Exercise-1

Marked Questions may have for Revision Questions.

OBJECTIVE QUESTIONS

Section (A) : Dry test

A-1. When a metal sulphate is heated in dry test tube, the colour changes from blue to white. Then metal sulphate may be :

(1) $BaSO_4$ (2*) $CuSO_4.5H_2O$ (3) Na_2SO_4 (4) None of these

A-2. Which of the following can not evolve more than one gas (vapour) if heated in dry test tube.

(1) $NaNO_3(s)$ (2*) $MgCO_3(s)$ (3) $FeSO_4(s)$ (4) $(NH_4)_2Cr_2O_7(s)$

A-3. On heating, a white amorphous inorganic compound becomes yellow and on cooling, turns white again.The salt may be **(SID_DEC 2014]**

(1) $PbCO_3$ (2) $MgCO_3$ (3*) $ZnCO_3$ (4) K_2CO_3

A-4. Which of the following metal carbonates liberate $CO_2(g)$ on heating :

(1) Na_2CO_3 (2) K_2CO_3 (3) Rb_2CO_3 (4*) Ag_2CO_3

A-5. In which of the following reactions a brown coloured gas is evolved ?

(1) KBr (s) + dil.H_2SO_4 ⟶ (2) $NH_4NO_2 \xrightarrow{\Delta}$

(3) $NaNO_3 \xrightarrow[800°C]{\Delta}$ (4*) $AgNO_3(s)$ + conc. H_2SO_4 ⟶

Section (B) : Flame and borax bead test

B-1. Why is concentrated HCl used to dissolve the given metal salt in the flame test ? **[SM SIR]**

(1) strong acids produce better flame test.

(2) HCl is volatile

(3*) Volatile metal chloride produce better flame test.

(4) sharper coloured are seen in the flame in presence of Cl^- ions.

B-2. The hottest part of the flame of a Bunsen burner is the

(1) Blue Zone (2*) Zone of complete combustion

(3) Zone of partial combustion (4) All parts of the flame are equally hot.

B-3. Metal (M) shows crimson red colour in flame test and its halide is deliquescent then metal (M) could be:

(1*) Li (2) Mg (3) Ca (4) Ba

B-4. In Borax bead test, metal oxides react with B_2O_3 and form a coloured bead. This bead contains.

(1) orthoborate ion (2*) metaborate ion (3) double oxide (4) tetraborate ion

B-5. Which one of the following ion does not give borax bead test :

(1) Cr^{3+} (2) Cu^{2+} (3) Mn^{2+} (4*) Zn^{2+}

B-6. In the Borax bead test of Co^{2+}, the blue colour of bead is due to the formation of :

(1) B_2O_3 (2) Co_3B_2 (3*) $Co(BO_2)_2$ (4) CoO

Section (C) : Dilute H_2SO_4 group

C-1. The carbonate of which of the following cation is insoluble in water ?

(1) Cs^+ (2) K^+ (3) NH_4^+ (4*) Ba^{2+}

C-2. A substance on treatment with dilute H_2SO_4 liberates a colourless gas which produces (i) turbidity with baryta water and (ii) turns acidified dichromate solution green. The reaction indicates the presence of :

(1) CO_3^{2-} (2) S^{2-} (3*) SO_3^{2-} (4) NO_2^-

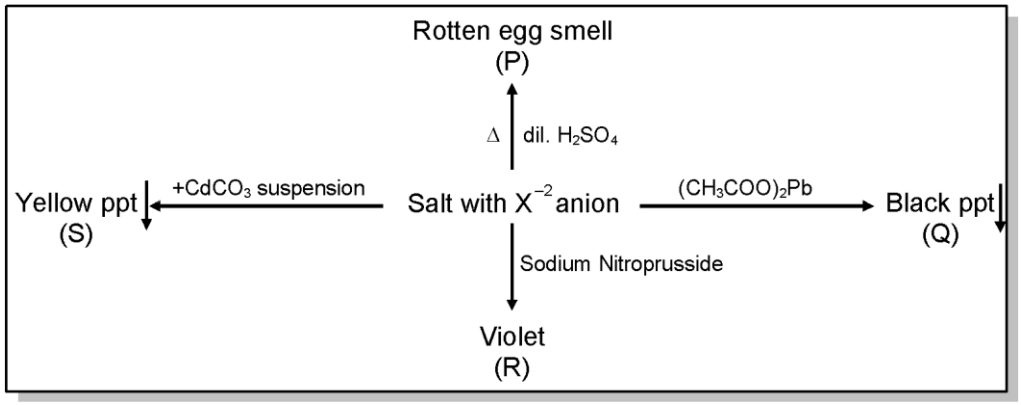
C-3. A mixture when rubbed with dilute acid smells like vinegar. It contains :

(1) sulphite (2) nitrate (3) nitrite (4*) acetate

C-4. When a salt is heated with dilute H_2SO_4 and $KMnO_4$ solution, the pink colour of $KMnO_4$ is discharged, the salt is :

(1*) a sulphite (2) a carbonate (3) a nitrate (4) a bicarbonate

C-5.



Anion (X^{-2}) is: **[SID Sir_DEC 2014]**

(1) CO_3^{2-} (2) SO_3^{2-} (3*) S^{2-} (4) $S_2O_3^{2-}$

Section (D) : Concentrated H_2SO_4 group

D-1. When a mixture of solid NH_4Cl, solid $K_2Cr_2O_7$ is heated with concentrated H_2SO_4, deep red vapours are obtained. This is due to the formation of :

(1) chromous chloride (2*) chromyl chloride (3) chromic chloride (4) chromic sulphate

D-2. AgCl dissolves in ammonia solution giving :

(1) Ag^+, NH_4^+ and Cl^- (2) $Ag(NH_3)^+$ and Cl^- (3) $Ag_2(NH_3)^{2+}$ and Cl^- (4*) $Ag(NH_3)_2^+$ and Cl^-

D-3. A solution of a salt with concentrated H_2SO_4 produces violet colour vapours which turns starch paste blue. The salt may contain :

(1) chloride (2) nitrate (3) bromide (4*) iodide

D-4. Nitrate is confirmed by ring test. The brown colour of the ring is due to formation of :

(1) ferrous nitrite (2*) nitroso ferrous sulphate

(3) ferrous nitrate (4) $FeSO_4.NO_2$

D-5. An inorganic salt when heated with concentrated H_2SO_4 evolves a colourless pungent smelling gas but with concentrated H_2SO_4 and MnO_2 evolves a coloured pungent smelling gas which bleaches moist litmus paper. The coloured gas is :

(1) NO_2 (2*) Cl_2 (3) Br_2 (4) I_2

D-6. Chromyl chloride vapours are dissolved in water and acetic acid and barium acetate solution is added, then:

(1) the solution will remain colourless. (2) the solution will become dark green.

