

Date : / / 201

Lesson (1)

Day :

Chemical Analysis

1) Write the scientific term for each of the following:

- 1) It is considered one of the important branches of chemical science which plays an important role to determine the identity of ores and products for standard specifications.
- 2) The chemical analysis used to identify the constituents of the substance, whether it is Pure (a sample salt) or a mixture of several substances.
- 3) It is a chemical analysis which aims to estimate the percentage of each essential Component of substance.
- 4) Acids which are easy to evaporate or decompose into gases.
- 5) An aqueous solution of one of calcium cations which turns turbid by passing CO_2 gas for short time.
- 6) A series of selected reactions used to identify the main constituent of the substance based on the changes occurred in these reactions.
- 7) An anion left after removing hydrogen cation from an acid.
- 8) An anion whose all salts are soluble in water.
- 9) The radicals that are carrying positive charge.
- 10) The radicals that are carrying negative charge.
- 11) A salt formed by the incomplete neutralization of a base with an acid.
- 12) A salt formed when the available "hydrogen" atoms of an acid are only partially replaced by a metal during neutralization with a base.
- 13) The substance that is used to test for the presence of another substance by causing a chemical reaction with it.
- 14) An acidic gas turns an acidified solution of potassium dichromate by conc. H_2SO_4 into green.
- 15) A gas of bad smell which turns a solution of lead (II) acetate into black.
- 16) A colourless gas turns into reddish-brown at the mouth of the test tube.



- 17) A colourless gas forms white fumes with a glass rod wetted with ammonia solution.
- 18) Reddish-orange fumes turn a paper wetted by starch into yellow.
- 19) Violet fumes turn starch solution into blue.
- 20) Reddish-brown fumes evolve due to the decomposition of the nitric acid.
- 21) A group of anions that reacts neither with dil. hydrochloric acid nor cone. sulphuric acid.
- 22) Cations which are precipitated as sulphides in an acidic medium.
- 23) Cations which are precipitated as hydroxides.
- 24) Cations which are precipitated as carbonates.
- 25) A colour produced by calcium ion in the flame test.

2) Complete the following tables :

Observations	Results
Effervescence and a colourless gas is evolved which turns limewater milky.	1. The gas is The anion is..... or To differentiate between them : Salt solution +
A colourless gas is evolved which turns at the mouth of the test tube to reddish-brown fumes.	2. The gas is..... and the reddish-brown Fumes are..... The anion is
A colourless gas is evolved which has irritating smell and turns an acidified potassium dichromate paper into green.	3. The gas is and the green colour is , The anion is
A colourless gas is evolved which has irritating smell and turns an acidified potassium dichromate paper into green and a yellow precipitate is formed.	4. The gas is , the ppt. is and the green colour is The anion is
A colourless gas is evolved which is characterized by its bad odour and turns lead (II) acetate paper to black.	5. The gas is , the ppt. is and the black colour is The anion is

Observations	Results
A colourless gas is evolved which forms white a glass rod wetted with ammonia solution,	1. The gas is..... .. and the white fumes are The anion is
A colourless gas is evolved which is oxidized by H_2SO_4 forming reddish-orange fumes which turns a paper wetted by starch solution to yellow.	2. The gas is and the fumes are The anion is
A colourless gas is evolved which is oxidized by H_2SO_4 forming violet fumes after heating which turns a paper wetted by starch solution to blue.	3. The gas is and the fumes are The anion is
Brown vapours are evolved and its density increases by adding copper felling.	4. The gas is The anion is -

3) Choose from the following columns what suit in the other columns:

(1) Choose from column (A) the suitable description for each compound in column (B):

Column (A)	Column (B)
(a) hite precipitate.	(i) $Fe(OH)_2$
(b) Black precipitate.	(ii) $Al(OH)_3$
(c) Yellowish-white precipitate.	(iii) $AgBr$
(d) Yellow precipitate.	(iv) $Fe(OH)_3$
(e) Gelatinous white precipitate.	(v) AgI
(f) Reddish-brown precipitate.	(vi) $MgCO_3$
(g) Greenish-white precipitate.	(vi) Ag_2S
	(vii) $PbCl_2$

(2) Choose from column (B) the suitable characteristics for the gases produced from the anion reactions listed in column (A) :

Column (A)	Column (B)
(a) $\text{CO}_3^{2-}(\text{s}) + \text{HCl}(\text{aq}) \xrightarrow{\text{dil}}$	(i) colourless gas forms white fumes with wetted glass rod of ammonia solution.
(b) $\text{SO}_3^{2-}(\text{s}) + \text{HCl}(\text{aq}) \xrightarrow{\text{dil}}$	(ii) Violet fumes turn a wetted paper of starch solution to blue.
(c) $\text{S}^{2-}(\text{s}) + \text{HCl}(\text{aq}) \xrightarrow{\text{dil}}$	(iii) colourless gas turns limewater turbid.
(d) $\text{NO}_2^{-}(\text{s}) + \text{HCl}(\text{aq}) \xrightarrow{\text{dil}}$	(iv) pungent gas turns an acidified potassium dichromate paper to green.
(e) $\text{Cl}^{-}(\text{s}) + \text{H}_2\text{SO}_4(\text{aq}) \xrightarrow[\text{conc}]{\Delta}$	(v) colourless gas has bad odour and turns a paper wetted with lead (II) acetate to black.
(f) $\text{I}^{-}(\text{s}) + 2\text{H}_2\text{SO}_4(\text{aq}) \xrightarrow[\text{conc}]{\Delta}$	(vi) colourless gas which turns to reddish-brown fumes at the mouth of the test tube.

