

Chemistry

TARGET : JEE (Main + Advanced)

LEADER COURSE

(SESSION : 2021-22)

RACE # 36 to 44 (BOOKLET)
(INORGANIC)



Corporate Office

ALLEN CAREER INSTITUTE

"SANKALP", CP-6, Indra Vihar, Kota (Rajasthan) INDIA-324005



+91-744-2757575



info@allen.ac.in

www.allen.ac.in

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Solubility chart of ionic compounds in aqueous solution.

Cation	Anion	Solubility	Exception
Any	OCl^- , ClO_2^- , ClO_3^- , ClO_4^- , NO_2^- , NO_3^- CH_3COO^- , HSO_3^- , HCO_3^- , HS^-	All are soluble	(i) ClO_4^- of K^+ , Rb^+ , Cs^+ are insoluble. (ii) AgNO_2 is insoluble (iii) CH_3COOAg is partially soluble.
K^+ , Rb^+ , Cs^+ & NH_4^+	Any	All are soluble	$[\text{PtCl}_6]^{-2}$ & $[\text{Co}(\text{NO}_2)_6]^{3-}$ are insoluble
Na^+	Any	All are soluble	-----
Any	Cl^- , Br^- , I^-	All are soluble	(i) Ag^+ , Pb^{2+} , Hg_2^{+2} , Cu_2^{+2} are insoluble (ii) PbCl_2 , CuBr_2 , Cu_2I_2 are soluble on warming (iii) HgBr_2 & HgI_2 remain insoluble on warming.
Any	SO_4^{-2}	All are soluble	(i) Ba^{+2} , Sr^{2+} , Pb^{2+} are insoluble (ii) CaSO_4 , Ag_2SO_4 , SnSO_4 & HgSO_4 are partially soluble
Any	SO_3^{-2} , CO_3^{-2} , $\text{C}_2\text{O}_4^{-2}$, PO_4^{-3} , O^{-2} , OH^- , F^-	All are insoluble	(i) BeF_2 & AgF are soluble (ii) Na^+ to Cs^+ & NH_4^+ are soluble (iii) O^{-2} & OH^- of Ca^{2+} Sr^{2+} & Ba^{+2} are soluble
Any	CN^- , OCN^- , SCN^- , S^{-2}	All are insoluble	I group cation & II group cation are soluble
Any	MnO_4^{-1} is similar to ClO_4^-	Same as ClO_4^-	NaMnO_4 , KMnO_4 are soluble

- Sulphides are usually insoluble, leaving those of alkali metals and ammonium sulphide, which are soluble. Sulphides of alkaline earth metals and of ammonium are decomposed in aqueous solution.
- Compounds of alkali metals and ammonium salts are generally soluble.
- CO_3^{2-} , OH^- , CrO_4^{2-} , PO_4^{3-} & SO_3^{2-} are found generally insoluble, leaving those of alkali metals and ammonium cation, which are soluble.

SOME SOLUBLE SALT :

1.	All nitrates (NO_3^-) are water soluble.
2.	All acetates (CH_3COO^-) salt are water soluble. Except – CH_3COOAg (s.s.), $(\text{CH}_3\text{COO})_2\text{Cu}$ $(\text{CH}_3\text{COO})_2\text{Hg}_2$ (s.s.) some basic acetates e.g. those of Fe, Al and Cr are insoluble in water.
3.	All chloride (Cl^-) are water soluble. Except – AgCl , PbCl_2 (soluble in hot water), Hg_2Cl_2 , Cu_2Cl_2 , BiOCl and SbOCl (white turbidity)
4.	All bromides (Br^-) are water soluble. Except – AgBr , PbBr_2 (soluble in boiled water), Hg_2Br_2 , Cu_2Br_2
5.	All Iodides (I^-) are water soluble. Except – AgI , PbI_2 (soluble in boiled water), Hg_2I_2 , HgI_2 , Cu_2I_2 , BiI_3 , BiOI (orange turbidity).
6.	All sulphates are water soluble. (some basic sulphates such as those of Hg, Bi, Cr are insoluble) Except – Ag_2SO_4 (s.s.), PbSO_4 , (s.s.), BaSO_4 , SrSO_4 , CaSO_4 (s.s.), Li_2SO_4
7.	All nitrites (NO_2^-) salts are water soluble. Except – AgNO_2
8.	All existing salts of HCO_3^- are water soluble. except. NaHCO_3 (s.s.)
9.	$\text{S}_2\text{O}_3^{2-} \Rightarrow$ Most of the thiosulphates those have been prepared are soluble in water Ag^+ , Pb^{2+} and Ba^{2+} (s.s.) Hg²⁺ , Bi³⁺ , Cu⁺ = insoluble

