PRISM WORLD

Std.: 9 (English) **Science 1**

Chapter: 5

Q.1 **Find the odd one out** **8**

1 Chloride, Nitrate, hydride, Ammonium.

Ans Ammonium - It is a basic radical (positive ion) and rest all are acidic radicals (negative ions).

2 Sodium Nitrate, sodium carbonate, sodium sulphate, sodium chloride.

Ans Sodium carbonate - It is formed by reaction of weak acid and strong base while remaining by reaction of strong acid and strong base.

3 Acetic acid, carbonic acid, Hydrochloric acid, Nitric acid.

Ans Carbonic acid - It is the only dibasic acid while remaining are monobasic acids.

4 Sodium chloride (aq), Potassium hydroxide (aq), Acetic acid (aq), Sodium acetate (aq)

Ans Acetic acid - It is a weak electrolyte while remaining are strong electrolytes. (weak electrolytes do not dissociate in water completely by strong electrolytes do dissociate almost completely)

5 Calcium oxide, Magnesium oxide, zinc oxide, sodium oxide.

Ans Zinc oxide - Zinc oxide (Z_nO) is an amphoteric oxide while remaining are basic oxides.

6 Crystalline blue vitriol, Crystalline common salt, Crystalline ferrous sulphate, crystalline sodium carbonate.

Ans Crystalline common salt. - It does not contain any water, crystallization while remaining contains it.

7 Hydrogen chloride, sodium hydroxide, calcium oxide, Ammonia.

Ans Hydrogen chloride - Hydrogen chloride (HCl) is acidic while others are basic.

8 Ammonium chloride, sodium chloride, Potassium Nitrate, sodium sulphate.

Ans Ammonium Chloride - It is formed by a strong acid and weak base reaction while others by reaction of strong acid and strong base.

Q.2 **Chemical reaction with equation:** **4**

1 Show the dissociation of following compounds on dissolving in water and write whether dissociation is small or large.
Magnesium chloride.

Ans $MgCl_{2(s)} \xrightarrow[\text{dissociation}]{\text{water}} Mg^{2+}_{(aq)} + 2Cl^{-}_{(aq)}$
The proportion of dissociation is large.

2 **Give the chemical reaction for following:**
NaOH solution was added to HCl solution.

Ans

HCl(aq) Hydrochloric acid	+	NaOH(aq) Sodium hydroxide	→	NaCl(aq) Sodium Chloride	+	$H2O_{(l)}$ Water		

Q.3 **Answer the following.** **8**

1 Write down the changes that will be seen in the following and explain the reason behind it.
Dilute H_2SO_4 was taken in an electrolytic cell and electric current was passed through it.

Ans When dilute H_2SO_4 is taken in an electrolytic cell and electric current is passed through the cell, hydrogen gas is produced at the cathode while oxygen in liberated at the anode due to electrolysis of H_2SO_4.

$2H^+_{(aq)} = 2e^- \rightarrow H_{2(g)}$ ..... at the cathode

$4OH^-_{(aq)} \rightarrow 2H_2O_{(l)} + O_{2(g)} + 4e^-$ ..... at the anode

$2H_2O_{(l)} \rightarrow 2H_{2(g)} + O_{2(g)}$

2 Classify aqueous solutions of the following substances according to their pH into three groups pH7, more than 7, less than 7. Common salt, sodium Acetate, Hydrochloric acid, Carbon dioxide, Potassium bromide, calcium hydroxide, Ammonium chloride, vinegar, sodium carbonate, Ammonia, Sulphur dioxide

Ans

pH less than 7	pH 7	pH more than 7
Hydrochloric acid Carbon dioxide Ammonium chloride Vinegar Sulphur dioxide	Common salt potassium bromide	sodium acetate calcium hydroxide Sodium Carbonate Ammonia

3 Classify the following oxides into three types and make table for it.
CaO, MgO, CO_2, SO_3, Na_2O, ZnO, Al_2O_3, Fe_2O_3