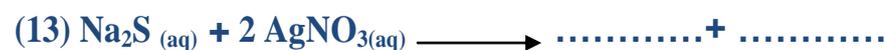
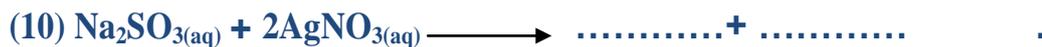
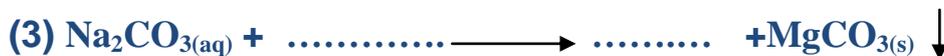
(3) Choose from column (A) what is suitable for each radical in column (B) :
On adding silver nitrate solution to the solution of some anions, a precipitate is formed :

Column (A)	Column (B)
(a) Black, soluble in ammonia solution	(i) Phosphate
(b) White, soluble slowly in ammonia solution	(ii) Bromide
(c) Yellowish-white, insoluble in ammonia solution.	(iii) Chloride
(d) Yellow, insoluble in dil. nitric acid .	(iv) Sulphide
(e) Yellow, soluble in dil. nitric acid and ammonia solution	

(4) Choose the solution from column (B) which is used to distinguish between each pair of the salts in column (A) :

Column (A)	Column (B)
(a) $\text{NaHCO}_3 - \text{Na}_2\text{CO}_3$	(i) Conc. H_2SO_4
(b) $\text{Na}_2\text{SO}_3 - \text{Na}_2\text{S}_2\text{O}_3$	(ii) BaCl_2
(c) $\text{NaNO}_3 - \text{NaNO}_2$	(iii) AgNO_3
(d) $\text{NaI} - \text{NaBr}$	(iv) Acidified iron sulphate
(e) $\text{Na}_3\text{PO}_4 - \text{Na}_2\text{SO}_4$	(v) NaOH
(f) $\text{FeSO}_4 - \text{FeCl}_3$	(vi) MgSO_4
	(vii) Dil. H_2SO_4

4) Complete the following reactions:



5) Show by balanced chemical reactions what happens in each of the following:

- (1) Passing carbon dioxide in limewater.
- (2) Adding hydrochloric acid to the white precipitate which is formed by reacting the salt solution of carbonate with magnesium sulphate.
- (3) Decomposing magnesium bicarbonate.
- (4) Exposing filter paper moistened with acidified potassium dichromate solution to the gas which is evolved when the solid salt of sulphite reacts with dil. HCl (1st session 09)
- (5) Exposing filter paper moistened with lead (II) acetate solution to the gas which is evolved when the solid salt of sulphide reacts with dil. HCl
- (6) Adding iodine solution to sodium thiosulphate.
- (7) Decomposing isolated acid from the reaction of sodium nitrite with dil. HCl .
- (8) Exposing nitric oxide to the oxygen.
- (9) Adding acidified potassium permanganate solution to sodium nitrite.
- (10) Exposing a glass rod moistened with ammonia solution to the gas which is evolved from the reaction of sodium chloride with conc. sulphuric acid.
- (11) The partial oxidation of hydrogen bromide by concentrated sulphuric acid.
- (12) Adding a small piece of copper metal to the isolated acid from the reaction of sodium nitrate with conc. sulphuric acid.
- (13) Mixing sodium nitrate with freshly prepared iron (II) sulphate and adding drops of conc. H_2SO_4 to them.
- (14) Adding barium chloride to sodium phosphate.
- (15) Adding lead (II) acetate solution to sodium sulphate.
- (16) Adding silver nitrate solution to sodium bromide.
- (17) Decomposing conc. nitric acid.
- (18) Adding sodium bromide to hot conc. sulphuric acid.
- (19) Adding conc. sulphuric acid to sodium iodide with heating, then passing the produced fumes on paper moistened with starch solution.



- (20) Adding dil. hydrochloric acid to sodium carbonate, then passing the product on Calcium hydroxide solution for short time.
- (21) Adding silver nitrate solution to sodium chloride.
- (22) Adding silver nitrate solution to sodium iodide.
- (23) Adding dil. hydrochloric acid to magnesium carbonate ppt.
- (24) Adding dil. hydrochloric acid to sodium bicarbonate salt.
- (25) Adding silver nitrate solution to sodium sulphite with heating.
- (26) Adding silver nitrate solution to sodium sulphide.
- (27) Adding dil. hydrochloric acid to sodium nitrite salt.
- (28) Adding silver nitrate solution to sodium phosphate.
- (29) Adding barium chloride to sodium sulphate solution.
- (30) Adding sodium hydroxide solution to iron (II) sulphate.
- (31) Adding excess of sodium hydroxide solution to aluminum sulphate.
- (32) Adding water containing carbon dioxide to the precipitate which is produced when calcium chloride solution reacts with ammonium carbonate.
- (33) Adding ammonium hydroxide to iron (III) chloride.
- (34) Adding dil. hydrochloric acid to copper (II) sulphate solution, then passing hydrogen sulphide gas.