Note – (s.s.) = sparingly soluble

SOME INSOLUBLE SALT

1.	All carbonates (CO_3^{2-}) are water insoluble. Except – IA carbonate, Li_2CO_3 (s.s.), $(\text{NH}_4)_2\text{CO}_3$
2.	All sulphites (SO_3^{2-}) are water insoluble. Except – IA $(\text{NH}_4)_2\text{SO}_3$
3.	All sulphides (S^{2-}) are water insoluble. Except – IA sulphide, IIA sulphides, $(\text{NH}_4)_2\text{S}$, (Al, Cr, Mg sulphides are completely hydrolysed)
4.	All phosphates (PO_4^{3-}) are water insoluble. Except – $(\text{NH}_4)_3\text{PO}_4$, IA phosphates (except Li_3PO_4) IA = 1° 2° 3° soluble IIA = 1° soluble but 2° 3° insoluble.
5.	All hydroxides (OH^-) are water insoluble. Except – IA hydroxide, $\text{Ba}(\text{OH})_2$, $\text{Sr}(\text{OH})_2$, $\text{Ca}(\text{OH})_2$
6.	All chromates are water insoluble. Except – Alkali metal $(\text{NH}_4)_2\text{CrO}_4$, CaCrO_4 , MgCrO_4 , SrCrO_4 (s.s.).
7.	All oxalate ($\text{C}_2\text{O}_4^{2-}$) are water insoluble. Except – IA, Ferrous oxalate, Ammonium oxalate, BeC_2O_4
8.	All fluorides (F^-) are insoluble in water except IA, AgF , HgF_2 , AlF_3 , BeF_2 and NiF_2 Pb^{2+} , Cu^{2+} , Fe(III) , Ba^{2+} , Li^+ = s.s

- ☛ Their is only hydrated thiosulphate salt is $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$.
- ☛ All permagnates (MnO_4^-) are water soluble.
- ☛ KClO_4 is not soluble in water.
- ☛ $\text{BO}_3^{3-} \Rightarrow$ The borates of the alkali metals are readily soluble in water, the borates of the other metals are in genral sparingly soluble in water but fairly soluble in acid and in NH_4Cl solution.

COLOURS OF DIFFERENT COMPOUNDS

Black Colour Compounds

1. PbS
2. Ag₂S
3. CuS
4. Cu₂S
5. NiS
6. CoS
7. HgS
8. FeS
9. NiO
10. MnO
11. FeO
12. CuO
13. PbO₂
14. MnO₂
15. Mn₃O₄
16. Fe₃O₄
17. Co₃O₄
18. Ni(OH)₃
19. Cu₃P₂
20. BiI₃
21. Hg + Hg(NH₂)Cl

Blue Colour Compounds

(a) Light Blue Compounds

1. Cu(OH)₂
2. Cu(NO₃)₂
3. CuCl₂
4. CuSO₄ · 5H₂O (Blue Vitriol)
5. Co(OH)₂

(b) Deep Blue Compounds

1. [Cu(NH₃)₄]SO₄ (Switzer's reagent)
2. [Cu(NH₃)₄](NO₃)₂
3. Fe₄[Fe(CN)₆]₃ (Prussian's blue)
4. Fe₃[Fe(CN)₆]₂ (Turnbull's blue)
5. Na₄[Fe(CN)₅(NOS)] (Violet)

Green Colour Compounds

1. Ni(OH)₂ (green ppt.)
2. Hg₂I₂ (green ppt.)
3. Cr₂O₃ (green solid)
4. Cr(OH)₃ (green ppt.)
5. Cr₂(SO₄)₃
6. CrCl₃
7. FeSO₄ · 7H₂O
8. FeCl₂
9. FeSO₄ · (NH₄)₂SO₄ · 6H₂O (Mohr's salt)
10. Na₂MnO₄
11. K₂MnO₄
12. B(OC₂H₅)₃ (Burns with green edge flame)
13. CoO · ZnO (Riemann's green)