(3) a yellow solution will be obtained. (4*) a yellow precipitate will be obtained.

Section (E) : Precipitation Reactions

E-1. Which one of the following reagents gives white precipitated with SO_4^{2-} ions?

(1*) $Ba(NO_3)_2$ (2) NH_4NO_3 (3) $NaNO_3$ (4) $Be(NO_3)_2$

E-2. A metal salt solution gives a yellow ppt. with silver nitrate. The ppt. dissolves in dil. Nitric acid as well as in ammonium hydroxide. The solution contains.

(1) Br^- (2) I^- (3*) PO_4^{3-} (4) SO_4^{2-}

Section (F) : zero Group

F-1. Nessler's reagent is :

(1) K_2HgI_4 (2*) K_2HgI_4 + KOH (3) K_2HgI_2 + KOH (4) K_2HgI_4 + KI

F-2. NH_4Cl + Nessler's reagent $\xrightarrow{KOH}$ Brown precipitate (X).

Chemical composition of (X) is :

(1) $Hg(NH_2)Cl$ (2) $Hg(NH_2)Cl$ + Hg (3*) $HgO.Hg(NH_2)I$ (4) $HgO.Hg(NH_2)NO_3$

F-3. Ammonium salts on heating with slaked lime liberates a colourless gas (X). Identify the incorrect statement for gas (X).

(1) (X) turns red litmus blue and produces dense white fumes in contact with dilute HCl.

(2) (X) turns filter paper moistened with mercurous nitrate black.

(3*) (X) when passed through Nessler's reagent produces a pink colour precipitate.

(4) (X) gives intense blue coloured solution with aqueous solution of $CuSO_4$.

Section (G) : I_{st} Group

G-1. Group reagent for I^{st} group radicals is : **(Group-I)**

(1) KCl (concentrated) (2) HCl (concentrated) (3*) HCl (dilute) (4) none of these

G-2. Cu^{2+} and Ag^{+} both are present in the same solution. To precipitate one of the ions and leave the other in solution, add :

(1) H_2S (aq) (2*) HCl (aq) (3) HNO_3(aq) (4) NH_4NO_3(aq)

G-3. Consider the following observation :

M^{n+} + HCl (dilute) $\longrightarrow$ white precipitate $\xrightarrow{\Delta}$ water soluble $\xrightarrow{CrO_4^{2-}}$ Yellow precipitate.

The metal ion M^{n+} will be :

(1) Hg^{2+} (2) Ag^{+} (3*) Pb^{2+} (4) Sn^{2+}

G-4. Identify the compound which turns black with ammonia solution.

(1) Lead chloride (2*) Mercurous chloride (3) Mercuric chloride (4) Silver chloride

G-5. Three separate samples of a solution of a single salt gave these results. One formed a white precipitate with excess ammonia solution, one formed a white precipitate with dilute NaCl solution and one formed a black precipitate with H_2S. The salt could be

(1) $AgNO_3$ (2*) $Pb(NO_3)_2$ (3) $Hg(NO_3)_2$ (4) $Mn(NO_3)_2$

G-6. A metal nitrate solution does not give white precipitate with concentrated hydrochloric acid but on dilution with water produces a white precipitate. The metal nitrate solution with K_2CrO_4 and Na_2HPO_4 reagents give red and yellow precipitates respectively which are soluble in ammonia solution. The cation of the metal nitrate is :

Section (H) : II_{nd} Group

H-1. H_2S in the presence of HCl precipitates II group but not IV group because

(1) HCl activates H_2S (2) HCl increases concentration of Cl^-

(3*) HCl decreases concentration of S^{2-} (4) HCl lowers the solubility of H_2S in solution

H-2. Which of the following metal ions is precipitated when H_2S gas is passed in presence of HCl? **(Group-II)**

(1) Co^{2+} (2) Al^{3+} (3*) Bi^{3+} (4) Mn^{2+}

H-3. Which compound does not dissolve in hot 50% HNO_3? **(Group-II)**

(1) AgS (2) CuS (3) Bi_2S_3 (4*) HgS

H-4. A metal chloride original solution on mixing with K_2CrO_4 solution gives a yellow precipitate soluble in aqueous sodium hydroxide. The metal may be :

(1) mercury (2) Iron (3) silver (4*) lead

H-5. When small amount of $SnCl_2$ is added to a solution of Hg^{2+} ions, a silky while precipitate is obtained. The silky white precipitate is due to the formation of :
(1*) Hg_2Cl_2 (2) $SnCl_4$ (3) Sn (4) Hg

H-6. When excess of dilute NH_4OH is added to an aqueous solution of copper sulphate an intense blue colour is developed. This is due to the formation of :
(1) $[Cu(NH_3)_6]^{2+}$ (2) $Cu(OH)_2$ (3*) $[Cu(NH_3)_4]^{2+}$ (4) $(NH_4)_2SO_4$

H-7. Precipitation of II group cations takes place when H_2S gas passed in presence of dilute HCl because H_2S is:
(1) highly ionised (2) not ionised (3*) less ionised (4) none of these

H-8. Which one among the following pairs of ions can not be separated by H_2S in presence of dilute hydrochloric acid ?
(1*) Cd^{2+}, Sn^{2+} (2) Al^{3+}, Hg^{2+} (3) Zn^{2+}, Cu^{2+} (4) Ni^{2+}, Bi^{3+}

H-9. Which of the following metal cation is reduced from its higher oxidation state (+2) to (+1) by both KI solution or in excess of KCN solution ?
(1) Zn^{2+} (2) Hg^{2+} (3*) Cu^{2+} (4) None

Section (I) : III$_{rd}$ Group

I-1. When NH_4Cl is added to a solution of NH_4OH :
(1) the dissociation of NH_4OH increases. (2) the concentration of OH^- increases.
(3) the concentrations of both OH^- and NH_4^+ increase. (4*) the concentration of OH^- ion decreases.