Ans

Acidic or Non-metal oxides	CO_2, SO
Basic or Metal oxides	CaO, MgO, Na_2O, Fe_2O_3
Amphoteric oxides	ZnO, Al_2O_3

4 Classify the acids according to their basicity and give one example of each type.

Ans Based on their basicity (i.e., number of ionizable H^+ ions), acids can be classified into monobasic, dibasic and tribasic acids.
Monobasic acid - HCl (hydrochloric acid)
Dibasic acid - H_2SO_4 (sulphuric acid)
Tribasic acid - H_3PO_4 (phosphoric acid)

Q.4 **Distinguish between** **6**

1 Acids and Bases.

Ans

	ACIDS	BASES
i.	Acids in their aqueous solutions give H^+ ions as the only cation	Bases in the ire aqueous solutions give OH ions as the only onion.
ii.	Acids are generally sour to taste	Bases are generally bitter to taste.
iii.	Red litmus do not change color white blue litmus twins red when dipped in acid.	Red litmus turns blue which blue litmus do not change color when dipped in a base.
iv.	Acid PH is less than 7 on a PH scale	Base PH is more than 7 on a PH scale.
v.	Acids can be formed when non-metallic oxides react water $CO_{2(g)} + H_2O_{(l)} \rightarrow H_2CO_{3(l)}$ $SO3_{(g)} + H_2O_{(l)} \rightarrow H_2SO_{4(l)}$	Bases can be formed by metallic oxides when heads with water. $CaO_{(s)} + H_2O_{(l)} – Ca(OH)_{2(s)}$ $MgO_{(s)} + H_2O_{(l)} – Mg(OH)_{2(s)}$

2 Anion And Cations

Ans

	ANION	CATION

i.	Anions are free radicals with a negative charge.	Cations are free radicals with a positive charge
ii.	Anions are formed by gaining of electrons from other species.	Cations are formed by denoting electrons to the other donating.
iii.	Anions form an acidic radical of any compound.	Cations form a basic radical of any compound.
iv.	Anions are usually large in size due increase in number of electrons.	Cations are usually smaller in size due to decrease in number of electrons.
v.	Anions are attracted towards the positive charge.	Cations are attracted towards the negative charge.
vi.	In anions, the number of electrons is greater than number of protons. Now metals form armor's	In cations, the number of electrons is lesser than the number of protons. Metals and H form cations

3 Negative electrode and positive electrode

Ans

	Negative electrode	**Positive electrode**
i.	The electrode connected to the negative terminal of a battery in an electric circuit is called the negative electrode or the cathode.	The electrode connected to the positive terminal of a battery in an electric circuit is called the positive electrode or the anode.
ii.	Negative electrode attracts positively charged ions (cations).	Positive electrode attracts negatively charged ions (anions).

Q.5 Give scientific reasons **4**

1 Hydronium ions are always in the form of H_3O^+.

Ans i. Hydronium ions i.e. H^+ ions are formed when any acid is dissolved in water to form its aqueous solution.
ii. H^+ ions are very small as it consists of single proton and no electron. This makes H^+ proton unstable in water
iii. Oxygen in the water molecule has a strong negative character and attracts this unstable proton in water.
iv. Thus, H^+ ion easily accommodates into H_2O molecule to form H_3O^+ ions and never found as single H^+ proton.