White Colour Compounds

1. AgCl
2. Ag₂CO₃ (white)
3. AgNO₂
4. Ag₂SO₄
5. PbCl₂
6. PbBr₂ (White crystalline ppt.)
7. Cu₂I₂ (White ppt.)
8. PbSO₄
9. SrSO₄
10. BaSO₄
11. Hg₂SO₄
12. BaCO₃
13. SrCO₃
14. CaCO₃
15. MgCO₃
16. Be(OH)₂
17. Mg(OH)₂
18. Ca(OH)₂
19. Al(OH)₃ (White gelatinous ppt.)
20. Cd(OH)₂ (Dirty White)
21. Bi(OH)₃ (White ppt.)
22. Zn(OH)₂
23. ZnCO₃
24. ZnS
25. ZnO
26. CaC₂O₄
27. Ag₂C₂O₄
28. Ag₂S₂O₃
29. PbS₂O₃
30. Zn₂[Fe(CN)₆] (white ppt.)

Yellow Coloured Compounds

1. As_2S_3
2. As_2S_5
3. CdS
4. SnS_2 (Artificial gold)
5. FeS_2 (Fool's gold)
6. $(\text{NH}_4)_2\text{S}_x$ (where $x = 2$ to 5) (YAS)
7. PbCrO_4
8. BaCrO_4
9. SrCrO_4
10. AgBr (light yellow)
11. AgI (Dark yellow)
12. PbI_2
13. PbO (in Cold)
14. ZnO (in Hot)
15. HgO (Yellow ppt.)
16. Na_2O_2 (Pale yellow)
17. Ag_3PO_4
18. Ag_3AsO_3
19. $\text{Cu}(\text{CN})_2$
20. $\text{K}_3[\text{Co}(\text{NO}_2)_6]$ (Fischer's salt)
21. $(\text{NH}_4)_3\text{PO}_4 \cdot 12\text{MoO}_3$
22. $(\text{NH}_4)_3\text{AsO}_4 \cdot 12\text{MoO}_3$
23. Na_2CrO_4
24. CrO_4^{2-} (Yellow in solution)

Red Colour Compounds

1. Ag_2CrO_4 (Brick red)
2. Hg_2CrO_4 (Brick red)
3. HgI_2 (Scarlet red)
4. Pb_3O_4 ($2\text{PbO} + \text{PbO}_2$)
5. CrO_2Cl_2 (Reddish brown)
6. $\text{Fe}(\text{CH}_3\text{COO})_3$ (Blood red)
7. $\text{Fe}(\text{SCN})_3$ (Blood red)
8. AsI_3
9. SbI_3
10. SnI_2
11. CuBr_2
12. $[\text{Ni}(\text{DMG})_2]$ (Rosy red)

Brown Coloured Compounds

1. SnS
2. Bi_2S_3
3. CdO
4. PbO_2
5. $\text{Fe}(\text{OH})_3$ (Reddish Brown)
6. Fe_2O_3 (Reddish Brown solid)
7. Cu_2O (Reddish Brown)
8. Ag_3AsO_4 (Reddish Brown)
9. $\text{O} \begin{array}{c} \diagup \text{Hg} \diagdown \\ \diagdown \text{Hg} \diagup \end{array} \text{NH}_2\text{I}$
10. $\text{Cu}_2\text{I}_2 + \text{I}_3^-$ (Brown ppt.)
11. $\text{Cu}_2[\text{Fe}(\text{CN})_6]$ (Chocolate brown)
12. NO_2 (Brown gas)
13. $[\text{Fe}(\text{H}_2\text{O})_5(\text{NO})]\text{SO}_4$ (Brown ring)

Orange Coloured Compounds

1. Sb_2S_3
2. Sb_2S_5
3. KO_3
4. CsO_2
5. $\text{Cr}_2\text{O}_7^{2-}$ (Orange in aq. solution)

Pink Coloured Compounds

1. $\text{Mn}(\text{OH})_2$
2. MnS
3. MnO_4^- (Pink or purple in aq. solution)
4. $\text{Co}(\text{CN})_2$
5. $(\text{NH}_4)_2\text{SnCl}_6$
6. $\text{CoCl}_2 \cdot 6\text{H}_2\text{O}$ (Pink on melting black also known as sympathetic ink)

Gas

1. Colourless odourless gas – CO_2 , N_2 , O_2
2. Colourless gas having pungent smell
 NH_3 , H_2S , SO_2
3. Coloured gas — Cl_2 (Yellowish green)
 Br_2 (Brown)
 NO_2 (Brown)
 I_2 (Violet fumes)

RACE # 38

INORGANIC CHEMISTRY

MM : 30

TIME : 15 Min.

