

Question Bank

Acids, Bases and Salts

1. Select the correct word from the list in brackets for each of the following statements : [1 mark each]

(i) A more volatile acid obtained, when a less volatile acid reacts with sodium nitrate is _____ [sulphuric acid/nitric acid].

Ans. Nitric acid.

(ii) An example of an acid derived from a mineral is _____ [acetic acid/citric acid/hydrochloric acid].

Ans. Hydrochloric acid.

(iii) An acid obtained when concentrated nitric acid is boiled with sulphur is _____. [sulphurous acid/nitrous acid/sulphuric acid].

Ans. Sulphuric acid.

(iv) An example of a base which is not an alkali is _____ [caustic potash, copper hydroxide, ammonium hydroxide].

Ans. Copper hydroxide

(v) A base obtained by strongly heating lead nitrate crystals is _____. [Pb_3O_4 / PbO_2 / PbO].

Ans. PbO

(vi) An example of a weak acid is _____. [HCl / H_2CO_3 / HNO_3 / H_2SO_4]

Ans. H_2CO_3 .

(vii) A volatile acid obtained when common salt is heated with concentrated sulphuric acid is _____.
[nitric acid/hydrochloric acid/sulphurous acid.]

Ans. Hydrochloric acid.

(viii) An example of a weak alkali solution is _____. [sodium hydroxide / potassium hydroxide / ammonium hydroxide].

Ans. Ammonium hydroxide.

(ix) An acid having a basicity 2 is _____ [acetic acid/nitric acid/carbonic acid].

Ans. Carbonic acid.

(x) An acid obtained by dissolving sulphur trioxide in water is _____ [sulphurous acid / sulphuric acid / oleum]

Ans. Sulphuric acid.

(xi) An insoluble base obtained when sodium hydroxide reacts with iron (III) sulphate is _____ [iron (II) hydroxide/iron (III) oxide/iron (III) hydroxide]

Ans. Iron (III) hydroxide.

(xii) A salt formed when sulphuric acid reacts with excess of potassium hydroxide is _____ [potassium sulphite / potassium hydrogen sulphate, potassium sulphate].

Ans. Potassium sulphate.

(xiii) An example of an insoluble salt is _____.
[Na₂SO₄ /CuSO₄ /PbSO₄ /ZnSO₄]

Ans. PbSO₄

(xiv) An example of a complex salt is _____.
[CaOCl₂ / K[Ag(CN)₂] / KNaSO₄]

Ans. K[Ag(CN)₂]

(xv) An example of a soluble salt is _____.
[CaCO₃/MgCO₃ /CuCO₃ / (NH₄)₂CO₃]

Ans. (NH₄)₂CO₃

(xvi) A salt prepared by neutralization in which titration involved is _____. [MgSO₄ /CaCl₂ /Cu(NO₃)₂ /NaCl]

Ans. NaCl

(xvii) An insoluble salt prepared by synthesis is _____.
[FeCl₃ /FeS /NaCl /CaCl₂]

Ans. FeS

(xviii) A salt prepared by precipitation (double decomposition of two soluble salts) is _____.
[K₂SO₄ /PbSO₄ /ZnSO₄ /FeSO₄]

Ans. PbSO₄

(xix) A salt prepared by simple displacement, i.e. action of dilute acid on a metal is _____.
[PbSO₄ /ZnSO₄ /Ag₂SO₄]

Ans. ZnSO₄

(xx) An example of an anhydrous salt is _____.
[Blue vitriol/green vitriol/sal ammoniac]

Ans. Sal ammoniac.

(xxi) An example of a salt which produces neutral solution on hydrolysis is _____. [sodium acetate/sodium carbonate/sodium chloride]

Ans. Sodium chloride.

(xxii) An example of a deliquescent salt is _____.
[CaCl₂ /CaSO₄ /CuSO₄ /NaCl]

Ans. CaCl₂

(xxiii) An example of an acidic salt is _____.
[NaHSO₄ /CH₃COONa/K₂SO₄]

Ans. NaHSO₄

(xxiv) The colour of hydrated copper sulphate is _____.
[blue/black/white]

Ans. Blue

(xxv) The example of amphoteric hydroxide is _____.
[Ca(OH)₂ /Cu(OH)₂ /Al(OH)₃ /Fe(OH)₃]

Ans. Al(OH)₃

(xxvi) The hydroxide which is soluble in excess of NaOH is _____.
[Al(OH)₃ /Fe(OH)₂ / Cu(OH)₂]

Ans. Al(OH)₃

(xxvii) A salt which will not react with NH₄OH solution is _____.
[NH₄Cl/CuCl₂ /ZnCl₂ /AlCl₃]

Ans. NH₄Cl

(xxviii) A hydroxide which on treating with excess of NH₄OH forms inky blue solution is _____.
[Zn(OH)₂ /Fe(OH)₂ /Fe(OH)₃ /Cu(OH)₂]

Ans. Cu(OH)₂

(xxix) An alkali which could be used to distinguish between soluble salts of zinc and lead is _____ [NaOH/NH₄OH/KOH]

Ans. Ammonium hydroxide [NH₄OH]

(xxx) An oxide of a metal which is amphoteric in nature is _____.
[PbO/Pb₃O₄ /PbO₂]

Ans. PbO.

2. Select the correct choice from (a), (b), (c) and (d) from the following statements.

(i) The colour of zinc hydroxide is :

- (a) dull white (b) gelatinous white
(c) chalk white (d) greyish white

(ii) The formula of the compound formed when zinc hydroxide dissolves in NH_4OH is :

- (a) $[\text{Zn}(\text{NH}_3)_4]\text{SO}_4$ (b) $[\text{Zn}_2(\text{NH}_3)_4]\text{SO}_4$
(c) $[\text{Zn}(\text{NH}_4)_2]\text{SO}_4$ (d) $[\text{Zn}(\text{NH}_4)_4]\text{SO}_4$

(iii) $\text{Zn}(\text{OH})_2$ and $\text{Pb}(\text{OH})_2$ can be distinguished from each other by treating them with :

- (a) Caustic soda sol. (b) Caustic potash sol.
(c) Ammonium hydroxide sol.
(d) Calcium hydroxide sol.

