate
(d) Double salt	D. Sodium zincate
(e) Normal salt	E. Sodium hydrogen carbonate

Solution 2(2007):
(a) - (E)
(b) - (A)
(c) - (D)
(d) - (B)
(e) - (C)

Question 3(2007):
Write balanced equations for the following reactions:
(a) Lead sulphate from lead nitrate solution and dilute sulphuric acid,
(b) Copper sulphate from copper and concentrated sulphuric acid.
(c) Lead chloride from lead nitrate solution and sodium chloride solution,
(d) Ammonium sulphate from ammonia and dilute sulphuric acid,
(e) Sodium chloride from sodium carbonate solution and dilute hydrochloric acid
Solution 3(2007):
(a) $Pb(NO_3)_2 + H_2SO_4 \longrightarrow PbSO_4 + 2HNO_3$
(b) $Cu + H_2SO_4 \longrightarrow CuSO_4 + H_2$
(C) $Pb(NO_3)_2 + 2NaCI \longrightarrow PbCI_2 + 2NaNO_3$
(d) $2NH_3 + H_2SO_4 \longrightarrow (NH_4)_2SO_2$
(e) $Na_2CO_3 + 2HCI \longrightarrow 2NaCI + H_2O + CO_2$

Question 1(2008):
What are the terms define by the following?
(i) A salt containing a metal ion surrounded by other ions or molecules,
(ii) A base which is soluble in water.
Solution 1(2008):
(i) Complex salts
(ii) Alkali

Question 2(2008):
Making use only of substances chosen from those given below:

Dilute sulphuric acid	sodium carbonate
Zinc	sodium sulphite
Lead	Calcium carbonate

Give the equations for the reactions by which you could obtain:
(i) Hydrogen
(ii) sulphur dioxide
(iii) carbon dioxide,
(iv) zinc carbonate (two steps required).

Solution 2(2008):

(i) $Nn + H_2SO_4 \longrightarrow ZnSO_4 + H_2$

(ii) $Na_2SO_3 \longrightarrow Na_2O + SO_2$

(iii) $Na_2CO_3 + H_2SO_4 \longrightarrow Na_2SO_4 + H_2O + CO_2$

(iv) $Zn + H_2SO_4 \longrightarrow ZnSO_4 + H_2$

$ZnSO_4 + Na_2CO_3 \longrightarrow Na_2SO_4 + ZnCO_3$