I-2. The solution of sodium meta aluminate on diluting with water and then boiling with ammonium chloride gives:
(1) $[Al(H_2O)_5OH]^{2+}$ (2) $AlCl_3$ (3*) $Al(OH)_3$ (4) $NaAl(OH)_4$

I-3. Which one among the following is insoluble in excess of NaOH solution?
(1) $Al(OH)_3$ (2) $Zn(OH)_2$ (3*) $Fe(OH)_3$ (4) $Pb(OH)_2$

I-4. Concentrated nitric acid is added before proceeding to test for group III members. This is to :
(1) oxidise any remaining H_2S.
(2*) convert ferrous ions to ferric ions as K_{sp} of Fe (II) hydroxide is higher.
(3) form nitrates which gives granular precipitate.
(4) increase ionisation of ammonium hydroxide.

I-5. Concentrated sodium hydroxide can separate a mixture of :
(1) Al^{3+} and Cr^{3+} (2*) Cr^{3+} and Fe^{3+} (3) Al^{3+} and Zn^{2+} (4) Cu^{2+} and Mn^{2+}

I-6. What product is formed by mixing the solution of $K_4[Fe(CN)_6]$ with the solution of $FeCl_2$ in complete absence of air ?
(1) Ferro ferricyanide (2) Ferric ferrocyanide (3) Ferric ferricyanide (4*) None

I-7. An original solution of an inorganic salt in dilute HCl gives a brown colouration with potassium hexacyanidoferrate (III) and reddish brown colouration with sodium acetate solution. The cation of the salt is :

(1) Ni^{2+} (2*) Fe^{3+} (3) Cu^{2+} (4) none

Section (J) : IV$_{th}$ Group

J-1. In qualitative analysis Ni^{2+} belongs to :

(1) IInd group (2) IIIrd group (3*) IVth group (4) VIth group

J-2. Which of the following sulphides is buff coloured (light pink coloured)?

(1) ZnS (2*) MnS (3) NiS (4) CdS

J-3. Which one of the following sulphide is white?

(1) MnS (2*) ZnS (3) HgS (4) CdS

J-4. HgS can be separated from ZnS by treating with :

(1*) HCl (2) NaOH (3) aqua-regia (4) NH_3

J-5. An aqueous solution of colourless metal sulphate M, gives a white precipitate with NH_4OH.This precipitated is soluble in excess of NH_4OH.On passing H_2S gas through this solution, a white precipitate is formed. The metal M in the salt is :

(1) Ca (2) Ba (3) Al (4*) Zn

J-6. Which one of the following cation will give a green coloured ash when a piece of filter paper dipped in a solution containing its salt and $Co(NO_3)_2$ is burned ?

(1) Cu^{2+} (2) Mg^{2+} (3) Al^{3+} (4*) Zn^{2+}

J-7. $Zn(OH)_2$ precipitate is soluble in :

(1) excess of sodium hydroxide (2) excess of ammonia solution

(3) solutions of ammonium salts (4*) all of these

J-8. Concentrated solution of sodium hydroxide in water can separate a mixture of :

(1) Zn^{2+} and Pb^{2+} (2) Al^{3+} and Pb^{2+} (3*) Pb^{2+} and Ni^{2+} (4) Al^{3+} and Zn^{2+}

Section (K) : V$_{th}$ and VI$_{th}$ Group

K-1. In fifth group, $(NH_4)_2CO_3$ is added to precipitate out the carbonates in presence of NH_4Cl. We do not add Na_2CO_3 because :

(1) $CaCO_3$ is soluble in Na_2CO_3

(2) Na_2CO_3 increases the solubility of fifth group carbonates

(3*) $MgCO_3$ will be precipitated out in fifth group

(4) $Mg(OH)_2$ will be precipitated

K-2. $K_4[Fe(CN)_6]$ can be used to detect one or more out of Fe^{2+} , Fe^{3+}, Zn^{2+}, Cu^{2+}, Ag^{+} , Ca^{2+} :
(1) Only Fe^{2+}, Fe^{3+} (2) Only Fe^{3+},Zn^{2+},Cu^{2+} (3) All but not Ca^{2+} (4*) All of these.

K-3. If crimson flame is given when an inorganic mixture is tested by flame test, it may be due to the presence of
(1) potassium (2*) strontium (3) barium (4) calcium

K-4. A brick red colour is imparted to Bunsen flame by a :
(1*) Ca salt (2) Sr salt (3) Na salt (4) Co salt

K-5. The presence of magnesium is confirmed in the qualitative analysis by :
(1) titan yellow solution + 2M NaOH solution (2) disodium hydrogen phosphate +NH_4Cl + NH_3 (aq.)
(3) magneson(I) reagent (4*) all of these

K-6. Which of the following solution gives white precipitate with $Pb(NO_3)_2$ as well as with $Ba(NO_3)_2$?
(1) Sodium chloride (2*) Sodium sulphate (3) Potassium iodide (4) All of these

K-7. An aqueous solution of salt gives white precipitate with $AgNO_3$ solution as well as with dilute H_2SO_4. It may be :

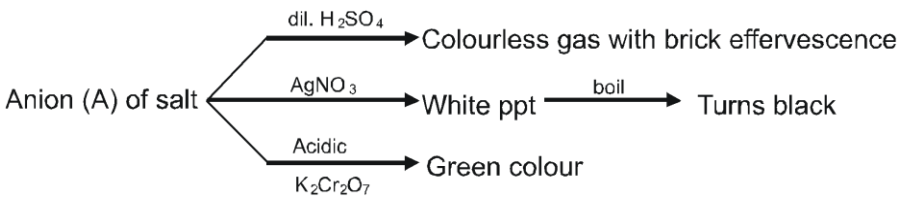
K-8. Select the correct statement with respect to Ca^{2+} ions.
(1) K_2CrO_4 gives white precipitate in the presence of acetic acid.
(2*) Potassium hexacyanidoferrate (II) solution gives white precipitate.
(3) Ammonia solution gives white precipitate.
(4) Prolonged passage of carbon dioxide gas through its aqueous solution produces white precipitate.