(iv) The colour of the solutions of Fe(III) salts is generally

- (a) reddish brown (b) light green
(c) light blue (d) dark blue

(v) An amphoteric oxide is one which

- (a) reacts with acids only to form salt and water
(b) reacts with alkalis only to form salt and water
(c) reacts with acids as well as alkalis to form salt and water
(d) reacts with acids as well alkalis to form salt and hydrogen.

(vi) An example of a soluble base is :

- (a) zinc hydroxide (b) aluminium hydroxide
(c) calcium hydroxide (d) copper hydroxide

- (vii) An example of a monobasic organic acid is
 (a) CH_3COOH (b) $(\text{COOH})_2$
 (c) H_2CO_3 (d) H_2SO_4
- (viii) The substance which will furnish hydronium ion is
 (a) limewater (b) vinegar
 (c) blue vitriol (d) washing soda
- (ix) An example of a complex salt is :
 (a) CaOCl_2 (b) $\text{K}_4[\text{Fe}(\text{CN})_6]$
 (c) $\text{FeSO}_4 \cdot (\text{NH}_4)_2\text{SO}_4$ (d) NaKSO_4
- (x) A sulphate of a metal which is soluble in water is
 (a) lead sulphate (b) potassium sulphate
 (c) calcium sulphate (d) barium sulphate
- (xi) An example of soluble carbonate is :
 (a) calcium carbonate (b) zinc carbonate
 (c) copper carbonate (d) potassium carbonate
- (xii) An example of a hydrated salt is :
 (a) common salt (b) nitre
 (c) washing soda (d) caustic soda
- Ans.** (i) (b) (ii) (a) (iii) (c) (iv) (a) (v) (c)
 (vi) (c) (vii) (a) (viii) (b) (ix) (b) (x) (b)
 (xi) (d) (xii) (c)

3. Differentiate between organic acids and inorganic acids. Give examples. [2]

Ans. Organic acids : The acids which are derived from plants are called organic acids. For example, acetic acid, citric acid, oxalic acid, etc.

Inorganic acids : The acids which are derived from minerals of the earth are called mineral acids. For example, HCl, H₂SO₄, HNO₃, H₂CO₃, etc.

4. Differentiate between hydracids and oxy-acids. Give examples. [2]

Ans. Hydracids : Mineral acids containing hydrogen and one non-metallic element, other than oxygen are called hydracids. For example HCl, HBr, H₂S, etc.

Oxy-acids : Mineral acids containing hydrogen, one non-metallic element and oxygen are called oxyacids. For example H₂SO₄, HNO₃, H₂SO₃, H₂CO₃ etc.

5. On what basis is the strength of (i) acids, (ii) alkalis determined? [2]

Ans. (i) The strength of an acid is determined by the concentration of hydronium ions present in its aqueous solution.

(ii) The strength of an alkali is determined by the concentration of hydroxyl ions present in its solution.

6. Differentiate between a strong acid and a weak acid. Give two examples. [2]

Ans. An acid which dissociates almost completely in an aqueous solution, thereby producing high concentration of H⁺ (aq) ions is called a strong acid. For example, hydrochloric acid, nitric acid, sulphuric acid and phosphoric acid.

An acid which dissociates only partially in an aqueous solution thereby producing low concentration of H⁺(aq) ions is called a weak acid.

For example, acetic acid, carbonic acid, sulphurous acid, nitrous acid are weak acids.

7. Differentiate between a strong alkali and a weak alkali. [2]

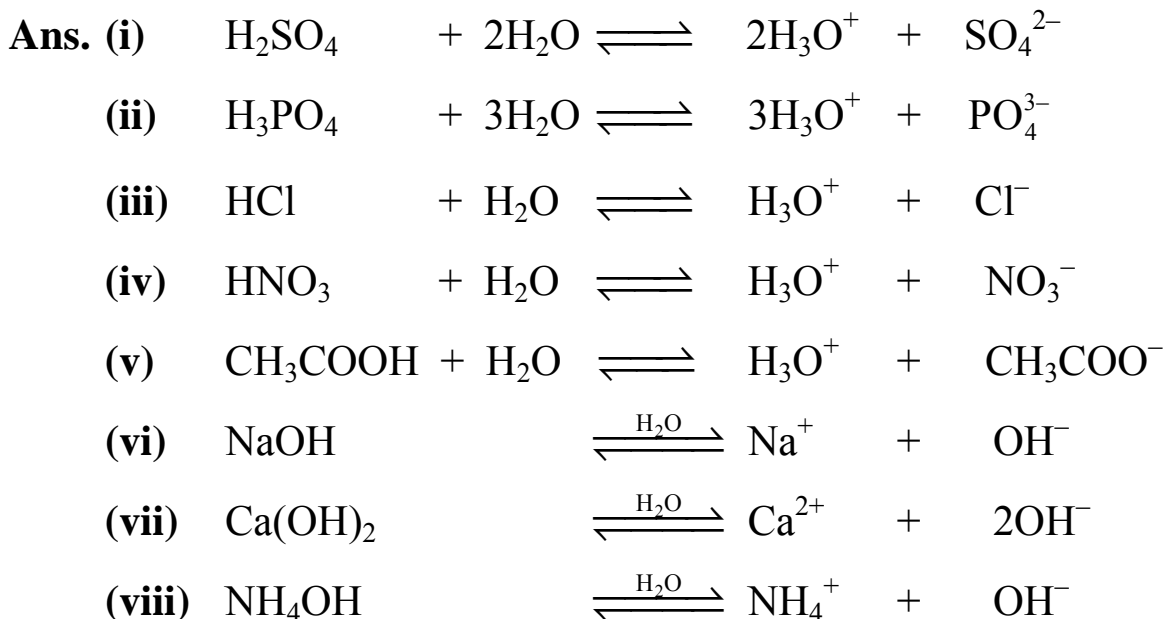
Ans. An alkali, which almost dissociates completely in an aqueous solution, thereby producing high concentration of OH^- ions is called a strong alkali. For example, lithium hydroxide, sodium hydroxide and potassium hydroxide.

