

Exercise-3C

1. Salts are prepared by the following methods:

- (a) Direct combination
- (b) Displacement
- (c) Double decomposition (precipitation)
- (d) Neutralisation of insoluble base
- (e) Neutralisation of an alkali (titration)

Solution:

- (a) Direct combination: Iron (III) chloride
- (b) Displacement: ZnSO_4
- (c) Double decomposition (precipitation): BaSO_4
- (d) Neutralisation of insoluble base: MgCl_2
- (e) Neutralisation of an alkali (titration): NaCl

2. 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:

- (i) blue
- (ii) red
- (iii) hydrogen gas
- (iv) basic, alkaline
- (v) graphite

3. What do you understand by water of crystallisation?

Give four substances which contain water of crystallisation and write their common names.

Solution:

Some salts, unite with a definite amount of water molecules which enter into loose chemical combination with one molecule of the substance which is known as the water of crystallisation.

Common name	Chemical name	Formula
Washing soda	Sodium carbonate decahydrate	$\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$
Epsom salt	Magnesium sulphate heptahydrate	$\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$
Potash alum	Hydrated potassium aluminium sulphate	$\text{K}_2\text{SO}_4 \cdot \text{Al}(\text{SO}_4)_3 \cdot 24\text{H}_2\text{O}$
Gypsum	Hydrated calcium sulphate	$\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$

4. (a) Define efflorescence. Give examples.

Chapter 3: Acids, Bases and Salts

(b) Define deliquescence. Give examples.

Solution:

(a) Efflorescence is the property of some salts to lose wholly, or partly their water of crystallisation when their crystals are exposed to dry air even for a short time. Such substances are called efflorescent substances.

Examples: $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$, $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$, $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$

(b) Certain water-soluble salts which on exposure to the atmosphere at ordinary temperature, absorb moisture from the atmospheric air and dissolve in the absorbed water, forming a saturated solution. This phenomenon is called deliquescence and the salts are called deliquescent.

Examples: CaCl_2 , MgCl_2 , ZnCl_2

5. Distinguish between drying and dehydrating agent.

Solution:

Drying agents	Dehydrating agents
They remove moisture from other substances.	They remove chemically combined elements of water in the ratio of 2:1 (hydrogen: oxygen) from a compound.
They are used to dry gases like chlorine, sulphur dioxide and hydrogen chloride. They are also used in desiccators to keep substances dry.	They prepare substances like carbon monoxide and sugar charcoal, etc
They represent a physical change. Eg: Phosphorous pentoxide (P_2O_5)	They represent a chemical change. Eg: Conc. Sulphuric acid (H_2SO_4)

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

Solution:

Conc. sulphuric acid is hygroscopic in nature and can remove moisture from other substances, thus it is used as a drying agent.

Also, it can be used as a dehydrating agent because of its strong affinity for water and hence absorbs water quickly from compounds.

7. 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



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

Solution:

(a) Sodium hydrogen sulphate [NaHSO_4] is an acid salt and is formed by the partial replacement of the replaceable hydrogen ion in a dibasic acid [H_2SO_4]. The [H] atom in NaHSO_4 makes it behave like an acid.

So, on dissolving in water, it gives hydrogen ions.

Chapter 3: Acids, Bases and Salts

(b) Desiccating agents are used to absorb moisture. Anhydrous calcium chloride (CaCl_2) is used as a desiccator because it has the capacity of absorbing moisture as it is hygroscopic in nature.

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

- (a) Solid NaOH (b) Solid CaCl_2
(c) Solid $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$ (d) Conc. sulphuric acid
(e) Iron (III) chloride

Solution:

- (a) Increase, as it absorbs the moisture in the environment.
(b) Increase, since it absorbs water from the atmosphere when exposed to air.
(c) Decrease, as it loses 9 molecules of water and turns into a monohydrate.
(d) Increase, since it absorbs moisture present in air and turns diluted.
(e) Increase, as it's a deliquescent substance.

9. (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 crystallisation.

Solution:

(a) Table salt turns moist as it absorbs the water and water vapour present in air especially during the rainy season as it has high humidity. Pure sodium chloride is not deliquescent, but the commercial version of the common salt have impurities such as magnesium chloride and calcium chloride which are deliquescent substances.

(b) By passing a current of dry hydrogen chloride gas through a saturated solution of the affected salt the impurity can be removed. As a precipitate pure sodium chloride is produced which can be recovered by filtering and washing first with some water and finally with alcohol.

(c) Conc. sulphuric acid can remove water molecules from blue vitriol.

(d) Common salt (NaCl) and sugar (Glucose)

10. Name the salt which on hydrolysis forms

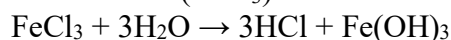
(a) Acidic

(b) Basic and

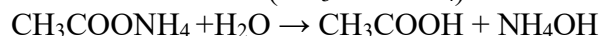
(c) Neutral solution. Give a balanced equation for each reaction.

Solution:

(a) Iron chloride (FeCl_3)



(b) Ammonium acetate ($\text{CH}_3\text{COONH}_4$)



(c) Sodium chloride

Chapter 3: Acids, Bases and Salts



11. State the change noticed when blue litmus and red litmus are introduced in the following solutions:

- (a) Na_2CO_3 solution
- (b) NaCl solution
- (c) NH_4NO_3
- (d) MgCl_2 Solution

Solution:

- (a) Na_2CO_3 solution: Since, this solution is alkaline in nature, red litmus changes to blue.
- (b) NaCl solution: As it's a normal salt, there will be no change in the colour of the litmus paper.
- (c) NH_4NO_3 : This solution is basic in nature, so red litmus changes to blue.
- (d) MgCl_2 Solution: As this is a neutral solution, there is no change in the litmus paper.

12. Answer the questions below relating your answers only to salts in the following list: Sodium chloride, anhydrous calcium chloride, copper sulphate-5-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:

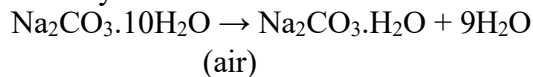
- (a) Water of crystallization
- (b) White
- (c) By heating with any dehydrating agent
- (d) Anhydrous calcium chloride is deliquescent

13. State your observation when

- (a) Washing soda crystals
- (b) Iron (III) chloride salts are exposed to the atmosphere.

Solution:

- (a) When washing soda ($\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$) is exposed to air, it loses 9 molecules of water to form its monohydrate.



- (b) The salt absorbs moisture from the atmosphere and turns into a saturated solution.