Choose the correct option. (Only one option is correct):

1. Which of the following pair of compounds cannot co-exist in aqueous solution. [3]
(A) Na_2CO_3 , K_2CO_3 (B) NaHCO_3 , NaOH (C) Rb_2CO_3 , KHCO_3 (D) NaOH and KCl

2. Ag_2CO_3 $\begin{cases} \text{(A)} \rightarrow \text{Black Residue. (C)} \xrightarrow[\text{Sol}^n]{\text{NH}_3} \text{Does not dissolve} \\ \text{(B)} \rightarrow \text{Black ppt. (D)} \xrightarrow[\text{NH}_3 \text{ Sol}^n]{\text{Clear solution}} \end{cases}$ [3]

A & B are

- (A) dil. HNO_3 and boiling in water respectively.
(B) Direct heating and boiling in water respectively.
(C) dil. HNO_3 and NH_3 respectively.
(D) hot water and NH_3 respectively.
3. Which of the following produces colourless gas with dil. H_2SO_4 [3]
(A) $\text{Na}_2\text{S}_2\text{O}_3$ (B) NaHCO_3 (C) $\text{CH}_3\text{CO}_2\text{NH}_4$ (D) All
4. Which of the following pair of salt produces odourless gas with dil. H_2SO_4 [3]
(A) HCO_3^- and HSO_3^- (B) HCO_3^- and CO_3^{2-}
(C) $\text{S}_2\text{O}_3^{2-}$ and CH_3CO_2^- (D) CO_3^{2-} and CH_3CO_2^-

Assertion/reason Type : (5 to 8)

- (A) Statement-1 is true, statement-2 is true and statement-2 is correct explanation for statement-1.
(B) Statement-1 is true, statement-2 is true and statement-2 is NOT the correct explanation for statement-1.
(C) Statement-1 is true, statement-2 is false.
(D) Statement-1 is false, statement-2 is true.
5. **Statement-1** : When HCO_3^- and CO_3^{2-} ions are present together, CaCl_2 is to be used in excess to distinguished both [3]
Statement-2 : Excess amount of CaCl_2 forms soluble complex with HCO_3^- of the formula of $[\text{Ca}(\text{HCO}_3)_6]^{4-}$
6. **Statement-1** : NaHCO_3 is the least soluble alkali bicarbonate. [3]
Statement-2 : massive H-bonding present in solid NaHCO_3 .
7. **Statement-1** : LiHCO_3 cannot exist in solid form. [3]
Statement-2 : Li_2O has the highest thermal stability among the alkali metals oxide.
8. **Statement-1** : $\text{CO}_2 + \text{K}_2\text{Cr}_2\text{O}_7 \longrightarrow$ no reaction [3]
Statement-2 : C is already in maximum oxidation state

Single Correct

9. A sodium salt on treatment with MgCl_2 gives white precipitate only on heating. The anion of the sodium salt is: [3]
- (A) HCO_3^- (B) CO_3^{2-} (C) NO_3^- (D) SO_4^{2-}
10. CO_3^{2-} and HCO_3^- can be distinguished by [3]
- (A) Phenolphthalein (B) BaCl_2 solution (C) HgCl_2 solution (D) All of these

FILL THE ANSWER HERE

1. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D	2. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D	3. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D	4. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D
5. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D	6. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D	7. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D	8. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D
9. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D	10. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D		

RACE # 39

INORGANIC CHEMISTRY

MM : 30

TIME : 15 Min.