An alkali, which dissociates partially in an aqueous solution, thereby producing low concentration of OH^- ions is called weak alkali. For example, ammonium hydroxide, calcium hydroxide and magnesium hydroxide.

8. Write the ionic equations when the following ionise in water

(i) H_2SO_4 , (ii) H_3PO_4 , (iii) HCl , (iv) HNO_3 , (v) CH_3COOH ,
(vi) NaOH , (vii) $\text{Ca}(\text{OH})_2$, (viii) NH_4OH

[1 × 8]

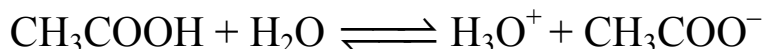


9. State giving reason which is a strong acid – dil HCl or conc H₂CO₃. [1]

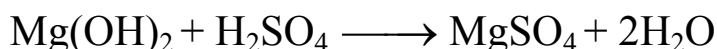
Ans. Dilute hydrochloric acid is a stronger acid than conc. H₂CO₃. It is because HCl almost completely dissociates in aqueous solution and hence produces a high concentration of H⁺(aq) ions as compared to H₂CO₃.

10. Explain why is the basicity of acetic acid one, and the acidity of magnesium hydroxide 2. [2]

Ans. Acetic acid dissociates to produce one H⁺(aq) ion per molecule and hence its basicity is one.

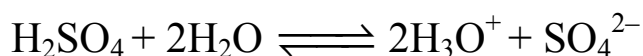


Magnesium hydroxide reacts completely with 2H⁺(aq) ions of an acid to form salt and water, therefore its acidity is 2.

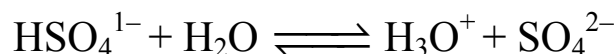
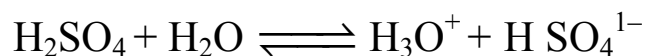


11. Why is sulphuric acid a dibasic acid? Give three reasons. Support your answer with equations, wherever possible. [3]

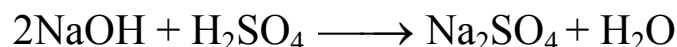
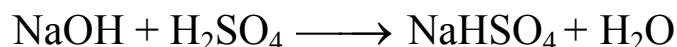
Ans. (i) A molecule of sulphuric acid furnishes 2H⁺(aq) ions in an aqueous sol.



(ii) A molecule of sulphuric acid dissociates in two steps in water:

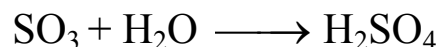


(iii) A molecule of sulphuric acid forms two series of salts, i.e., hydrogen sulphates (acid salt) and sulphates (normal salt).

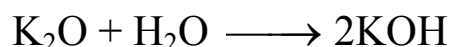


- 12.** How will you obtain (i) sulphuric acid from an acidic oxide, and (ii) potassium hydroxide from a basic oxide? [2]

Ans. (i) When sulphur trioxide (acidic oxide) is dissolved in water, an exothermic reaction takes place with the formation of sulphuric acid.



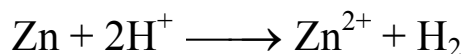
(ii) When potassium oxide (basic oxide) is dissolved in water, an exothermic reaction takes place with the formation of potassium hydroxide



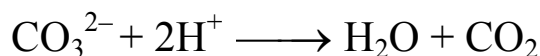
- 13.** State two chemical properties each with equations for (i) a solution containing $\text{H}^+(\text{aq})$ ions (ii) a solution containing OH^- ions.

Ans. (i) The solution containing $\text{H}^+(\text{aq})$ ions is an acid solution.

(a) It reacts with active metals to liberate hydrogen gas.

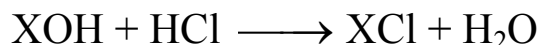


(b) It reacts with metallic carbonates to liberate carbon dioxide gas and water.

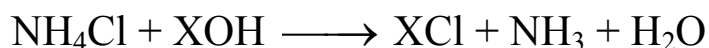


(ii) The solution containing OH^- ions is basic (alkaline) in nature.

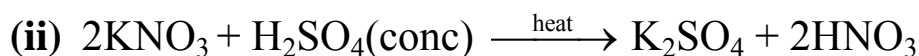
(a) It reacts with acids to form salt and water as only products.



(b) It reacts with ammonium salts on warming and liberates ammonia gas.

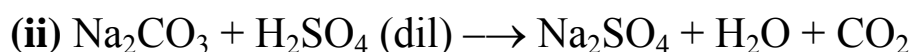
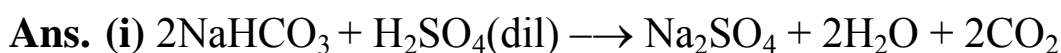


- 14.** Write fully balanced chemical equations for the reaction of conc sulphuric acid with (i) metallic chloride (ii) metallic nitrate. Explain, why the chlorides and nitrates form their respective acids.

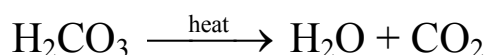


It is because, a less volatile acid always displaces more volatile acid from its salt.

- 15.** Write fully balanced equations for the reaction of dil sulphuric acid on (i) sodium hydrogen carbonate (ii) sodium carbonate. Why is carbonic acid not formed in the above reactions? [3]

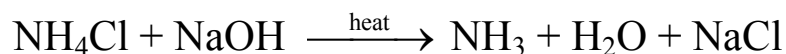
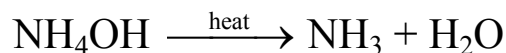
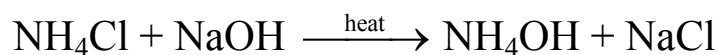


Infact, initially the carbonic acid is formed. However, it being unstable decomposes due to the heat of reaction to form carbon dioxide and water.