6) Write the balanced chemical reactions that give the gases which can be detected by the following:

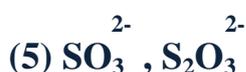
- (1) Colourless, turns the limewater milky.
- (2) Ability to turn acidified potassium dichromate paper into green.
- (3) Bad odour, turns the lead (II) acetate paper to black.
- (4) Colourless, turns into reddish-brown fumes when it is exposed to air at the mouth of the test tube.
- (5) Colourless, turns filter paper moistened with starch to yellow.
- (6) Colourless, gives white fumes with glass rod moistened with ammonia solution.
- (7) Colourless, turns into violet vapours by heating.
- (8) Brown vapour turns into dense vapour when copper felling is added.



7) How to differentiate practically between each of the following (by using balanced chemical equations as possible) :

- (1) Sodium chloride and sodium iodide salts "by using cone. sulphuric acid".
- (2) Sodium nitrite and sodium nitrate salts.
- (3) Sodium bromide and sodium iodide "by using silver nitrate solution."
- (4) Sodium carbonate and sodium sulphite salts.
- (5) Sodium bromide and sodium chloride salts.
- (6) Sodium carbonate and sodium bicarbonate solutions "by using magnesium sulphate solution".
- (7) Calcium chloride and calcium bicarbonate salts.
- (8) Sodium sulphite and sodium thiosulphate salts.
- (9) Sodium sulphide and sodium bromide solutions.
- (10) Potassium nitrate and potassium chloride salts.
- (11) Sodium bicarbonate and sodium nitrite salts.
- (12) Sodium sulphide and sodium chloride salts.
- (13) Sodium sulphate and sodium iodide salts.
- (14) Sodium sulphide and sodium thiosulphate salts.
- (15) Sodium sulphate and sodium phosphate solutions.
- (16) Sodium nitrite and sodium sulphide salts.
- (17) Sodium sulphite and sodium sulphate salts.
- (18) Hydrochloric acid and sulphuric acid "by using sodium chloride".
- (19) Iron (II) sulphate and iron (III) sulphate solutions "by using ammonia solution".
- (20) Iron (II) chloride and iron (III) chloride solutions.
- (21) Sodium chloride and aluminum chloride solutions.
- (22) Aluminum and ammonium salts.

8) Show by a balanced chemical equation, how to distinguish practically between each pair of the following anions (using one confirmatory test) :



9) Choose the alphabetical letter which represents the correct answer for each of the following sentences:

(1) The gas which turns limewater milky is

(a) CO_2 (b) SO_2 (c) NO_2 (d) SO_3

(2) The salt which gives vapours with conc. H_2SO_4 and if a copper felling is added, dense fumes will evolve, this salt may be

(a) nitrate.

(b) chloride.

(c) bromide.

(d) iodide.

(3) Barium sulphate is insoluble in

(a) conc. HNO_3 (b) conc. HCl (c) dil. HCl (d) conc. H_2SO_4

(4) The reagent $(\text{NH}_4)_2\text{CO}_3$ precipitates

(a) Ca^{2+} (b) Fe^{3+} (c) Cu^{2+} (d) Ag^+

(5) Sulphur dioxide may be detected by its

(a) greenish-yellow colour.

(b) reddish-brown colour.

(c) ability to turn acidified potassium dichromate paper into green.

(d) ability to decolourize acidified KMnO_4 solution.

(6) Iodine can be obtained from NaI solution by the action of

(a) conc. HCl (b) dil. HCl (c) BaCl_2 (d) conc. H_2SO_4

(7) Which of the following statements is correct when dil. HCl is added to NaNO_2 ?

(a) A deep red vapour is evolved.

(b) A colourless gas is evolved which turned into violet fumes by the action of conc. H_2SO_4

(c) A colourless gas is evolved which has irritating smell.

(d) A colourless gas is evolved which turned reddish-brown at the mouth of the test tube.