Single correct :

- CO_3^{2-} and SO_3^{2-} cannot be distinguished by [3]
(A) H_2O_2 solution (B) lime water (C) Cl_2 water (D) all of these
- Which of the following options is correct [3]
I. HgCl_2 can be used for the distinction of HCO_3^- and CO_3^{2-}
II. Hg_2Cl_2 is insoluble in water
III. Aq. suspension of Ag_2CO_3 and Ag_2SO_3 both produces Ag_2O on heating
IV. SO_2 acts as reducing agent when passed through FeCl_3 solution
(A) FFTT (B) TFFT (C) TTFT (D) FTFF
- Soda extract is useful when given mixture has any insoluble salt, it is prepared by [3]
(A) Fusing soda and mixture and then extracting with water
(B) Dissolving NaHCO_3 and mixture in dil HCl
(C) Boiling Na_2CO_3 and mixture in dil HCl
(D) Boiling Na_2CO_3 and mixture in distilled water.
- Which of the following salts will not produce any observable changes when H_2S is passed through its aqueous solution [3]
(A) $(\text{CH}_3\text{CO}_2)_2\text{Pb}$ (B) $\text{Na}_2[\text{Fe}(\text{CN})_5\text{NO}]$
(C) AgNO_3 (D) none of these
- The colour of KMnO_4/H^+ will be decolourised by [3]
(A) S^{2-} solution (B) SO_3^{2-} solution (C) both (A) and (B) (D) None

Multiple correct :

- Which of the following reagent(s) can show colour change when SO_2 gas is passed through it. [3]
(A) Bromine water (B) Acidic potassium dichromate solution
(C) Acidic ferric chloride solution (D) Chlorine water

Assertion / Reason :

Questions given below consist of two statements each printed as Assertion (A) and Reason (R); while answering these questions you are required to choose any one of the following four responses:

- (A) If both (A) and (R) are true and (R) is the correct explanation of (A)
(B) If both (A) and (R) are true but (R) is not correct explanation of (A)
(C) If (A) is true but (R) is false
(D) If (A) is false and (R) is true

- Assertion :** Initially there is no ppt. when AgNO_3 is added to Na_2SO_3 solution [3]

Reason: Localised formation of Ag_2SO_3 is destroyed by soluble complex formation like $[\text{AgSO}_3]^-$

Paragraph type :

Question No. 8 to 10(3 questions)

[9]

Acetic acid is added to the solution of sodium carbonate the gas evolved does not turn purple colour of KMnO_4 but turns lime water milky forming a compound (M) which becomes soluble by passing the same gas in excess forming another compound (N). But same observation is not obtained with boric acid

8. Purple colour of KMnO_4 has not changed because
 - (A) the gas has no oxidising property since central atom is with minimum oxidation state
 - (B) the gas has no reducing property since the central atom is with maximum oxidation state
 - (C) the gas has no precipitation characteristics
 - (D) the gas precipitates CaCO_3 from lime water
9. The compound formed in the above sequence (M) and (N) are respectively
 - (A) water soluble CaCO_3 and water soluble $\text{Ca}(\text{HCO}_3)_2$
 - (B) water insoluble CaCO_3 and water insoluble $\text{Ca}(\text{HCO}_3)_2$
 - (C) water insoluble CaCO_3 and water soluble $\text{Ca}(\text{HCO}_3)_2$
 - (D) water soluble CaCO_3 and water insoluble $\text{Ca}(\text{HCO}_3)_2$
10. The correct order of increasing acidity is

(A) Boric acid < Acetic acid < Carbonic acid	(B) Acetic acid < Boric acid < Carbonic acid
(C) Carbonic acid < Acetic acid < Boric acid	(D) Boric acid < Carbonic acid < Acetic acid

FILL THE ANSWER HERE

1. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D	2. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D	3. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D	4. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D
5. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D	6. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D	7. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D	8. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D
9. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D	10. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D		

RACE # 40

INORGANIC CHEMISTRY

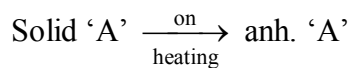
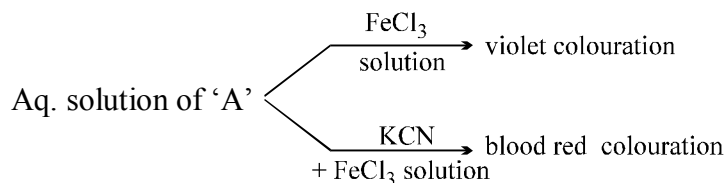
MM : 30

TIME : 15 Min.