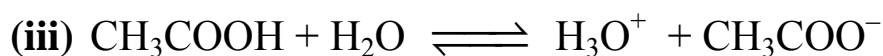
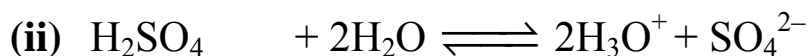
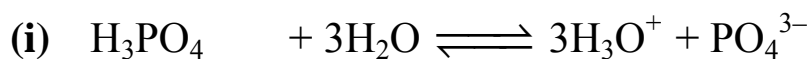
- 16.** State with reason, why ammonium salts on heating with an alkali liberate ammonia gas. [2]

Ans. Initially the ammonium salts react with the given alkali to form ammonium hydroxide and metal salt. However, the ammonium hydroxide being unstable decomposes to form ammonia gas and water.



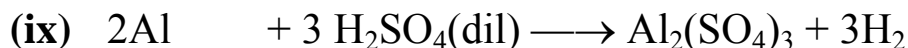
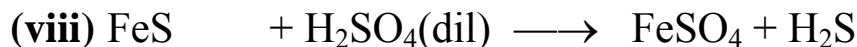
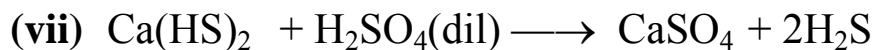
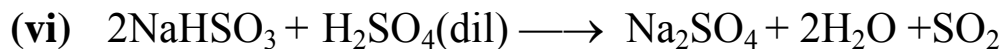
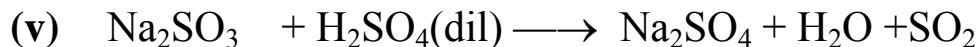
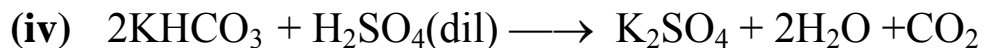
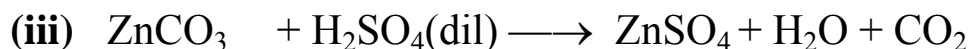
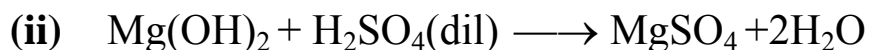
- 17.** Show ionically why (i) phosphoric acid,
(ii) sulphuric acid and (iii) acetic acid are called acids. [3]

Ans. Any substance which furnishes $\text{H}^+(\text{aq})$ ions as the only positively charged ions in an aqueous solution is called an acid.



As the above substance furnish only H_3O^+ positively charged ions in the aqueous solution, therefore, they are acids.

- 18.** Write equation of dilute sulphuric acid with :
(i) copper (II) oxide (ii) magnesium hydroxide
(iii) zinc carbonate (iv) potassium hydrogen carbonate (v) sodium sulphite (vi) sodium hydrogen sulphite (vii) calcium hydrogen sulphide (viii) iron (II) sulphide (ix) aluminium [9]



19. Distinguish between the “strength of an acid” and “concentration of an acid.” [2]

Ans. The degree of ionisation of an acid in an aqueous solution is called strength of an acid. It determines whether an acid is strong or weak. The measure of amount of water present in the given sample of an acid is called its concentration. It determines whether an acid is dilute or concentrated.

20. 1 molar solution of acetic acid is a weak acid as compared to 0.1 molar solution of hydrochloric acid. Why? Explain your answer. [2]

Ans. 1 molar solution of acetic acid has a degree of dissociation less than 4%, whereas 0.1 molar solution of hydrochloric acid has degree of dissociation more than 90%.

Now, as the degree of dissociation determines the strength, therefore, 0.1 molar hydrochloric acid is a strong acid, but 1 molar acetic acid is a weak acid.

21. What do you understand by the term titration? [1]

Ans. A chemical reaction in which hydronium ions [H^+ (aq) ions] of an acid and hydroxyl (OH^-) ions of base combine to form molecules of unionised water is called titration.

22. Define the following terms, giving at least two examples.

- (i) normal salt (ii) acid salt
(iii) basic salt (iv) double salt
(v) mixed salt (vi) complex salt

[2 × 6]

Ans. (i) Normal salt : A salt formed by complete replacement of replaceable hydrogen ions of an acid, by a basic radical (cations) is called normal salt. Example : Sodium sulphate (Na_2SO_4), Potassium chloride (KCl)

- (ii) **Acid Salt** : A salt formed by partial replacement of replaceable hydrogen ions of an acid, by a basic radical (cation) is called acid salt. Example : Sodium hydrogen carbonate (NaHCO_3), Potassium hydrogen sulphate (KHSO_4).
- (iii) **Basic salt** : A salt formed by partial replacement of hydroxyl radical of a diacidic or triacidic base with an acid radical is called basic salt. Examples : Basic copper chloride [$\text{Cu}(\text{OH})\text{Cl}$], Basic lead nitrate [$\text{Pb}(\text{OH})\text{NO}_3$]
- (iv) **Double salt** : The salt produced by the crystallisation of two simple salts from a mixture of their saturated solution is called double salt. Examples : Potash alum [$\text{K}_2\text{SO}_4 \cdot \text{Al}_2(\text{SO}_4)_3 \cdot 24\text{H}_2\text{O}$], Mohr's salt [$\text{FeSO}_4 \cdot (\text{NH}_4)_2\text{SO}_4 \cdot 6\text{H}_2\text{O}$]
- (v) **Mixed salt** : A salt which contains two or more basic or acidic radicals other than $\text{H}^+(\text{aq})$ and OH^- ions is called mixed salt. Examples : Calciumchlorohypochlorite [$\text{Ca}(\text{OCl})\text{Cl}$]. Disodium- potassium phosphate [Na_2KPO_4]
- (vi) **Complex salt** : A salt formed by the crystallisation of two simple salts which on dissolving in water furnishes one simple and one complex ion is called complex salt. Examples : Sodium argento cyanide $\text{Na}[\text{Ag}(\text{CN})_2]$; Potassium ferro cyanide $\text{K}_4[\text{Fe}(\text{CN})_6]$.