- (8) Salt solution of+ BaCl_2 produce white precipitate insoluble in acids;
(a) nitrate (b) phosphate (c) sulphate (d) nitrite
- (9) Salt solution of+lead (II) acetate produce black precipitate.
(a) sulphate (b) nitrate (c) phosphate (d) sulphide
- (10) Which of the following ions form a reddish-brown precipitate when an aqueous solution of sodium hydroxide is added to it ?
- (a) Copper (II) ions. (b) Iron (II) ions. (c) Iron (III) ions. (d) Aluminum ions.
- (11) Which of the following ions would form a white precipitate when sodium hydroxide solution is added to it ? .
- (a) Aluminum ions. (b) Calcium ions. (c) Iron (II) ions. (d) Copper (II) ions.
- (12) Which of the following ions would form a black precipitate when acidified hydrogen sulphide solution is added to it?
- (a) Iodide ions. (b) Copper (II) ions. (c) Iron (II) ions. (d) Sulphate ions.
- (13) Which of the following ions would form a white precipitate when acidified barium nitrate solution is added to it ? .
- (a) Chloride ions. (b) Iodide ions. (c) Nitrate ions. (d) sulphate ions
- (14) Which of the following gases fits the following description "the gas is colourless , has irritating smell and turns a paper wetted with acidified potassium dichromate into green" ?.....
- (a) Ammonia. (b) Carbon dioxide. (c) Sulphur dioxide. (d) Nitrogen dioxide.
- (15) Which of the following gives a gas with bad odour when treated with dil. HCl ? .
- (a) Carbonate. (b) Sulphide. (c) Sulphate. (d) Borate.
- (16) Which of the following cations whose carbonate salt is soluble in water? .
- (a) Na^+ (b) NH_4 (c) Ca^{2+} (d) Cu^{2+}
- (17) Salt solution of+ hydrochloric acid produce a yellow preolpitate and gas has irritating smell.
- (a) sulphide (b) carbonate (c) thiosulphate (d) sulphite

(18) Salt solution of + sodium hydroxide solution produce a reddish-brown precipitate.

- (a) copper (II) (b) iron (III) (c) aluminum (d) iron (II)

(19) Reaction of dil. HCl acid with a substance evolving a colourless gas which turns clear limewater milky, indicates the presence of .

- (a) CO_3^{2-} (b) S^{2-} (c) NO_2^- (d) Cl^-

(20) The type of analysis that deals with the used methods in determining the constituents of compounds is .

- (a) qualitative analysis. (b) gravimetric analysis.
(c) volumetric analysis. (d) quantitative analysis.

(21) An inorganic compound (A) is dissolved in conc. H_2SO_4 and then is warmed. A violet coloured gas (B) is produced, which turns into blue when exposed to a paper wetted with starch solution. So, (B) and (A) are respectively.

- (a) SO_2 and Na_2SO_3 (b) SO_3 and Na_2SO_4
(c) NO_2 and NaNO_3 (d) I_2 and KI

(22).....Combines with Fe (II) ions to form a brown complex.

- (a) N_2O (b) NO (c) N_2O_3 (d) N_2O_4

(23) Which of the following statements is correct? .

- (a) A paper moistened with lead (II) acetate solution turns black, when brought in contact with H_2S gas.
(b) Both of carbonate and bicarbonate ions in their solutions give a reddish-brown precipitate with magnesium sulphate.
(c) Nitrate in the presence of zinc reacts with dil. H_2SO_4 to liberate NO_2 gas.
(d) A paper moistened with starch turns blue when brought in contact with SO_2 vapours.

(24) precipitate is insoluble in ammonia solution.

- (a) AgI (b) AgCl (c) AgBr (d) Ag_3PO_4

- (25) Violet vapours evolve whenreacts with conc. H_2SO_4
 (a) bromide (b) iodide (c) chloride (d) nitrate
- (26) Reaction of a salt solution with silver nitrate produces a yellow coloured precipitate which is insoluble in ammonia solution. So, the salt may be
 (a) chloride. (b) bromide. (c) nitrate. (d) iodide.
- (27) In the ring test of nitrate, the brown colour of the ring appears due to the formation of
 (a) ferrous nitrate. (c) ferrous nitrite.
 (b) nitrous ferrous sulphate. (d) ferrous sulphate.
- (28) The violet colour of the permanganate is removed, whenis added to it.
 (a) NaNO_2 (b) NaNO_3 (c) NaCl (d) NaBr
- (29) Which of the following reagents can be used for distinguishing between AgCl , AgBr and AgI ?
 (a) Dil. ammonia solution. (b) Dil. HNO_3
 (c) Conc. HCl (d) Conc. ammonia solution.
- (30) Which of the following precipitates is soluble in dil. HCl ?
 (a) $\text{Ba}_3(\text{PO}_4)_2$ (b) BaSO_4 (c) BaSO_3 (d) $\text{Ba}(\text{OH})_2$
- (31) On adding salt solution to silver nitrate, a yellow precipitate is formed. The salt anion may be .
 (a) PO_4^{3-} (b) SO_4^{2-} (c) SO_3^{2-} (d) CO_3^{2-}
- (32) When both of Cu^{2+} and Ag^+ are present in the same solution, by adding .., Cu^{2+} ion is precipitated, while Ag^+ is kept in the solution.
 (a) $(\text{NH}_4)_2\text{CO}_3$ (b) HNO_3 (c) H_2S (d) NH_4OH
- (33) On adding dil. hydrochloric acid to sodium thiosulphate solution, a yellow suspended sulphur is formed accompanied by.....
 (a) sulphur trioxide. (b) oxygen. (c) sulphur dioxide. (d) carbon dioxide.