Single correct :

1. Na_2SO_3 and $\text{Na}_2\text{S}_2\text{O}_3$ cannot be distinguished by [3]
(A) addition of $\text{Pb}(\text{OAc})_2$ followed by heating (B) addition CaCl_2 solution
(C) addition of AgNO_3 followed by heating (D) All of these
2. The co-ordination number of central ion of the complex obtained in the sodium nitroprusside test of sulphide ion is [3]
(A) 5 (B) 6 (C) 7 (D) 4
3. Which of the following acid radical does not produce white ppt with $\text{Pb}(\text{OAc})_2$ solution. [3]
(A) Br^- (B) $\text{S}_2\text{O}_3^{2-}$ (C) CO_3^{2-} (D) None of these
4. H_2S is passed into BaCl_2 solution. The ppt formed is [3]
(A) BaS (B) $\text{Ba}(\text{SH})_2$ (C) $\text{Ba}(\text{OH})_2$ (D) no ppt.
5. Colour obtained in test of $\text{S}_2\text{O}_3^{2-} + [\text{Ni}(\text{en})_3] (\text{NO}_3)_2$ is [3]
(A) Red (B) Violet (C) Indigo (D) Yellow
6. Which of following is / are reduced by thiosulphate solution. [3]
(I) Fe^{+3} solution (II) I_2 solution (III) Cu^{+2} solution (IV) Hg^{2+}
(A) I, II, III only (B) I, III only (C) IV only (D) I, III, IV only
7. $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$ is heated strongly to produce M and N and water. Both are consisting of S. Mention the average oxidation state of 'S' in M and N respectively. [3]
(A) -2, +5 (B) -2, +4 (C) $-\frac{2}{5}$, +6 (D) -2, +6
8. A compound (X) on decomposition gives a colourless gas. The residue is dissolved in water to obtain (Y). Excess CO_2 is bubbled through aqueous solution of (Y) and (Z) is formed. (Z) on gentle heating gives back (X). The (X) is [3]
(A) CaCO_3 (B) $\text{Ca}(\text{HCO}_3)_2$ (C) NaHCO_3 (D) Na_2CO_3

Question No. 9 & 10 (2 questions)



[6]

9. 'A' is

- (A) $\text{K}_2\text{S}_2\text{O}_3$ (B) CaS_2O_3 (C) PbS_2O_3 (D) $\text{Na}_2\text{S}_2\text{O}_3$

10. 'A' on strong heating produces compound(s) has/have

- (A) chain structure (B) Tetrahedral structure
(C) both (D) none

FILL THE ANSWER HERE

1. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D	2. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D	3. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D	4. <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D
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RACE # 41

INORGANIC CHEMISTRY

MM : 30

TIME : 15 Min.

Single correct :

- Comment **True (T)** or **False (F)** for the following statements. [3]
 - Same gas comes out when Na_2S is treated with dil. HCl and Na_2SO_3 is treated with $(\text{Zn} + \text{dil. H}_2\text{SO}_4)$
 - Same observation when acidified nitrite solution is treated with urea or thiourea followed by addition of FeCl_3 solution.
 - Same observation when nitrite solution or **acetate** solution is treated with dil. H_2SO_4 solution
 - With CaCl_2 and BaCl_2 both acetate and formate do not react.

(A) FTTF (B) TFTT (C) TFFT (D) FTTT
- (X) $\xrightarrow{\text{KOH}}$ (Y) (gas turns red litmus blue) + (Z) $\xrightarrow{\text{Zn} + \text{KOH}}$ (Y) (gas) [3]
 (X) $\xrightarrow{\Delta}$ gas (supports in combustion)
Identify (X) to (Z).

(A) $\text{X} = \text{NH}_4\text{NO}_2$	$\text{Y} = \text{NH}_3$	$\text{Z} = \text{KNO}_2$
(B) $\text{X} = (\text{NH}_4)_2\text{Cr}_2\text{O}_7$	$\text{Y} = \text{NH}_3$	$\text{Z} = \text{Cr}_2\text{O}_3$
(C) $\text{X} = (\text{NH}_4)_2\text{SO}_4$	$\text{Y} = \text{NH}_3$	$\text{Z} = \text{K}_2\text{SO}_4$
(D) $\text{X} = \text{NH}_4\text{NO}_3$	$\text{Y} = \text{NH}_3$	$\text{Z} = \text{KNO}_3$
- BeC_2O_4 and BaC_2O_4 are heated separately with bunsen burner. The solid residue obtained are respectively [3]