2 Buttermilk spoils in kept in Copper or brass container.

Ans i. Buttermilk milk consists of milk acid known as lactic acid
ii. Copper and Brass is an alloy are moderately reactive at normal temperatures and can react very easily
iii. If buttermilk is kept in copper or brass utensil, the lactic acid reacts with copper or brass and erodes the metal container.
iv. The products formed are toxic in nature and can be very harmful for consumption. May come food poisoning

Q.6 Explain with the help of examples **3**

1 What is meant by neutralization? Give two examples from everyday life of neutralization reaction.

Ans i. Neutralization cab be defined as reaction between acid and base from salt and water as products. Examples in daily life
ii. During acidity, when acid in stomach increases, different antacids or soda water is consumed. The basic antacids or Cold milk neutralizes acid reducing the burning sensation in stomach.
iii. Toothpastes are alkaline. Most food we consume is acidic. This substances are farmed due to bacterial acuity on food provides Corrosion of tooth enamel. On brushing the teeth, she base in toothpaste neutralizes the acid in mouth and prevents tooth decay.

Q.7 Solve Numerical problems **12**

1 Write down concentrations of each solution in g/L and mol/L.
(H = 1, C=12, Na = 23, O=16, Cl = 35.5, S=32, N=14)
2g NaOH in 50ml solution

Ans 50 ml Solution = 0.05ml Solution

Concentration (in g/L) = $\frac{\text{weight of solute (in g)}}{\text{Volume of solution (in l)}}$

$\therefore$ Concentration = $\frac{2\text{ g}}{0.05\text{l}}$ = 40 g / l

Molar mass of NaOH = (Na) x 1 + (O) x 1 + (H) x 1
= (23 x 1) + (16 x 1) + (1 x 1)
= 23 + 16 + 1
= 40 g/ml.

Number of Moles = $\frac{\text{Weight of solute}}{\text{Molar Mass}}$
= $\frac{2}{40}$
= 0.05 moles

Concentration = $\frac{\text{Number of Moles}}{\text{Volume of Solution}}$
= $\frac{0.05}{0.05}$
= 1 mol / L

Concentration in g/L = 40g/L

Concentration in mol/L = 1 mol/L

2 3g CH_3COOH in 100ml solution.

Ans **Given :** Mass of CH_3COOH = 3 g, volume of solution = 100 ml.

To find : concentration in g/L and mol/L

Formula : a. Concentration (in g/L) = $\frac{\text{Mass of solute in grams}}{\text{Volume of solution in litres}}$

b. Molarity (mol/L = $\frac{\text{Number of moles of solute}}{\text{Volume of solution in litres}}$

Calculation: Concentration (in g/L) = $\frac{\text{Mass of solute in grams}}{\text{Volume of solution in litres}} = \frac{3\text{g}}{\text{O.1L}}$ = **30 g/L**

Moles = $\frac{\text{Mass of solute in grams}}{\text{Molecular mass of substances}} = \frac{3}{60.0}$ = 0.05 mol

Molarity (mol/L) = $\frac{\text{Number of moles of solute}}{\text{Volume of solution (L)}} = \frac{0.05\text{ mol}}{0.1\text{ L}}$ = **0.5 mol/L**

Concentration of the given solution is **30 g/L** and **0.5 mol/L.**

3 Write down concentrations of each solution in g/L and mol/L.
(H = 1, C=12, Na = 23, O=16, Cl = 35.5, S=32, N=14)
7.3g Hcl in 100ml solution

Ans 100ml Solution = 0.1 L solution

Concentration (in g/L)= $\frac{\text{Weignt (in grams)}}{\text{Valume of Solution (in L)}}$

$\therefore$ Concentration = $\frac{7.3\text{g}}{0.1\text{L}}$ = 73g/L

Molar mass of HCl= (H) $\times$1 + (I) $\times$1
= 1 + 35.5
= 36.5g/mel

Number of moles= $\frac{\text{Weignt}}{\text{Molar mass}}$
= $\frac{7.3}{36.5}$ = 0.2 moles

$\therefore$ Concentration (in mol/L)= $\frac{\text{Number of moles}}{\text{Volume of solution (in L)}}$
= $\frac{0.2}{0.1}$
= 2 mol/L

$\therefore$ Concentration in g/L = 73 g/L

Concentration in mol/L= 2 mol/L

4 4.9 g H_2SO_4 in 200ml solution.