23. Classify the following as soluble and insoluble salts.

- | | |
|---------------------------|------------------------|
| (i) ammonium carbonate | (ii) lead sulphate |
| (iii) copper nitrate | (iv) zinc sulphide |
| (v) calcium bicarbonate | (vi) sodium sulphite |
| (vii) aluminium sulphate | (viii) silver nitrate |
| (ix) magnesium bisulphate | (x) potassium chloride |

[5]

Ans. Soluble salts

Ammonium carbonate, copper nitrate, calcium bicarbonate, sodium sulphite, aluminium sulphate, silver nitrate, magnesium bisulphate and potassium chloride.

Insoluble salts : Lead sulphate and zinc sulphide

24. Give one word/words for the statements given below :

- (i) A compound which on dissolving in water furnishes hydronium ions as the only positively charged ions.
- (ii) An acid which furnishes 3 hydronium ions per molecule on ionisation.
- (iii) An acid which undergoes partial dissociation, on dissolving in water.
- (iv) A water soluble base, which furnishes hydroxyl ions.
- (v) The number of H^+ ions of an acid which react completely with one molecule of base to form salt and water as the only products.
- (vi) An indicator which turns pink in alkaline solution and colourless in an acid solution.
- (vii) A hydrated salt which loses its water of crystallisation on exposure to air.
- (viii) The phenomenon due to which a salt reacts with water to form parent acid and alkali.
- (ix) A salt which absorbs moisture from air and changes into liquid state.

[10]

- Ans.**
- | | |
|-----------------------|----------------------|
| (i) acid | (ii) tribasic acid |
| (iii) weak acid | (iv) alkali |
| (v) acidity of a base | (vi) phenolphthalein |

(vii) efflorescent salt (viii) hydrolysis

(ix) deliquescent salt.

25. Fill in the blank spaces by choosing appropriate words given in brackets.

(i) An example of mineral acid is _____. (HCOOH/HCl)

(ii) A _____ acid undergoes almost complete dissociation, on dissolving in water (strong/concentrated)

(iii) Sodium acetate on hydrolysis forms sodium hydroxide and _____. (formic acid/acetic acid)

(iv) Sodium sulphite reacts with dilute sulphuric acid to form sodium sulphate, _____ gas and water. (sulphur trioxide/sulphur dioxide)

(v) The number of H^+ ions of an acid which react completely with one molecule of a base is called its _____. (basicity/acidity)

(vi) Copper (II) chloride reacts with sodium hydroxide to form _____ copper hydroxide and sodium chloride. (soluble/insoluble)

(vii) A chemical reaction between hydronium ions of an acid and OH^- ions of base to form unionised water is called _____. (crystallisation/neutralisation)

(viii) A salt which absorbs moisture from the air, but does not change its physical state is called _____ salt. (efflorescent/hygroscopic)

(ix) Dissolution of aluminium foil in HCl as well as NaOH shows that it is _____ in nature. (metallic/amphoteric)

[9]

Ans. (i) HCl (ii) strong (iii) acetic acid (iv) sulphur dioxide (v) acidity (vi) insoluble (vii) neutralisation (viii) hygroscopic (ix) amphoteric

26. Complete the statements given below :

- (i) All acidic solutions contains _____ ions.
- (ii) All alkaline solution contains _____ ions.
- (iii) The reaction between an acid and a base is essentially a reaction between _____ ions and _____ ions to form _____ .
- (iv) Metal A reacts with cold water forming hydrogen and new compound B. The anion combined with A in a substance B is named _____ .

[4]

Ans. (i) All acidic solution contains $H^+(aq)$ ions.

(ii) All alkaline solution contains OH^- ions.

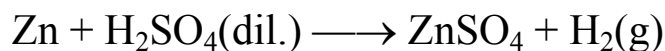
(iii) The reaction between an acid and a base is essentially a reaction between $H^+(aq)$ ions and OH^- ions to form water.

(iv) Metal A reacts with cold water forming hydrogen and new compound B. The anion combined with A in a substance B is named hydroxyl ion.

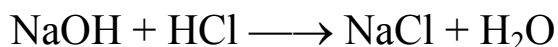
27. Give one chemical property (not indicators) with a balanced equation in each case which are typical of (i) a dilute acid (ii) a dilute aqueous alkali.

[2]

Ans. (i) Dilute acid reacts with active metals to form a metallic salt and hydrogen gas.



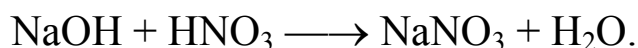
(ii) Dilute alkali reacts with an acid to form salt and water as the only products.



28. Define the following terms giving one example in each case
(i) An acid (ii) A base (iii) An acid salt. [3]

Ans. (i) A compound which on dissolving in water furnishes hydronium ions as the only positively charged ions is called an acid. For example, $\text{HCl} \rightleftharpoons \text{H}^+ + \text{Cl}^-$.

(ii) A compound which reacts with the H^+ ions of an acid to form salt and water as only product is called base. For example :



(iii) A salt formed by the partial replacement of H^+ ions of an acid by a basic radical is called acid salt. For example, NaHSO_4 .

29. Dry crystals of sodium sulphate are to be prepared starting with dilute sulphuric acid and aqueous sodium hydroxide solution. [4]

The steps involved in the preparation of salt are given below in the wrong order :

- (a) Heat the solution in an evaporating dish until its volume is reduced;
- (b) Boil the resulting solution with activated charcoal ;
- (c) Place the alkali and few drops of litmus solution in flask;
- (d) Dry the crystals in desiccator;
- (e) Filter the mixture, retaining filtrate;
- (f) Allow the solution to crystallise slowly;
- (g) Place the acid solution in the burette;
- (h) Take 25 cm^3 of alkali using pipette;
- (i) Add the acid drop by drop until litmus just turns red.

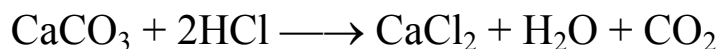
Using the letters (a), (b), (c), etc., only, to represent the instructions, complete the following sequence to show the correct order of the procedure.