K-9. Potassium chromate solution is added to an aqueous solution of a metal chloride. The precipitate thus obtained is insoluble in acetic acid. The precipitate is subjected to flame test, the colour of the flame is :
(1) lilac (2*) apple green (3) crimson red (4) brick red

Exercise-2

Marked Questions may have for Revision Questions.

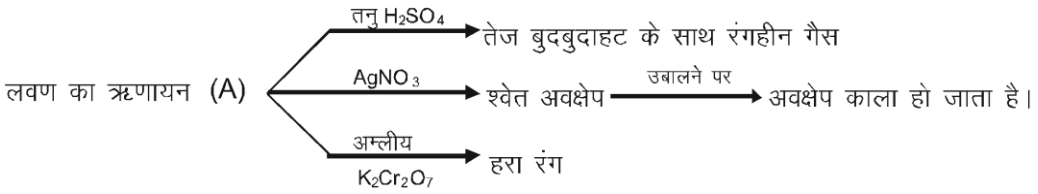
OBJECTIVE QUESTIONS



1. **[SID_DEC 2014]**
Shape of anion A will be :

(1) Tetrahedral (2) Trigonal planner

(3*) Trigonal pyramidal (4) Linear



2. How do we differentiate between Br^- and I^-?

(1) By adding silver nitrate solution.

(2*) By adding lead acetate solution.

(3) By adding first silver nitrate solution and then sodium arsenite solution.

(4) By adding dilute H_2SO_4.

3. Match column-I with column-II and select the correct answer using the codes given below :

	Column-I (Basic radicals)		**Column-II (Group number)**
(1)	Hg_2^{2+}	(p)	II
(2)	Cu^{2+}	(q)	III
(3)	Al^{3+}	(r)	I
(4)	Zn^{2+}	(s)	IV

	(1)	(2)	(3)	(4)		(1)	(2)	(3)	(4)
(1)	(q)	(p)	(r)	(s)	(2)	(p)	(q)	(r)	(s)
(3)	(p)	(r)	(q)	(s)	(4*)	(r)	(p)	(q)	(s)

4. Match column-I with column-II and select the correct answer using the codes given below.

	Column-I (Salts)		**Column-II (Colour of flame)**
(1)	Cu^{2+} salts	(p)	Brick red
(2)	Ca^{2+} salts	(q)	Apple green or yellowish-green
(3)	Ba^{2+} salts	(r)	Bluish green or green
(4)	Sr^{2+} salts	(s)	Crimson

	(1)	(2)	(3)	(4)		(1)	(2)	(3)	(4)
(1)	(q)	(p)	(r)	(s)	(2*)	(r)	(p)	(q)	(s)
(3)	(p)	(r)	(q)	(s)	(4)	(p)	(q)	(r)	(s)

5. An inorganic compound 'A' is dissolved in dilute hydrochloric acid and is then warmed. A colourless gas 'B' is produced. When a filter paper moistened with potassium iodate and the starch solution is exposed to the gas it turns blue. The gas B and the compound A are :

(1*) SO_2 and Na_2SO_3 (2) SO_3 and Na_2SO_4 (3) CO_2 and Na_2CO_3 (4) H_2S and Na_2SO_3

6. Consider following reaction ; Nitrite + Acetic acid + Thiourea $\longrightarrow$ $N_2\uparrow + SCN^- + 2H_2O$. Formation of the product in the above reaction is identified by :

(1*) $FeCl_3$ / dilute HCl, when blood red colour appears.

(2) $FeCl_3$ / dilute HCl, when blue colour appears.

(3) $K_2Cr_2O_7$ / HCl, when green colour appear.

(4) $KMnO_4$ / HCl, when colourless solution is formed.

7. A mixture of two colourless substances was dissolved in water. When gaseous Cl_2 was passed through the solution, containing small quantity of CCl_4 a violet colour developed in CCl_4 layer. Addition of $BaCl_2$ to the original solution give a white precipitate. The mixture contains :

(1) salts of nitrate and chloride. (2) salts of bromide and chloride.

(3*) salts of iodide and sulphate. (4) salts of sulphate and chloride.

8. The reagents, NH_4Cl and aqueous NH_3 will precipitate :

(1) Ca^{2+} (2*) Al^{3+} (3) Mg^{2+} (4) Zn^{2+} .

9. A metal salt solution forms a yellow precipitate with potassium chromate in acetic acid, a white precipitate with dilute sulphuric acid, but gives no precipitate with sodium chloride or iodide, it is :

(1) lead carbonate (2) basic lead carbonate

(3*) barium carbonate (4) strontium carbonate

10. Mg is not precipitated in V group because :

(1) $MgCO_3$ is soluble in water. (2*) K_{sp} of $MgCO_3$ is high.

(3) $MgCO_3$ is soluble in NH_4OH. (4) None.

Exercise-3

PART - I :JEE (MAIN) / AIEEE PROBLEMS (PREVIOUS YEARS)

OFFLINE JEE-MAIN

1. How do we differentiate between Fe^{3+} and Cr^{3+} in group IIIrd ? **[AIEEE 2002, 3/225]**

(1) By adding excess of NH_4OH solution. (2) By increasing NH_4^+ ion concentration.

(3) By decreasing OH^- ion concentration. (4*) Both (2) and (3).

2. Which one of the following statement is correct ? **[AIEEE 2003, 3/225]**

(1*) From a mixed precipitate of AgCl and AgI, ammonia solution dissolves only AgCl.

(2) Ferric ions gave a deep green precipitate on adding potassium ferrocyanide solution.

(3) On boiling a solution having K^+, Ca^{2+} and HCO_3^- ions we get a precipitate of $K_2Ca(CO_3)_2$.