(A) BeO and BaO (B) BeO and BaCO_3
 (C) BeCO_3 and BaO (D) BeCO_3 and BaCO_3
- Unknown salt 'A' + **solid** $\text{K}_2\text{Cr}_2\text{O}_7$ + conc. $\text{H}_2\text{SO}_4 \longrightarrow$ Reddish brown fumes. [3]
 Which is the correct statement regarding the above observation

(A) It confirms the presence of Cl^- ion
 (B) It confirms the presence of Br^- ion
 (C) It confirms the presence of both
 (D) It neither confirms Cl^- nor Br^- unless it is passed through NaOH solution

Question No. 5 to 6 (2 questions)

[6]

Questions given below consist of two statements each printed as Assertion (A) and Reason (R); while answering these questions you are required to choose any one of the following four responses:

- (A) if both (A) and (R) are true and (R) is the correct explanation of (A)
 (B) if both (A) and (R) are true but (R) is not correct explanation of (A)
 (C) if (A) is true but (R) is false
 (D) if (A) is false and (R) is true

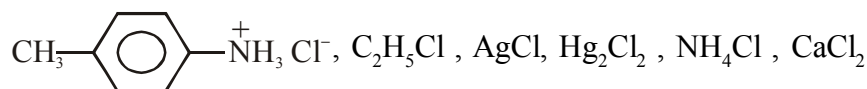
5. (A) NO_3^- and NO_2^- both do not give brown fumes with dil. H_2SO_4
(R) Protonation of NO_2^- is more easier compared to NO_3^- since NO_3^- is more stable by resonance
6. (A) Oxalate evolves gas with dilute H_2SO_4 in presence of MnO_2
(R) MnO_2 acts as catalyst over here

Single Correct

7. Which is not easily precipitated from aqueous solution [3]
(A) Cl^- (B) SO_4^{2-} (C) NO_3^- (D) CO_3^{2-}
8. Give the correct order of initials **T** or **F** for following statements. Use **T** if statement is true and **F** if it is false. [3]
(i) Cu^+ undergoes disproportionation to Cu and Cu^{2+} in aq. solution
(ii) Hg_2Cl_2 does not impart chromyl chloride test
(iii) $[\text{Fe}(\text{H}_2\text{O})_5\text{NO}]^{2+}$ complex is highly unstable due to the presence of weak field ligand
(iv) Bond length of CO^+ is greater than CO
(A) TFFT (B) TTFT (C) FTTF (D) TTFF
9. $\text{BaCO}_3(\text{s}) + \text{AcOH} \xrightarrow[\Delta]{\text{Na}_2\text{C}_2\text{O}_4 \text{ Solution}} ?$ [3]
Comment on the product of this reaction.
(A) BaCO_3 remains unaffected.
(B) BaC_2O_4 will be precipitated as white precipitate
(C) $\text{Ba}(\text{OAc})_2$ will be precipitated as white precipitate
(D) Clear solution

Integer :

10. Chromyl chloride test can be given by how many of the following compounds easily. [3]



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RACE # 42

INORGANIC CHEMISTRY

MM : 33

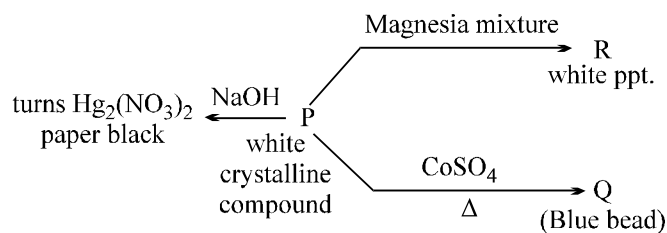
TIME : 15 Min.

Single correct :