Ans **Given :** Mass of H_2SO_4 = 4.9 g, volume of solution = 200 ml.

To find : concentration in g/L and mol/L

Formulae : a. Concentration (in g/L) = $\frac{\text{Mass of solute in grams}}{\text{Volume of solution in litres}}$

b. Molarity (mol/L) $= \frac{\text{Number of moles of solute}}{\text{Volume of solution in litres}}$

Calculation: Concentration (in g/L) $= \frac{\text{Mass of solute in grams}}{\text{Volume of solution in litres}} = \frac{4.9\text{g}}{\text{O.2L}}$ = **24.5 g/L**

Moles $= \frac{\text{Mass of solute in grams}}{\text{Molecular mass of substances}} = \frac{4.9}{98.0}$ = 0.05 mol

Molarity (mol/L) $= \frac{\text{Number of moles of solute}}{\text{Volume of solution (L)}} = \frac{0.05\text{ mol}}{0.2\text{ L}}$ = **0.25 mol/L**

Concentration of the given solution is **24.5 g/L** and **0.25 mol/L.**

Q.8 Answer the following **33**

1 Write down the changes that will be seen in the following and explain the reason behind it.
Magnesium oxide was added to dilute HCl and Magnesium oxide was added ot dilute NaOH.

Ans i. Magnesium oxide is basic in nature as it forms Magnesium hydroxide in water and forms OH^- ions.
ii. On adding to dilute HCl, it neutralizes the acid solution to form Magnesium chloride and water.
iii. The reaction can be given as

$MgO_{(s)} + 2HCl_{(aq)} \rightarrow MgCl_{2(aq)} + H_2O_{(l)}$
base acid salt water

iv. When Mgo is added to NaOH solution, no chemical reaction is observed between them.

2 Write down the changes that will be seen in the following and explain the reason behind it.
Zinc oxide was added to dilute HCl and zinc oxide was added to dilute NaOH.

Ans i. Zinc oxide is amphoteric in nature as it reacts with acid as a base and reacts with base as acid and products in both reactions are salt and water.
ii. With dilute HCl, zinc oxide reacts to form zinc chloride and water.

$ZnO_{(s)} + 2HCl_{(aq)} \rightarrow ZnCl_{2(aq)} + H_2O_{(l)}$
base acid salt water

iii. When added to dilute NaOH, it forms salt of sodium zincate and water molecules. Na+ forms the cationic part and ZnO_2^- forms the anionic part of sodium zincate salt.
iv. The reaction is given as

$ZnO_{(s)} + 2NaOH_{(aq)} \rightarrow Na_2ZnO_{2(aq)} + H_2O_{(l)}$
acid base salt water

3 Write down the changes that will be seen in the following and explain the reason behind it.
Dilute HCl acid was added to limestone.

Ans i. Molecular formula for limestone is $CaCO_3$ also known as calcium carbonate.
ii. when added to dilute acid, effervescence is observed in the solution. This effervescence is of carbon dioxide gas.
iii. the by products along with CO_2 are calcium chloride salt and water.
iv. The reaction is represented as

$CaCO_{3(s)} + 2HCl_{(aq)} \rightarrow CaCl_{2(aq)} + CO_{2(g)} + H_2O_{(l)}$

4 Write down the changes that will be seen in the following and explain the reason behind it.
Pieces of blue vitriol were heated in a test tube on cooling water is added ot it.

Ans i. Blue vitriol is crystalline salt with water of crystallization comprised in the crystal arrangement of molecules.
ii. On heating, this water of crystallization is lost and white anhydrous copper sulphate is formed.
iii. The water is lost in form of vapour.

$CuSO_4.5H_2O_{(s)} \xrightarrow{\text{heating}} CuSO_4 + 5H_2O_{(g)}$
Blue vitriol White precipitate blue vitriol

iv. After adding water again regains blue colour and crystallite nature. Adding excess water can reduce the intensity of the blue colour.