(4) Manganese salts give a violet borax bead test in the reducing flame .

3. A red solid is insoluble in water. However it becomes soluble if some KI is added to water. Heating the red solid in a test tube results in liberation of some violet coloured fumes and droplets of a metal appear on the cooler parts of the test tube. The red solid is : **[AIEEE 2003, 3/225]**

(1) $(NH_4)_2\ Cr_2O_7$ (2*) HgI_2 (3) HgO (4) Pb_3O_4.

4. Which of the following compounds is **not** colored yellow ? **[JEE-Main 2015, 4/120]**

(1*) $Zn_2[Fe(CN)_6]$ (2) $K_3[Co(NO_2)_6]$

(3) $(NH_4)_3[As(Mo_3O_{10})_4]$ (4) $BaCrO_4$

ONLINE JEE-MAIN

1. The cation that will not be precipitated by H_2S in the presence of dil HCl is:

[JEE(Main) 2015 Online (10-04-15), 4/120]

(1) Pb^{2+} (2) As^{3+} (3*) Co^{2+} (4) Cu^{2+}

2. An aqueous solution of a salt X turns blood red on treatment with SCN^- and blue on treatment with $K_4[Fe(CN)_6]$. X also gives a positive chromyl chloride test. The salt X is :

[JEE(Main) 2015 Online (10-04-15), 4/120]

(1) $CuCl_2$ (2) $Cu(NO_3)_2$ (3*) $FeCl_3$ (4) $Fe(NO_3)_3$

3. When concentrated HCl is added to an aqueous solution of $CoCl_2$, its colour changes from reddish pink to deep blue. Which complex ion gives blue colour in this reaction?

[JEE(Main) 2015 Online (11-04-15), 4/120]

(1*) $[CoCl_4]^{2-}$ (2) $[CoCl_6]^{3-}$ (3) $[CoCl_6]^{4-}$ (4) $[Co(H_2O)_6]^{2+}$

4. A pink coloured salt turns blue on heating. The presence of which cation is most likely ?

[JEE(Main) 2015 Online (11-04-15), 4/120]

(1*) Co^{2+} (2) Cu^{2+} (3) Zn^{2+} (4) Fe^{2+}

5. Sodium extract is heated with concentrated HNO_3 before testing for halogens because :

[JEE(Main) 2016 Online (10-04-16), 4/120]

(1) Ag reacts faster with halides in acidic medium.

(2) Silver halides are totally insoluble in nitric acid.

(3) Ag_2S and AgCN are soluble in acidic medium.

(4*) S^{2-} and CN^-, if present, are decomposed by conc. HNO_3 and hence do not interfere in the test.

6. Aqueous solution of which salt will not contain ions with the electronic configuration $1s^2 2s^2 2p^6 3s^2 3p^6$?

[JEE(Main) 2016 Online (10-04-16), 4/120]

(1) NaCl (2) CaI_2 (3*) NaF (4) KBr

7. A solution containing a group-IV cation gives a precipitate on passing H_2S. A solution of this precipitate in dil. HCl produces a white precipitate with NaOH solution and bluish-white precipitate with basic potassium ferrocyanide. The cation is : **[JEE(Main) 2017 Online (08-04-17), 4/120]**

(1) Mn^{2+} (2*) Zn^{2+} (3) Co^{2+} (4) Ni^{2+}

PART - II : JEE (ADVANCED) / IIT-JEE PROBLEMS (PREVIOUS YEARS)

1. In nitroprusside ion the iron and NO exist. They exist as Fe^{II} and NO^+ rather than Fe^{III} and NO. These forms can be differentiated by : **[JEE 1998]**

(A) estimating the concentration of Iron. (B) measuring the concentration of CN.

(C*) measuring the solid state magnetic moment. (D) thermally decomposing the compound.

2. **Assertion :** Sulphate is estimated as $BaSO_4$ and not as $MgSO_4$.

Reason : Ionic radius of Mg^{2+} is smaller than that of Ba^{2+}. **[JEE 1998]**

(A) Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

(B*) Both Assertion and Reason are true but Reason is not correct explanation of Assertion.

(C) Assertion is true but Reason is false.

(D) Assertion is false but Reason is true.

3. A gas 'X' is passed through water to form a saturated solution. The aqueous solution on treatment with silver nitrate gives a white precipitate. The saturated aqueous solution also dissolves magnesium ribbon with evolution of a colourless gas 'Y'. Identify 'X' and 'Y'? **[JEE 2002, 3/150]**

4. [X] + $H_2SO_4 \longrightarrow$ [Y] a colourless gas with irritating smell; [Y] + $K_2Cr_2O_7$ + $H_2SO_4 \longrightarrow$ green solution. [X] and [Y] is : **[JEE 2003, 3/144]**

5. A dilute aqueous solution of a sodium salt forms white precipitate with $MgCl_2$, only after boiling. The anion of the sodium salt is : **[JEE 2004, 3/144]**

(A*) HCO_3^- (B) CO_3^{2-} (C) NO_3^- (D) SO_4^{2-}

6. A metal nitrate reacts with KI to give a black precipitate which on addition of excess of KI is converted into orange colour solution. The cation of the metal nitrate is : **[JEE - 2005, 3/84]**

(A) Hg^{2+} (B*) Bi^{3+} (C) Pb^{2+} (D) Cu^+

7. The species present in solution when CO_2 is dissolved in water are : **[JEE 2006, 5/184]**

(A*) CO_2, H_2CO_3, HCO_3^-, CO_3^{2-} (B) HCO_3^{2-}, CO_3^{2-}

(C) CO_3^{2-}, HCO_3^- (D) CO_2, H_2CO_3

8. A white precipitate is obtained when a solution is diluted with H_2O and boiled. On addition of excess NH_4Cl/NH_4OH, the volume of precipitate decreases leaving behind a white gelatinous precipitate. Identify the precipitate which dissolves in ammonia solution or NH_4Cl. **[JEE 2006, 3/184]**

9. In blue solution of copper sulphate excess of KCN is added then solution becomes colourless due to the formation of : **[JEE 2006, 3/184]**