- (34) Hydrochloric acid is considered as a reagent for
- (a) iodide. (b) nitrate (c) nitrite. (d) bromide.
- (35) On adding lead (II) acetate to sodium sulphate solution, a..... ppt. is formed.
- (a) black (b) blue (c) green (d) white
- (36) Barium chloride is used to detect the presence of
- (a) nitrate. (b) sulphide. (c) bicarbonate. (d) sulphate.
- (37) All salts are soluble in water.
- (a) carbonate (b) sulphide (c) bicarbonate (d) chloride.
- (38)..... carbonate is insoluble in water.
- (a) Copper (b) Sodium (c) Potassium (d) All the previous
- (39) On heating magnesium bicarbonate, a..... ppt. is formed.
- (a) white (b) black (c) blue (d) brown
- (40) Conc. sulphuric acid is more stable than
- (a) hydrochloric acid. (b) hydrobromic acid.
(c) nitric acid. (d) all the previous.
- (41) Hydrochloric acid is more stable than acid.
- (a) sulphuric (b) carbonic (c) nitric (d) phosphoric.
- (42) Silver chloride ppt. is soluble in.....
- (a) conc. sulphuric acid. (b) conc. ammonia solution.
(c) hydrochloric acid. (d) nitric acid.
- (43) On reduction of Mn^{7+} in $KMnO_4$ into Mn^{2+} in $MnSO_4$ solution, the solution colour.....
- (a) disappears. (b) becomes violet.
(c) changes from orange to yellow. (d) doesn't change.
- (44) A black ppt. is formed by the action of H_2S on
- (a) zinc sulphate. (b) ferric sulphate.
(c) aluminum sulphate. (d) copper sulphate.



- (45) The solution of sodium meta-aluminate is formed when a white precipitate (A) dissolves in the reagent (B), the precipitate (A) and the reagent (B) arerespectively.
- (a) $\text{Al}(\text{OH})_3$ and $\text{Ca}(\text{OH})_2$. (b) $\text{Fe}(\text{OH})_2$ and NaOH
 (c) $\text{Fe}(\text{OH})_3$ and NaOH (d) $\text{Al}(\text{OH})_3$ and NaOH
- (46) An aqueous solution of colourless metal sulphate (M) gives a white gelatinous precipitate with NH_4OH which is soluble in dil. acids. The metal (M) in the salt is
- (a) Fe (b) Al (c) Ca. (d) Cu
- (47) Bunsen flame acquires a brick red colour by..... .
- (a) Co. salt. (b) No. salt. (c) Fe salt. (d) Cu salt.
- (48) An aqueous solution of CaCl_2 gives white precipitate with
- (a) conc. H_2SO_4 (b) dil. H_2SO_4 (c) conc. HCl (d) dil. HCl
- (49) On adding aluminum carbonate to calcium chloride solution, a..... ppt. is formed.
- (a) red (b) white (c) blue (d) yellow
- (50) An aqueous solution of a salt gives white precipitate with dil. H_2SO_4 and with $(\text{NH}_4)_2\text{CO}_3$ solution. It may be
- (a) CaCl_2 (b) FeCl_3 (c) AlCl_3 (d) FeCl_2
- (51) An inorganic salt solution gives a yellow precipitate with silver nitrate. The precipitate dissolves in nitric acid and in ammonium hydroxide, the solution contains
- (a) bromide. (b) iodide. (c) phosphate. (d) sulphate.
- (52) The salt which gives NO_2 with dilute HCl and also decolourizes acidified KMnO_4 solution is
- (a) NO_2^- (b) CO_3^{2-} (c) NO_3^- (d) SO_3^-
- (53) ions produce a ppt. soluble in excess of NaOH solution.
- (a) Cl^- (b) Fe^{2+} (c) Fe^{3+} (d) Al^{3+}
- (54) $\text{Na}_2\text{SO}_4 + \text{BaCl}_2 \longrightarrow$ white precipitate + aqueous solution, then by adding conc. H_2SO_4 and heating the solution, gas (G) is evolved. Which of the following properties represents the gas (G) ?
- (a) It turns paper wetted with lead (II) acetate to black.



Correct the underlined words in each of the following statements:

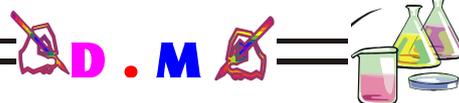
- (1) Concentrated sulphuric acid acts as a reagent for nitrite anion.
- (2) On adding silver nitrate solution to sodium chloride solution, a yellow ppt. is formed.
- (3) On adding sodium nitrate solution to calcium chloride solution, a white ppt. is formed soluble in conc. ammonium solution.
- (4) On adding hot conc. sulphuric acid to nitrate salt, a colourless gas evolves producing white clouds with glass rod moistened with ammonium solution.
- (5) On adding barium chloride solution to sodium phosphate, a yellow ppt. is formed.
- (6) On adding dil. hydrochloric acid to sodium sulphide, a gas evolves which turns a paper moistened with lead (II) acetate into blue.
- (7) On adding cone. iron (II) sulphate to nitrate salt solution, then adding dil. nitric acid at the mouth of the test tube, a brown ring is formed.
- (8) On adding lead (IV) acetate solution to sodium sulphate, a white ppt. is formed insoluble in dil. hydrochloric acid.
- (9) On adding iodine solution to sodium thiosulphate, the violet colour disappears.
- (10) On adding sulphuric acid to calcium chloride solution, a white ppt. is formed which turns into violet when exposing it to light.
- (11) On adding acidified potassium permanganate by conc. sulphuric acid to sodium thio- sulphate solution, the permanganate colour disappears.
- (12) On passing CO₂ gas in calcium bicarbonate solution, it changes into calcium carbonate. (13) Hydrogen sulphide gas is odourless.
- (14) Silver chloride ppt. dissolves in cone. ammonia solution slowly. !
- (15) The reagent of the third analytical group is sodium carbonate.
- (16) On adding sodium hydroxide solution to iron (II) sulphate solution, a brown ppt. is formed,
- (17) On adding sodium hydroxide solution to iron(III) chloride, a blood red ppt is formed.
- (18) Al(OH)₃ solution is soluble in excess of NaOH producing aluminum oxide.
- (19) The third analytical group is precipitated as carbonates,
- (20) NaOH solution is the reagent of the second analytical group.