5 Show the dissociation of following compounds on dissolving in water and write whether dissociation is small or large.
(i) Potassium hydroxide
(ii) Sodium chloride
(iii) Ammonia.

Ans (i) $KOH(l) \xrightarrow[\text{dissociation}]{\text{water}} K^+_{(aq)} + OH^-_{(aq)}$

The proportion of dissociation is large as KOH is a strong base.

(ii) $NaCl_{(s)} \xrightarrow{\text{dissociation}} Na^+_{(aq)} + Cl^-_{(aq)}$

The dissociation proportion is large.

(iii) $NH_{3(q)} + H_2O_{(l)} \rightarrow NH_4OH \rightarrow NH_4^+{}_{(aq)} + OH^-_{(aq)}$

The dissociation proportion is small as Ammonia is a weak base.

6 Write down the changes that will be seen in the following and explain the reason behind it.
Two or three filings of copper were added to 10 ml dilute nitric acid and stirred.

Ans i. Metal when added to a dilute acid, it generally forms metal salt and hydrogen gas.
ii. As copper is added to dilute nitric acid and stirred, slowly bubbles start to appear in the solution and copper nitrate precipitate is observed.
iii. These bubbles formed are of hydrogen gas which is inflammable and indicates the reaction between the metal and dilute acid.
iv. The reaction can be given as

$Cu_{(s)} + 2HNO_{3(aq)} \rightarrow Cu(NO_3)_{2(aq)} + H_{2(g)}$

7 Show the dissociation of following compounds on dissolving in water and write whether dissociation is small or large.
(i) Acetic acid.
(ii) Copper sulphate.
(iii) Hydrochloric acid.

Ans (i) $CH_3COOH_{(l)} \xrightarrow[\text{dissociation}]{\text{water}} CH_3\,COO^-_{(aq)} + h^+_{(aq)}$

The proportion of dissociation is small as acetic acid is a weak acid.

(ii) $CuSO_{4(l)} \xrightarrow[\text{dissociation}]{\text{water}} Cu^{2+}_{(aq)} + SO_4^{2-}{}_{(aq)}$

The proportion of dissociation is large.

(iii) $HCl_{(l)} \xrightarrow[\text{dissociation}]{\text{water}} H^+_{(aq)} + Cl^-_{(aq)}$

It is a strong acid and dissociation proportion is large.

8 Write down the changes that will be seen in the following and explain the reason behind it.
Two drops of the phenolphthalein indicator were added to 10 ml solution of sodium Hydroxide.

Ans i. Sodium Hydroxide is alkaline in nature.
ii. Phenolphthalein indicator is sensitive to pH change and colour of the solution changes on adding it to different solution.
iii. When added to sodium hydroxide solution, the solution turns pink in colour.
iv. This indicates the basic character of sodium hydroxide as the indicator turns the solution pink.

9 Explain what is meant by electrolysis of water write electrode reactions and explain them.

Ans Electrolysis of water.
i. Decomposition of water molecules by passing electricity through it leading to dissociation into is into.
ii. At cathode : electrolysis, H^+ nuns being posit hire are alluded towards cathode, accepts e from cathode & form H_2 gas. At anode : $2H2O_{(L)}+2e \rightarrow H_{2(g)} + 2OH^-_{(aq)}$.
iii. At anode, the water molecule dissociate and produce electrons and H^+ ions. Also, O_2gas is formed which is liberated at anode. $2H_2O_{(l)} \rightarrow O_{2(g)} + 4H+_{(aq)} + 4e$.

10 Write down the changes that will be seen in the following and explain the reason behind it.
50 ml of water is added to a 50 ml solution of copper sulphate.

Ans i. $CuSO_4$ or blue vitriol solution is dark blue in colour.
ii. As water is added to the solution, the intensity of the blue colour goes on decreasing.
iii. The concentration of the solution decreases.
iv. Amount of solute remains the same.