(h), (c), (g), (), (), (), (), (f), (d).

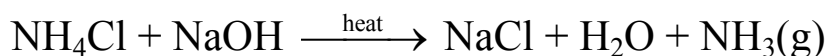
Ans. (h), (c), (g), (i), (b), (e), (a), (f), (d).

- 30. (a) (i)** Give one chemical property of (1) an acid (2) an alkali. [2]
(ii) Name one everyday use of citric acid. [1]
(iii) In terms of theory of ionisation, define :
 (1) an acid (2) a base (3) neutralisation. [3]
(b) Starting with copper chips and concentrated nitric acid, describe briefly how you can prepare black copper oxide. [4]

Ans. (a) (i) (1) An acid reacts with metallic carbonates to liberate carbon dioxide gas

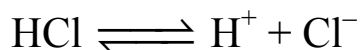


(2) An alkali reacts with ammonium salts on warming to form ammonia gas

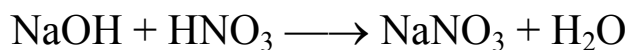


(ii) Citric acid is used in making soft drinks.

(iii) (1) A compound on dissolving in water furnishes hydronium ions as the only positively charged ion is called as acid. For example

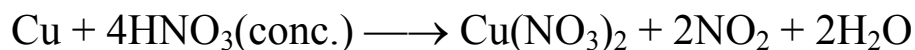


(2) A compound which reacts with the H^+ ions of an acid to form salt and water as only product is called base. For example :

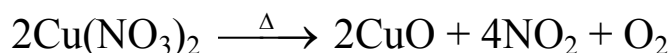


(3) A chemical reaction in which hydronium ion derived from an acid reacts with hydroxyl ion derived from a base, so as to form unionised water is called neutralisation.

- (b) Dissolve copper turnings in conc. nitric acid. The following reaction takes place with the formation of copper nitrate.



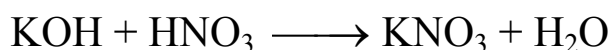
Filter the reaction mixture and transfer the clear solution of copper nitrate to china dish. Heat the solution to dryness and then heat strongly. The copper nitrate decomposes to form copper oxide. Go on heating till brown fumes of nitrogen dioxide stop coming. The residue is copper oxide.



- 31.** Starting from potassium hydroxide and nitric acid, how will you prepare crystals of potassium nitrate? [4]

Ans. (i) Take about 20 ml solution of potassium hydroxide in a conical flask and add to it few drops of red litmus solution. The solution will turn blue.

- (ii) To the above solution add dilute nitric acid drop till the solution changes into red colour.



- (iii) To the above solution add half a spoon of animal charcoal and boil.

- (iv) Filter the above solution so as to obtain clear filtrate of potassium nitrate solution.

- (v) Transfer the solution to china dish and heat it over a low flame, till the solution is reduced to half.

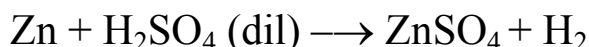
- (vi) Allow the solution to cool to room temperature. The crystals of potassium nitrate will separate out.

- (vii) Filter the crystals of potassium nitrate and dry them in the folds of filter paper.

32. Briefly describe, how will you obtain crystals of zinc sulphate starting from zinc and dilute sulphuric acid. [4]

Ans. (i) Take about 50 ml of dil H_2SO_4 in a beaker and drop in it about 5 g of granulated pieces of zinc.

(ii) When the reaction stops, filter the solution and collect the clear filtrate of zinc sulphate.



(iii) Transfer the solution to china dish and heat it over low flame, till its volume is reduced to more than half.

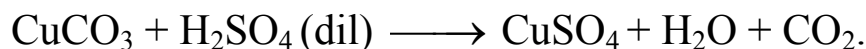
(iv) Allow the solution to cool to room temperature. The crystals of zinc sulphate separate out.

(v) Filter the zinc sulphate crystals and dry them in the folds of filter paper.

33. You are provided with copper carbonate and concentrated sulphuric acid. How will you proceed to prepare hydrated crystals of copper sulphate? [4]

Ans. (i) Take a 200 ml beaker and pour in it 100 ml of distilled water. To the water add 10 ml of conc sulphuric acid drop by drop and continuously stir. This forms dilute sulphuric acid.

(ii) To the dilute sulphuric acid add excess of copper carbonate.



When the reaction stops and some copper carbonate is left at the base of beaker, filter the contents.

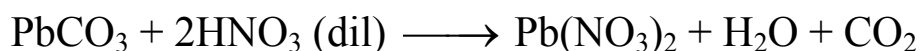
(iii) Collect the clear filtrate of copper sulphate in a china dish and heat it over low flame, till its volume is reduced to half.

(iv) Allow the solution to cool to remove temperature, when the crystals of $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ separate out.

(v) Filter the crystals of $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ and dry them in the folds of filter paper.

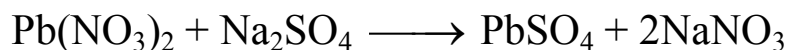
34. You are required to prepare lead sulphate from lead carbonate. Briefly explain how will you proceed. [4]

Ans. (i) Take 100 ml of dil nitric acid in a beaker and to it add excess of lead carbonate. Stir the contents of reaction mixture, when the following reaction takes place.



(ii) When the reaction stops, filter the reaction mixture so as to collect the clear filtrate of lead nitrate solution.

(iii) To the lead nitrate solution add excess of sodium sulphate solution when the following reaction takes place with the formation of lead sulphate.



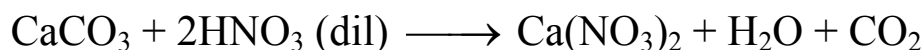
(iv) Filter the insoluble lead sulphate, wash it with hot water and finally dry it in the folds of filter paper.