11) Give reasons for:

- (1) Carbon dioxide turns Limewater milky.
- (2) Hydrochloric acid is used as a reagent for the anions of group (I).
- (3) Barium chloride is used as a reagent for phosphate and sulphate anions.
- (4) Passing of carbon dioxide in limewater for long time leads to disappearing the turbidity.
- (5) Dense vapours of NO_2 gas evolved when a small piece of copper metal is added to
The reaction of sodium nitrate with conc. H_2SO_4 .
- (6) The violet colour of potassium permanganate solution acidified by sulphuric acid will be removed by adding potassium nitrite solution.
- (7) The colourless nitric oxide gas is converted to reddish-brown colour at the mouth of the test tube.
- (8) Hydrogen chloride gas forms white fumes with the glass rod moistened with starch solution.
- (9) Reddish-orange fumes of bromine are formed during the reaction of conc. sulphuric acid with sodium bromide,
- (10) Violet vapour will be produced during the reaction between conc. sulphuric acid and potassium iodide with heating.
- (11) On adding sodium hydroxide gradually to aluminum chloride solution, white ppt. is formed and then disappears.
- (12) The precipitate of calcium carbonate dissolves in water containing carbon dioxide.
- (13) Filter paper wetted by lead (II) acetate solution turns black when it is exposed to hydrogen sulphide gas.
- (14) When magnesium sulphate reagent is added to sodium carbonate, white ppt. is formed on cold, while adding it to sodium bicarbonate, the precipitate is formed after heating.
- (15) The brown colour of iodine solution is removed when sodium thiosulphate is added to it.
- (16) Sulphur dioxide gas turns a paper wetted with an acidified potassium dichromate into green.

- (17) The brown ring is formed when nitrate solution is mixed with freshly prepared FeSO_4 and few drops of conc. H_2SO_4 acid are added to them.
- (18) Dil. hydrochloric acid doesn't react with sodium sulphate.
- (19) On adding hydrochloric acid to sodium thiosulphate, a yellow suspension is formed.
- (20) Gentle heating is preferred to detect the presence of anions of dil. hydrochloric acid group.
- (21) We can distinguish between sodium carbonate and calcium carbonate by using water.
- (22) We can distinguish between the white ppt. of barium phosphate and the white ppt. of barium sulphate by using dil. hydrochloric acid.
- (23) On adding lead (II) acetate solution to sodium sulphate, a white ppt. is formed.
- (24) Dil. hydrochloric acid is used as a reagent for carbonate anion.
- (25) Hot conc. sulphuric acid is used as a reagent for chloride anion.
- (26) Identification of basic radicals is more complicated than that of acidic radicals.
- (27) The third analytical group is precipitated as hydroxides.
- (28) Dil. hydrochloric acid is used as a reagent for first analytical group.
- (29) On adding the second analytical group ($\text{HCl} + \text{H}_2\text{S}$) to copper sulphate, a black ppt. is formed.
- (30) On adding sodium hydroxide solution to iron (II) sulphate, a greenish-white ppt. is formed.
- (31) On adding sodium hydroxide solution to iron(III)chloride, a reddish-brown ppt. is formed.
- (32) On adding ammonium carbonate solution to calcium chloride, a white ppt. is formed.
- (33) The white ppt. of calcium carbonate is soluble in water containing CO_2
- (34) Dil. hydrochloric acid is not used to differentiate between salts of sodium carbonate and bicarbonate.

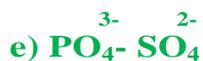


Mention an example to show the importance of analytical chemistry in :

- (1) Agriculture. (2) Studying environmental pollutants.
 (3) pharmaceutical industries. (4) Checking the validity of industrial products.

Miscellaneous questions:

- (1) Which radicals come in dilute HCl group?
 (2) What is the reaction which occurs by passing CO₂ for short time in limewater?
 (3) How to distinguish between the vapours of bromine and nitrogen dioxide gases by only one method?
 (4) Compare between quantitative and qualitative analysis "related to : scientific concept" .
 (5) Mention the scientific basis for the detection of each of the following:
 a) Acidic radicals of salts. B) Basic radicals of salts.
 (6) How to distinguish between the product of adding ammonium hydroxide solution to :
 Aluminum sulphate and iron (II) sulphate.
 (7) How can you practically detect the presence of :
 a) Calcium cation in calcium chloride solution.
 b) Phosphate anion "by only one method".
 (8) How to distinguish between each group of the following radicals, by using the precipitation tests:



- 9) When sodium hydroxide is added to three salt solutions of chloride, the following are formed :

The first: white gelatinous precipitate.