(A) $[Cu(CN)_4]^{2-}$ (B*) Cu^{2+} get reduced to form $[Cu(CN)_4]^{3-}$

(C) $Cu(CN)_2$ (D) CuCN

10. $MgSO_4 + NH_4OH + Na_2HPO_4 \longrightarrow$ white crystalline precipitate. The formula of crystalline precipitate is : **[JEE 2006, 3/184]**

(A) $MgCl_2.MgSO_4$ (B) $MgSO_4$ (C*) $Mg(NH_4)PO_4$ (D) $Mg(PO_4)_2$

11. A solution of a metal ion when treated with KI gives a red precipitate which dissolves in excess KI to give a colourless solution. Moreover, the solution of metal ion on treatment with a solution of cobalt(II) thiocyanate gives rise to a deep blue crystalline precipitate. The metal ion is : **[JEE - 2007, 3/162]**

(A) Pb^{2+} (B*) Hg^{2+} (C) Cu^{2+} (D) Co^{2+}

12. Passing H_2S gas into a mixture of Mn^{2+}, Ni^{2+}, Cu^{2+} and Hg^{2+} ions in an acidified aqueous solution precipitates: **[JEE 2011, 3/180]**

(A*) CuS and HgS (B) MnS and CuS (C) MnS and NiS (D) NiS and HgS

13. Concentrated nitric acid, upon long standing, turns yellow-brown due to the formation of : **[JEE(Advanced) 2013, 2/120]**

(A) NO (B*) NO_2 (C) N_2O (D) N_2O_4

14. Upon treatment with ammoniacal H_2S, the metal ion that precipitates as a sulphide is : **[JEE(Advanced) 2013, 2/120]**

(A) Fe(III) (B) Al (III) (C) Mg(II) (D*) Zn(II)

15. The reagent(s) that can selectively precipitate S^{2-} from a mixture of S^{2-} and SO_4^{2-} in aqueous solution is(are)

(A) $CuCl_2$ (B) $BaCl_2$ (C) $Pb(OOCCH_3)_2$ (D) $Na_2[Fe(CN)_5NO]$

16. In the following reaction sequence in aqueous solution, the species **X**, **Y** and **Z**, respectively, are

$S_2O_3^{2-} \xrightarrow{Ag^+}$ **X** (Clear solution) $\xrightarrow{Ag^+}$ **Y** (white precipitate) $\xrightarrow{\text{with time}}$ **Y** (black precipitate)

[JEE(Advanced) 2016, 4/120]

DBC-IDM_E (I)

(A*) $[Ag(S_2O_3)_2]^{3-}$, $Ag_2S_2O_3$, Ag_2S (B) $[Ag(S_2O_3)_3]^{5-}$, Ag_2SO_3, Ag_2S

(C) $[Ag(SO_3)_2]^{3-}$, $Ag_2S_2O_3$, Ag (D) $[Ag(SO_3)_3]^{3-}$, Ag_2SO_4, Ags

Additional Problems For Self Practice (APSP)

PART - I : PRACTICE TEST PAPER

JEE(Main) Pattern Practice paper (30 SCQ, 1 hr, 120 Marks).

This Section is not meant for classroom discussion. It is being given to promote self-study and self testing amongst the Resonance students.

Max. Marks : 120 **Max. Time : 1 Hr.**

Important Instructions

1. The test is of **1 hour** duration.
2. The Test Booklet consists of **30** questions. The maximum marks are **120.**
3. Each question is allotted **4 (four)** marks for correct response.
4. Candidates will be awarded marks as stated above in Instructions No. 3 for correct response of each question.
   ¼ (one fourth) marks will be deducted for indicating incorrect response of each question. No deduction from the total score will be made if no response is indicated for an item in the answer sheet.
5. There is only one correct response for each question. Filling up more than one response in any question will be treated as wrong response and marks for wrong response will be deducted accordingly as per instructions 4 above.

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1. When a salt is heated with dilute H_2SO_4 and $KMnO_4$ solution, the pink colour of $KMnO_4$ is discharged, the salt is :
(1*) a sulphite (2) a carbonate (3) a nitrate (4) a bicarbonate

2. Solution of a salt in dilute H_2SO_4 or acetic acid produces deep blue colour with starch iodide solution. The salt contains :
(1) Br^- (2) I^- (3) Cl^- (4*) NO_2^-

3. A test tube containing a nitrate and another containing a bromide and MnO_2 are treated with concentrated H_2SO_4. The reddish brown fumes evolved are passed through water. The water will be coloured by :
(1) the nitrate (2*) the bromide (3) both (4) none of the two

4. Which of the following combines with Fe(II) ions to form a brown complex?
(1) N_2O (2*) NO (3) N_2O_5 (4) N_2O_4

5. Colourless salt (A) + dil. H_2SO_4 or CH_3COOH + KI $\longrightarrow$ blue colour with starch. (A) can be
(1) K_2SO_3 (2) Na_2CO_3 (3*) NH_4NO_2 (4) NH_4Cl

6. There are four test tubes containing dilute HCl, $BaCl_2$, $HgCl_2$ and KNO_3 solutions. Which of the following reagents will help in the identification of $BaCl_2$?

(1) NaOH (2*) K_2CrO_4 (3) $AgNO_3$ (4) both (2) and (3)

7. Which one of the following ions does not give borax bead test ?

(1) Cr^{3+} (2) Cu^{2+} (3) Mn^{2+} (4*) Zn^{2+}

8. A brick red colour is imparted to Bunsen flame by a :

(1*) Ca salt (2) Sr salt (3) Na salt (4) Co salt

9. Which one of the following metal salts produces a blue coloured bead in cobalt nitrate charcoal cavity test ?

(1) Zn^{2+} (2) Mg^{2+} (3) Sn^{2+} (4*) Al^{3+}

10. $BaCl_2$ solution gives a white precipitate with a solution of a salt, which dissolves in dilute hydrochloric acid with the evolution of colourless, pungent smelling gas. The gas as well as the salt both are used as bleaching agent in the textile industries. The salt contains:

(1*) sulphite (2) sulphide (3) acetate (4) carbonate

11. Pink colour of acidified $KMnO_4$ is decolourised but there is no evolution of any gas. This may happen with the compound containing the following acid radical.