35. We cannot prepare calcium sulphate by treating marble chips with dilute sulphuric acid. Outline the procedure to prepare calcium sulphate from marble chips. [5]

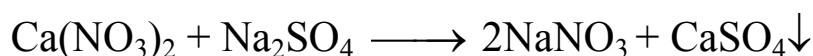
Ans. Marble chips (CaCO_3) initially reacts with dilute sulphuric acid to form insoluble calcium sulphate, which settles on its exposed surface. This in turns cuts off dilute sulphuric from the marble chips and hence the reaction stops.

In order to prepare calcium sulphate from marble chips following steps are followed.

(i) Marble chips are dissolved in dilute nitric acid so as to form soluble calcium nitrate solution.



- (ii) The reaction mixture is filtered and a clear solution of calcium nitrate is collected. To this solution is added excess of sodium sulphate solution when the insoluble calcium sulphate precipitates out.



- (iii) The reaction mixture is then filtered. The insoluble precipitate of calcium sulphate is washed with hot water and is finally dried in the folds of filter paper.

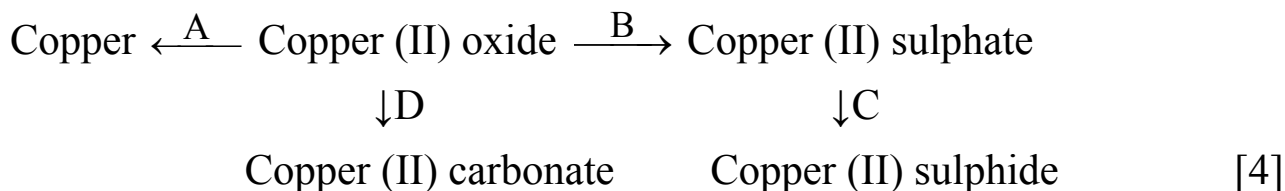
- 36.** Certain pairs of substances from the list given below, react together to give salts. Copy and complete the sentences (i) to (iv) that follow the correct pair of substances for each salt.

List : Zinc, dilute sulphuric acid, copper oxide, barium chloride, iron, sodium carbonate, magnesium chloride and sulphur.

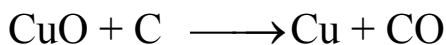
- (i) Zinc sulphate is made from _____ and _____
 (ii) Copper sulphate is made from _____ and _____
 (iii) Iron sulphide is made from _____ and _____
 (iv) Magnesium carbonate is made from _____ and _____ [4]

- Ans.** (i) Zinc sulphate is made from zinc and dilute sulphuric acid.
 (ii) Copper sulphate is made from copper oxide and dilute sulphuric acid.
 (iii) Iron sulphide is made from iron and sulphur.
 (iv) Magnesium carbonate is made from magnesium chloride and sodium carbonate.

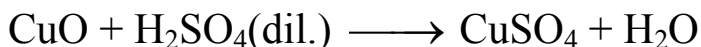
37. For each of the following conversions in the scheme below, state briefly in words or by means of equations, how the conversions can be carried out. [4]



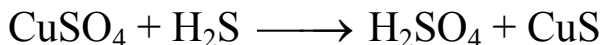
Ans. (A) Heat a mixture of copper (II) oxide and charcoal strongly. The copper oxide is reduced to copper metal.



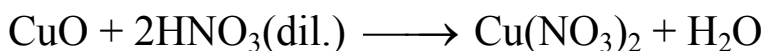
(B) Treat copper (II) oxide with dilute sulphuric acid. The reaction takes place on warming, with the formation of copper sulphate solution.



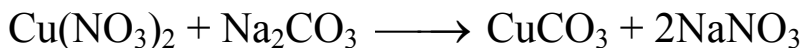
(C) Pass hydrogen sulphide gas through copper (II) sulphate solution. Black copper (II) sulphide precipitates out.



(D) Treat copper (II) oxide with dilute nitric acid when it dissolves to form solution of copper (II) nitrate.



To the clear solution of $\text{Cu}(\text{NO}_3)_2$ add excess of sodium carbonate solution. The copper (II) carbonate separates out as an insoluble precipitate.



38. (a) What is the name of compound present in lemon, which is chiefly responsible for its sour taste?

(b) State one important use of each of the following :

(1) caustic soda (Sodium hydroxide)

(2) quicklime (Calcium oxide).

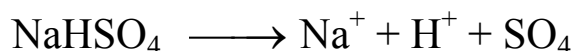
[3]

Ans. (a) Citric acid is responsible for sour taste.

(b) 1. Caustic soda is used in the manufacture of soap.

2. Quicklime is used in making mortar.

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



[1]

Explain.

(b) Copy and complete the following table :

<i>Common Name</i>	<i>Chemical Name</i>	<i>Formula</i>
<i>Common salt</i>	<i>Sodium chloride</i>	<i>NaCl</i>
<i>1. Nitre</i>		
<i>2.</i>	<i>Conc. sulphuric acid</i>	
<i>3. Laughing gas</i>		
<i>4. Soda ash (Na₂CO₃)</i>		<i>Na₂CO₃</i>

[4]

(c) (i) Name one caustic alkali.

[1]

(ii) Basicity of acetic acid is one. Explain.

[1]

Ans. (a) Sodium hydrogen sulphate is an acid salt, formed by the partial neutralisation of H^+ (aq) ions of sulphuric acid with sodium hydroxide. Thus, on dissolving in water it furnishes H^+ ions.

(b)

<i>Common Name</i>	<i>Chemical Name</i>	<i>Formula</i>
<i>Common salt</i>	<i>Sodium chloride</i>	<i>NaCl</i>
<i>1. Nitre</i>	<i>Potassium nitrate</i>	<i>KNO₃</i>
<i>2. Oil of vitriol</i>	<i>Conc. sulphuric acid</i>	<i>H₂SO₄</i>
<i>3. Laughing gas</i>	<i>Nitrogen (I) Oxide</i>	<i>N₂O</i>
<i>4. Soda ash</i>	<i>Anhydrous sodium carbonate</i>	<i>Na₂CO₃</i>

(c) (i) Caustic soda (NaOH).

(ii) It means, one molecule of acetic acid, on complete dissociation in water, will furnish one H⁺ (aq) ion.