11 Write down the changes that will be seen in the following and explain the reason behind it.
A litmus paper was dropped into 2ml dilute acid then 2ml concentrated NaOH was added to it.

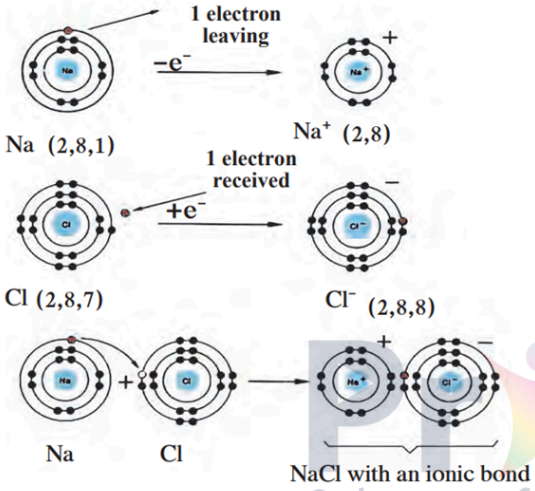
Ans i. when red litmus paper is dropped in dilute acid, it does not show any change in colour.

ii. On adding concentrated NaOH, the alkaline character of the solution increases and litmus turns blue in colour.
iii. when blue litmus paper is dropped in dilute acid, it changes red in colour.
iv. On adding concentrated NaOH, the alkaline character of solution increases and litmus turns back blue again.

Q.9 Answer the following in detail **15**

1 Explain by drawing a figure of the electronic configuration.
Formation of sodium chloride from sodium and chlorine.

Ans i. Electronic configuration of sodium is (2, 8, 1) and that of chlorine is (2, 8, 7).
ii. The outermost shell of sodium and chlorine atoms is not a complete octet.
iii. Sodium atom loses and electron to form Na^+ ion which has a complete octet.
iv. Chlorine atom gains this electron to form Cl^- ion which has a complete octet.
v. An ionic bond a formed between the oppositely charged Na^+ and Cl^- ions and thus, an ionic compound NaCl having very high stability is formed.
Formation of sodium chloride from sodium and chlorine can be explained using electronic configuration diagram as shown below:



2 Obtain a sample of rainwater. Add to it a few drops of universal indicator. Meausre its pH. Describe the nature of the sample of rainwater and explain the effect if it has on the living world.

Ans i. Using a universal indicator, the sample of rainwater was measured to have a pH between 5 and 5.5. This indicates that rainwater is slightly acidic in nature.
ii. Acidic rain directly affects the chemical and pH balance of the ground water as other water bodies.
iii. Animals that cannot withstand such imbalances, fail to reproduce, become deformed due to bone decalcification, fail to grow normally or may even die.
iv. Acid rain leaches calcium out of the soil. Decreased calcium affects plant life. Weakened plant life cannot tolerate extreme temperatures or fight off insects and diseases.
v. Acid rain can also cause serious damage to the human respiratory system if inhaled deeply. A damaged respiratory system means decreased oxygen in the blood supply, which eventually damages the heart.
vi. It also damages buildings and other structures made of stone or metal.

3 Explain Formation of a magnesium chloride from magnesium and chlorine.

Ans i. Electronic configuration of magnesium is (2, 8, 2) and that of chlorine is (2, 8, 7).
ii. The outermost shell of magnesium and chlorine atoms is not a complete octet.
iii. Magnesium atom loses two electrons to form Mg^{2+} ion which has a complete octet.
iv. Each chlorine atom gains an electron to form Cl^- ion which has a complete octet.
v. Ionic bonds are formed between the charged Mg^{2+} and Cl^- ions and thus, an ionic compound $MgCl_2$ having very high stability is formed of magnesium chloride and chlorine can be explained using electronic configuration diagram as shown below.