(1) SO_3^{2-} (2) NO_2^- (3) S^{2-} (4*) All of these

12. When KI is added to acidified solution of sodium nitrite :

(1*) NO gas is liberated and I_2 is set free (2) N_2 gas is liberated and HI is produced

(3) N_2O gas is liberated and I_2 is set free (4) N_2 gas is liberated and HOI is produced

13. Zinc pieces are added to acidified solution of SO_3^{2-}. Gas liberated can :

(1*) turn lead acetate paper black (2) turn lime water milky

(3) give white precipitate with $AgNO_3$ solution (4) None of these

14. A substance on treatment with dilute H_2SO_4 liberates a colourless gas which produces (i) turbidity with baryta water and (ii) turns acidified dichromate solution green. The reaction indicates the presence of :

(1) CO_3^{2-} (2) S^{2-} (3*) SO_3^{2-} (4) NO_2^-

15. Ammonium molybdate test is used for the estimation of :

(1*) PO_4^{3-} (2) PO_4^{3-} (3) SO_3^{2-} (4) SO_4^{2-}

16. Identify the compound which turns black with ammonia solution.

(1) Lead chloride (2*) Mercurous chloride (3) Mercuric chloride (4) Silver chloride

17. A white crystalline substance dissolves in water. On passing H_2S in this solution, a black precipitate is obtained. The black precipitate dissolves completely in hot HNO_3. On adding a few drops of concentrated

H_2SO_4, a white precipitate is obtained which is soluble in ammonium acetate. The white precipitate is that of:

18. The composition of golden spangles is :
(1) $PbCrO_4$ (2*) PbI_2 (3) As_2S_3 (4) $BaCrO_4$

19. In which of the following solvents, AgBr will have the highest solubility ?
(1) 10^{-3} M NaBr (2*) 10^{-3} M NH_4OH (3) Pure water (4) 10^{-3} M HBr

20. Which one among the following pairs of ions can not be separated by passing H_2S gas in presence of dilute hydrochloric acid?
(1*) Cd^{2+}, Sn^{2+} (2) Al^{3+}, Hg^{2+} (3) Zn^{2+}, Cu^{2+} (4) Ni^{2+}, Bi^{3+}

21. Which of the following is not precipitated as sulphide by passing H_2S in the presence of dilute HCl ?
(1) Copper (2) Arsenic (3) Cadmium (4*) None of these

22. Which of the following metal cation is reduced from its higher oxidation state (+2) to (+1) by both KI solution and excess of KCN solution ?
(1) Zn^{2+} (2) Hg^{2+} (3*) Cu^{2+} (4) None

23. Which of the following reagents give an orange coloured soluble complex when dissolved in excess with Bi^{+3} ions ?
(1) Ammonia solution (excess).
(2) Dilution in water
(3*) Potassium iodide solution.
(4) Freshly prepared 0.125 M alkaline sodium tetrahydroxidostannate (II) solution.

24. Which of the following ions on reaction with NaOH and subsequent heating produce black Precipitate?
(1*) Cu^{+2} (2) Zn^{+2} (3) Al^{+3} (4) Pb^{+2}

25. $FeCl_3 + K_3[Fe(CN)_6] + H_2O_2 \longrightarrow$ Precipitate. The colour of the precipitate is :
(1) sky blue (2) brown (3*) prussian blue (4) white

26. $CrO_4^{2-} + H^+ + H_2O_2 \xrightarrow{\text{ether}} X + H_2O$
Identify the correct statement with respect to X.
(1) It is an acid anhydride of chromic acid.
(2) It is a red colour compound which can be extracted easily into the ethereal phase.
(3*) It is chromium peroxide which produces blue colouration in ethereal layer on gentle shaking.
(4) It is Cr_2O_3 which is used as a green pigment.

27. White precipitate of $Mn(OH)_2$ on heating with PbO_2 and concentrated HNO_3 gives red-violet (purple) colour due to the formation of :
(1*) $HMnO_4$ (2) Mn_2O_7 (3) $MnO(OH)_2$ (4) $PbMnO_4$

28. $Zn(OH)_2$ precipitate is soluble in :
(1) excess of sodium hydroxide (2) excess of ammonia solution
(3) solutions of ammonium salts (4*) all of these

29. Select the correct statement with respect to Ca^{2+} ions.
(1) K_2CrO_4 gives white precipitate in the presence of acetic acid.
(2*) Potassium hexacyanidoferrate (II) solution gives white precipitate.
(3) It gives lilac colour in Bunsen flame.
(4) Prolonged passage of carbon dioxide gas through its aqueous solution produces white precipitate.

30. A mixture of two salts is not water soluble but dissolves completely in dilute HCl to form a colourless solution. The mixture could be :
(1) $AgNO_3$ and KBr (2*) $BaCO_3$ and ZnS (3) $FeSO_4$ and Na_2CO_3 (4) $Mn(NO_3)_2$ and $MgSO_4$

PART - II : PRACTICE QUESTIONS

1. A colourless gas is dissolved in water and the resulting solution turns red litmus blue ; the gas may have been which one of the following ?
(1) HCl (2) H_2S (3) SO_2 (4*) NH_3

2. When Ag reacts with conc. HCl, then products will be :
(1) AgCl, Cl_2 (2) AgCl, H_2 (3) AgCl, H_2, Cl_2 (4*) None of these

3. Which of the following salt will evolve sulphur dioxide gas along with formation of yellowish turbidity when treated with dilute H_2SO_4 ?
(1) Sodium sulphide (2) Sodium sulphite (3*) Sodium thiosulphate (4) Sodium sulphate

4. Aqueous solution of a salt + $MgSO_4$ solution —→ no precipitate in cold $\xrightarrow{\text{Heating}}$ White precipitate appears. The salt contains the acidic radical :
(1) CO_3^{2-} (2*) HCO_3^- (3) SO_3^{2-} (4) $C_2O_4^{2-}$

5. In the test for iodine, I_2 is treated with sodium thiosulphate ($Na_2S_2O_3$) :
$Na_2S_2O_3 + I_2$ —→ NaI + ...
(1*) $Na_2S_4O_6$ (2) Na_2SO_4 (3) Na_2S (4) Na_3ISO_4