40. (a) Name an acid used in cooking food.

[1]

(b) Following is the list of chemicals :

Cl₂, H₂SO₄, HCl acid, Fe, ZnSO₄, CO₂, Na₂CO₃, MgSO₄, NaOH and water.

Using the above chemicals only, state briefly how you would prepare following (No equations required).

(i) Magnesium carbonate

(ii) Ferrous sulphate [Iron (II) sulphate]

(iii) Ferric chloride [Iron (III) chloride]

(iv) Sodium zincate.

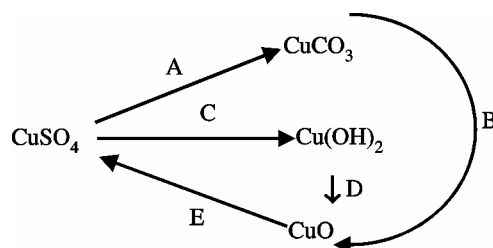
[4]

Ans. (a) Acetic acid (vinegar) is used in cooking food.

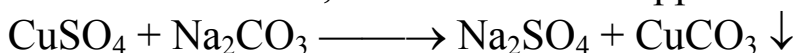
(b) (i) Magnesium carbonate is prepared by treating sodium carbonate solution with magnesium sulphate solution, when double decomposition takes place with the precipitation of insoluble magnesium carbonate.

- (ii) By treating iron with dilute sulphuric acid, a displacement reaction takes place, with the formation of ferrous sulphate.
- (iii) When chlorine is passed over red hot iron ferric chloride is formed.
- (iv) When zinc sulphate is heated with excess of conc. sodium hydroxide, sodium zincate is formed.

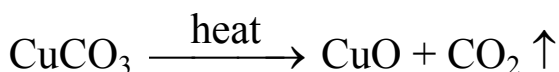
41. For each of the conversions A, B, C, D and E in the scheme below, state briefly in words, how conversions can be carried out. [5]



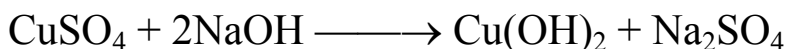
Ans. A. Copper sulphate solution is treated with excess of sodium carbonate solution, when insoluble copper carbonate is formed.



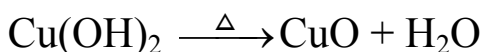
B. Copper carbonate is heated strongly, when it decomposes to form copper oxide.



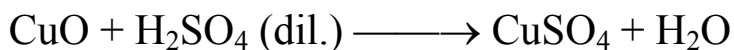
C. Copper sulphate solution is treated with excess of sodium hydroxide solution, when blue coloured insoluble copper hydroxide is formed.



D. Copper hydroxide is heated strongly, when it decomposes to form black copper oxide.



E. Copper oxide is dissolved in dil. sulphuric acid, when it forms copper sulphate.



- 42. (a)** For each of the salts **P**, **Q**, **R** and **S**, suggest suitable method of preparation which relates to the descriptions given : (i) **P** is a sodium salt (ii) **Q** is an insoluble salt (iii) **R** is a soluble salt of copper (iv) **S** is a soluble salt of zinc.

[Name only the method. Do not describe procedure for preparation.]

[4]

(b) Name :

(i) two bases which are not alkalis.

(ii) a normal salt and an acid salt of same acid.

(iii) a salt is insoluble in cold water, but soluble in hot water. [2]

Ans. (a) (i) **P** can be prepared by neutralisation.

(ii) **Q** can be prepared by precipitation.

(iii) **R** can be prepared by dissolving copper oxide in an acid followed by evaporation and crystallisation.

(iv) **S** can be prepared by dissolving zinc metal in an acid, followed by evaporation and crystallisation.

(b) (i) Iron (II) hydroxide and copper (II) hydroxide.

(ii) Na_2SO_4 is a normal salt and NaHSO_4 is an acid salt.

(iii) Lead chloride is insoluble in cold water, but soluble in hot water.

43. By giving two examples, define or explain the following terms.

(i) anhydrous salt

(ii) hydrated salt

(iii) water of crystallisation

(iv) deliquescent substance

(v) hygroscopic substance

(vi) Efflorescent substance

[10]

Ans. (i) A salt which does not contain any water of crystallisation is called **anhydrous salt**.

Examples : Sodium chloride [NaCl]

Sodium nitrate [NaNO₃]

(ii) A salt which contains definite number of water molecules of water attached loosely to its one molecule is called **hydrated salt**.

Examples : CuSO₄ · 5H₂O, Na₂CO₃ · 10H₂O

(iii) The number of water molecules which are loosely attached to one molecule of a salt is called **water of crystallisation**.

Example : In ZnSO₄ · 7H₂O, 7 molecules of water are that of water of crystallisation. In CaCl₂ · 6H₂O, 6 molecules of water are that of water of crystallisation.

(iv) The water soluble substances, which absorb moisture from air to change to liquid state are called **deliquescent substances**.

Examples : anhydrous calcium chloride and sodium hydroxide crystals.

(v) The substances which absorb moisture from air, but do not change their state are called **hygroscopic substances**.

Example : Quicklime, phosphorous pentoxide, conc. sulphuric acid.

(vi) **Efflorescent substances** are those which partly or wholly lose their water of crystallisation when exposed to air. **Examples :**

(i) Washing soda [Na₂CO₃ · 10H₂O], Blue vitriol [CuSO₄ · 5H₂O]

- 44.** Zinc metal and aluminium metal are amphoteric in nature. What do you understand by the statement? Support your answer by writing fully balanced chemical equations.

Ans. Zinc as well as aluminium metals react both with acids as well as alkalis to form a salt and displace hydrogen gas. Such metals which react, both with acids as well as alkalis are called amphoteric in nature.



- 45.** The oxides and hydroxides of zinc and aluminium metals are amphoteric in nature. What do you understand by the statement? Support your answer by writing relevant chemical equations. [5]

Ans. The oxides and hydroxides of metals which react, both with acids as well as alkalis to form their respective salts and water are called amphoteric oxides.