The second: reddish-brown precipitate.

The third: greenish-white precipitate.

Mention the basic radical for everyone of the three salts and write the equations of the reactions.

- 10) Hydrochloric acid is -added to three sodium salts in solid state,

The first: gas evolved which has irritating smell and turns a paper wetted with acidified potassium dichromate to green.

The second: colourless gas evolved which turns reddish-brown at the mouth of the test tube.

The third: colourless gas evolved which has initating smell with suspension of yellow substance.

Mention the acidic radical for each one of the three salts and write the equations of the reactions.



(11) Write one use for the following reagents with explanation by the symbolic equation:

- a) Ammonium hydroxide. b) Barium chloride.
c) Silver nitrate. d) Acidified potassium permanganate.
e) Magnesium sulphate solution. F) Lead (II) acetate solution.
g) Ammonium carbonate solution.

(12) Write the name and the chemical formula of the acidic or basic radical which gives the following product during confirmatory test:

- (1) Salt solution + sodium hydroxide solution produce a greenish-white precipitate.
(2) Salt solution + magnesium Sulphate solution produce a white precipitate after heating.
(3) Salt solution + silver nitrate produce a yellow precipitate which is insoluble in ammonia solution.
(4) A salt solution with silver nitrate form a black precipitate,
(5) A salt solution removes the brown colour of the iodine solution.
(6) A salt reacts with dil hydrochloric acid and gives a gas with a bad smell which turns a paper wetted with acidified potassium dichromate solution into green.
(7) A salt solution removes the colour of the acidified potassium permanganate with conc. sulphuric acid.
(8) A salt reacts with dil. hydrochloric acid and gives a gas which turns a paper wetted with lead (II) acetate solution into black.
(9) A salt solution with silver nitrate form a white precipitate which turns violet in sunlight.
(10) A salt with hot conc. sulphuric acid form orange-red fumes.
(11) A salt solution with lead (II) acetate form a white precipitate.
(12) A salt solution with silver nitrate form a yellow precipitate which dissolves in ammonia solution,
(13) A salt gives with dil. hydrochloric acid a colourless gas which turns at the mouth of the tube into reddish-brown.
(14) A salt solution with magnesium sulphate form a white ppt. on cold,
(15) A salt reacts with dil. hydrochloric acid and gives a yellow suspension with the evolving a bad smell gas,
(16) A salt solution forms black precipitate which dissolves in dil. nitric acid by passing hydrogen sulphide gas through it in an acidic medium.
(17) A salt solution forms a white gelatinous precipitate by adding sodium hydroxide solution to it, where the precipitate dissolves by excess of sodium hydroxide solution.
(18) A salt solution with sodium hydroxide form a reddish-brown precipitate.
(19) A salt colourizes the non-illuminant region in the bunsen flame with brick red colour.



(13) Write the name of evolved gas (or vapour) from the reaction of each of the following and how to detect it :

- (1) Dil. hydrochloric acid with sodium carbonate salt.
- (2) Dil. hydrochloric acid with sodium sulphite salt
- (3) Dil. hydrochloric acid with sodium sulphide salt.
- (4) Dil. hydrochloric acid with sodium thiosulphate salt.
- (5) Dil. hydrochloric acid with sodium nitrite salt.
- (6) Cone. sulphuric acid with sodium chloride salt.
- (7) Cone. sulphuric acid with sodium bromide salt.
- (8) Cone. sulphuric acid with sodium iodide salt.
- (9) Cone. sulphuric acid with sodium nitrate salt.

(14) Mention one confirmatory test for each of the following:

- | | |
|-------------------------|------------------------|
| (1) Carbonate anion. | (2) Bicarbonate anion. |
| (3) Sulphite anion. | (4) Sulphide anion. |
| (5) Thiosulphate anion. | (6) Nitrite anion. |
| (7) Chloride anion. | (8) Bromide anion. |
| (9) Iodide anion. | (10) Nitrate anion. |
| (11) Phosphate anion. | (12) Sulphate anion. |
| (13) Aluminum cation, | (14) Iron (II) cation. |
| (15) Iron (III) cation. | (16) Calcium cation. |

(15) On reacting iron metal with dn. hydrochloric acid, a solution (A) is produced and a colourless gas (B) is evolved and on adding sodium carbonate to solution (A), iron (II) carbonate and solution (C) are formed and on heating iron (II) carbonate, a black solid substance (D) is formed with evolving of gas (E) which turns limewater milky.

(a) Mention the names of (A), (C), (D) and (E).