6. With Cr_2O_3, colour of the bead in sodium carbonate bead test is :
(1) red (2) blue (3) yellow (4*) green

7. Which metal gives violet colour in oxidising flame when heated with borax ?
(1) Fe (2) Pb (3) Co (4*) Mn

8. KBr, on reaction with conc. H_2SO_4, gives reddish-brown gas :

(1*) Bromine (2) Mixture of bromine and HBr
(3) HBr (4) NO_2

9. An inorganic salt when heated evolves coloured gas which bleaches moist litmus paper. The evolved gas is :
(1*) NO_2 (2) SO_2 (3) N_2O (4) I_2

10. Which of the following halide is soluble in water ?
(1*) AgF (2) AgCl (3) AgBr (4) AgI

11. Which of the following radical can not be confirmed by using dil.HCl:
(1) S^{2-} (2*) NO_3^- (3) CO_3^{2-} (4) NO_2^-

12. When $K_2Cr_2O_7$ is heated with conc. H_2SO_4 and soluble chloride such as KCl :
(1*) red vapours of CrO_2Cl_2 are evolved
(2) Cl^- ion is oxidized to Cl_2 gas
(3) $CrCl_3$ is formed
(4) $Cr_2O_7^{2-}$ ion is reduced to green Cr^{3+} ion

13. A white solid imparts a violet colour to a Bunsen flame. On being heated with concentrated H_2SO_4, the solid gives violet vapours that turn starch paper blue. The salt may be :
(1*) KI (2) NaI (3) MgI_2 (4) $CaBr_2$

14. NaCl, NaBr, NaI mixture on adding conc. H_2SO_4 gives gases, respectively :
(1) HCl, HBr, HI (2*) HCl, Br_2, I_2 (3) Cl_2, Br_2, I_2 (4) None of these

15. Potassium chromate solution is added to an aqueous solution of a metal chloride. The yellow precipitate thus obtained is insoluble in acetic acid. The precipitate is subjected to flame test, the colour of the flame is:
(1) lilac (2*) apple green (3) crimson red (4) brick red

16. The reagents, NH_4Cl and aqueous NH_3 will precipitate :
(1) Ca^{2+} (2*) Al^{3+} (3) Mg^{2+} (4) Zn^{2+} .

17. In the precipitation of the iron group in qualitative analysis, ammonium chloride is added before adding ammonium hydroxide to :
(1*) decrease concentration of OH^- ions (2) prevent interference by phosphate ions
(3) increase concentration of Cl^- ions (4) increase concentration of NH_4^+ ions

18. Fe^{2+} does not give prussian blue colour with $K_4[Fe(CN)_6]$ but on its reaction with (X), prussian blue colour appears (X) can be :
(1*) MnO_4^-/ H^+ (2) Zn/NaOH (3) NH_3 (aq) (4) all true

19. Select the correct statement with respect to Fe^{3+} ions.
(1) Iron (III) ions react with H_2S in acidic solution to give a black precipitate of Fe_2S_3.
(2) Iron (III) ions react with ammonium sulphide to give the black precipitate of Fe_2S_3.

(3*) Iron (III) ions react with ammonium thiocyanate solution to produce deep red colouration.
(4) All of these

20. Which of the following cation does not give red colour precipitate/solution with dimethylglyoxime (DMG) in alkaline solution ?
(1*) Zn^{+2} (2) Ni^{+2} (3) Fe^{2+} (4) both (1) and (3)

21. A suspension containing insoluble substances ZnS, MnS, HgS, Ag_2S and FeS, is treated with 2N HCl. On filtering, the filtrate contains appreciable amounts of which one of the following?
(1) Zinc and mercury (2) Silver and iron
(3) Manganese and mercury (4*) Zinc, manganese and iron

22. Potassium chromate K_2CrO_4 is NOT used to identify. **(SJ Sir) (QUA) (Cationic) (MCQ) (E)**
(1) Pb^{+2} (2) Ba^{+2} (3) Ag^{+} (4*) Ca^{+2}

23._ When H_2S gas is passed through HCl containing aqueous solution of $CuCl_2$, $HgCl_2$, $BiCl_3$, and $CaCl_2$ it does not precipitate out :
(1) CuS (2) HgS (3) Bi_2S_3 (4*) CaS

24._ AgI is soluble in NaCN due to formation of :
(1*) $Na[Ag(CN)_2]$ (2) $Ag(CN)_2$ (3) $Na_2[Ag(CN)_3]$ (4) $Na_2[Ag(CN)_2]$

25._ Cu^{2+} and Ag^{+} are both present in the same solution. To precipitate one of the ions and leave the other in soluton, which reagent should be added :
(1) H_2S (aq) (2*) HCl (aq) (3) HNO_3 (aq) (4) NH_4NO_3 (aq)

26._ Aqueous (A) + $K_2CrO_4 \longrightarrow$ (B) (Red ppt.) $\xrightarrow{\text{aq. } NH_3}$ (C) (soluble)

A is :
(1*) $AgNO_3$ (2) $Pb(NO_3)_2$ (3) $Hg_2(NO_3)_2$ (4) $Ca(NO_3)_2$

27._ The ion most difficult to remove as a precipitate is :
(1) Ag^{+} (2*) NH_4^{+} (3) Fe^{3+} (4) Cu^{2+}

28._ $CuSO_4$ reacts with NH_4OH to give deep blue complex of :
(1*) $[Cu(NH_3)_4]SO_4$ (2) $[Cu(NH_3)_4](OH)_2$
(3) Both (1) and (2) (4) none of these

29._ Thenard blue is :
(1) $Cu(NH_3)_4SO_4$ (2*) $CoAl_2O_4$ (3) $K_2Fe[Fe(CN)_6]$ (4) $Fe_4[Fe(CN)_6]_3$

30._ Among the species A ($CrCl_3$), B (CuS), C ($AlCl_3$), D ($ZnCl_2$), which will be soluble in excess of NaOH ?
(1*) A,C and D (2) C and D only (3) B and C only (4) A and D only