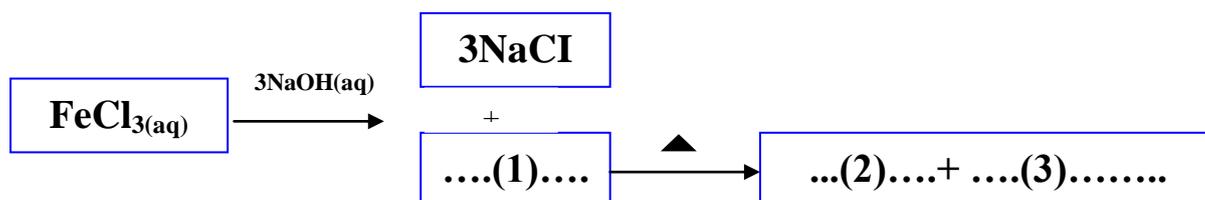
(b) Describe, how to identify the gas (B) practically.

(16) You have a solution containg $\text{Pb}^{2+}_{(\text{aq})}$ and $\text{Ca}^{2+}_{(\text{aq})}$ $\text{Fe}^{2+}_{(\text{aq})}$ with equal concentrations, which one of these cations will :

a) Precipitate on adding dil. Hel to part of the solution. (Give reason)

b) Not precipitate on adding ammonium hydroxide solution to the other part of the solution. (Give reason)

(17) Complete the following diagram:



(18) The following table illustrates the steps of the detection of $\text{Ca}^{2+}_{(aq)}$, $\text{Ag}^{+}_{(aq)}$ and $\text{Cu}^{2+}_{(aq)}$ cations in a mixture of their salt solutions :

- Mention the analytical group's names of the reagent for each step.
- Mention the structural formulae of (A), (B) and (C).
- Does the addition of Na^{+} cation to the mixture of the previous cations affect on the arrangement of the detection steps? (Give reason).

Step	Group reagent	Observation
(1)	Dil. hydrochloric acid	ppt. (A)
(2)	$\text{H}_2\text{S} + \text{dil. HCl}$	ppt. (B)
(3)	$(\text{NH}_4)_2\text{CO}_3$ solution	ppt. (C)

Question : (19)

Explain by balanced chemical equation How can you differentiate practically by experiment between each pair of the following salty.

- Sodium sulphite, Sodium sulphate
- Iron II chloride, Iron III chloride
- Sodium nitrite, Sodium nitrate
- Sodium chloride, aluminum chloride

Question : (20)

Write the name and formula of acidic or basic radicals which gives the following product during test them.

- Salt solution + sodium hydroxide solution produce white ppt.
- Salt solution + magnesium sulphate solution produce white ppt. after heat
- Salt solution + silver nitrate solution produce yellow ppt. insoluble in ammonia solution,

Question : (21)

Write one use for the following reagent with explanation by symbolic equation.

- Ammonium hydroxide
- Barium chloride
- Silver nitrate
- Acidified Potassium permanganate

Question : (22)

Choose the right answer from those below each sentence:

a- Salt solution + barium chloride solution produce white ppt. insoluble in acids

- Nitrate
- phosphate
- nitrite

b-- Salt solution + lead(II) acetate solution produce black ppt.

- Sulphate
- Nitrate
- phosphate
- sulphide

c- Salt solution + sodium hydroxide solution produce reddish brown ppt.

- Copper(II)
- iron(III)
- aluminum
- iron(II)

d- Solid salt + hydrochloric acid produce gas has irritating smell with yellow ppt. -

- Sulphide
- carbonate
- thiosulphate
- sulphite



Question : (23)

Give reason for with explanation by symbolic equation whenever possible.

- On adding sodium hydroxide gradually to aluminum chloride solution white ppt. is produced then disappear
- Dilute hydrochloric acid is not used to differentiate between salts of sodium carbonate and bicarbonate.
- The violet colour of potassium permanganate solution acidified by sulphuric acid, Will be removed by adding potassium nitrite solution.
- Filter paper wetted by lead (II) acetate solution turns black when it is exposed to hydrogen sulphide gas.
- Violet vapour will be produced during reaction between conc. sulphuric acid and Potassium iodide with heat.

Question : (24)

Choose from column (A) what is suitable from column (B) : on adding silver nitrate solution to the solution of the some anions, a ppt. formed.

(A)	(B)
1-black does not dissolve in nitric acid	Phosphate
2- white soluble in ammonia solution	Bromide
3- white yellow slowly soluble in ammonia solution	Chloride
4- yellow insoluble in ammonia solution	Sulphide
5- yellow does not dissolve in dil. nitric acid	

Question : (25)

Sodium hydroxide solution is added to three salt solutions of chlorides, the following are formed :

First white gelatinous ppt.

Second reddish brown ppt.

Third white green ppt.

Mention the basic radical for every one of the three salts, and write the equations of the reactions

Question : (26)

Hydrochloric acid is added to three sodium salts in solid state.

First gas evolved which has a very irritating smell and turns a paper wet with.

Acidified potassium dichromate to green.

Second Colourless gas evolved which turned reddish brown at the mouth of the tube

Third Colourless gas evolved which has irritating smell with suspension of yellow substance.

Mention the acidic radical for every one of the three salts and write the equations of the reactions .