- In the $K_2Cr_2O_7$ solution **when** alkali solution of $BaCl_2$ is added, the yellow ppt. obtained is of
(A) $BaCr_2O_7$ (B) $BaCrO_4$ (C) $BaCrO_4 \cdot 2H_2O$ (D) none [3]
- Aq. suspension of a yellow substance (A) $\xrightarrow[\text{conc. solution}]{KI}$ colourless solution (B) $\xrightarrow[\text{solution added}]{NH_4Cl}$ Brown ppt.
Compound (A) is [3]
(A) PbI_2 (B) AgI (C) HgI_2 (D) Hg_2I_2
- When $K_2Cr_2O_7$ is treated with H_2O_2 in acidic medium, in presence and in absence of org. solvent. The oxidation state of chromium finally: [3]
(A) increases and decreases respectively
(B) decreases and increases respectively
(C) retained same and decreases respectively
(D) retained same in both cases.
- 'A' (white substance) $\xrightarrow{\Delta}$ swells up first $\xrightarrow[\text{heating}]{\text{strong}}$ contracted into amorphous powder. A is [3]
(A) $Na_2B_4O_7 \cdot 10H_2O$ (B) $Na_2B_4O_7$
(C) $K_2SO_4 \cdot Al_2(SO_4)_3 \cdot 24H_2O$ (D) $Na(NH_4)HPO_4 \cdot 4H_2O$
- Aqueous solution of A + $AcOH$ + K_2CrO_4 \longrightarrow yellow ppt. The above information is not correct for which of the following cations: [3]
(I) Pb^{2+} (II) Ba^{2+} (III) Ca^{2+} (IV) Sr^{2+}
(A) I & III (B) I, II & IV (C) I, II (D) III, IV
- When the soda extract containing thiosulphate ion treated with excess of $AgNO_3$ solution followed by boiling, then. [3]
(A) White precipitate is formed (B) Black precipitate is formed
(C) brown precipitate is formed (D) No ppt precipitate is formed
- Identify the correct statement [3]
(A) The ppt of $BaCO_3$ is insoluble in dil HCl
(B) $Hg(NO_3)_2 + Na_2S \rightarrow$ white ppt of HgS
(C) $Na_2SO_4 + Hg(NO_3)_2 \rightarrow$ yellow ppt of $HgSO_4 \cdot 2HgO$
(D) H_2S turns lime water milky
- Statement-1:** Brown ring test can be done for NO_3^- in presence of NO_2^- [3]
Statement-2: Oxidation state of iron is changing from +2 to +1 in the brown ring complex.
(A) Statement-1 is true, statement-2 is true and statement-2 is correct explanation for statement-1.
(B) Statement-1 is true, statement-2 is true and statement-2 is NOT the correct explanation for statement-1.
(C) Statement-1 is true, statement-2 is false.
(D) Statement-1 is false, statement-2 is true.

Question No. 9 & 10 (2 questions)

[6]



9. Water of crystallisation in compound P

- (A) 4 moles (B) 7 moles (C) 10 moles (D) 5 moles

10. Blue compound Q is

- (A) $\text{Co}(\text{BO}_2)_2$ (B) NaCoPO_4 (C) $\text{CoO} \cdot \text{Al}_2\text{O}_3$ (D) $\text{CoO} \cdot \text{MgO}$

FILL THE ANSWER HERE

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RACE # 43

INORGANIC CHEMISTRY

MM : 30

TIME : 15 Min.

Single correct :

- Which reaction is possible [3]

(A) $\text{KMnO}_4 + \text{Na}_2\text{SO}_4 \longrightarrow$ (B) $\text{BaSO}_4 + \text{KCl} \longrightarrow$

(C) $\text{SrSO}_4 + \text{Ni}(\text{NO}_3)_2 \longrightarrow$ (D) $\text{ZnSO}_4 + \text{BaS} \longrightarrow$
- Match the following list and choose the correct option. [3]

List 'A'	List 'B'
(I) HgI_2	(a) Yellow ppt obtained when H_2S is passed in its dil. HCl solution
(II) Na^+	(b) Yellow solution
(III) FeCl_3	(c) Yellow flame
(IV) As^{3+}	(d) Yellow sublimate
(A) I-(a), II-(c), III-(d), IV-(b)	(B) I-(d), II-(c), III-(b), IV-(a)
(C) II-(d), III-(c), I-(b), IV-(a)	(D) II-(d), I-(c), III-(b), IV-(a)
- Which of the following reaction form yellow ppt./residue. [3]

(A) $\text{Pb}(\text{OAc})_2 + \text{NaBr} \longrightarrow$

(B) $\text{ZnCO}_3 + \text{Co}(\text{NO}_3)_2 \xrightarrow[\text{Charcoal Cavity}]{\Delta}$

(C) $\text{HgCl}_2 + \text{Na}_2\text{SO}_4 \longrightarrow$

(D) $\text{AgNO}_3 + \text{K}_2\text{CrO}_4 \longrightarrow$
- A reddish pink substance on heating gives off a vapour which condenses on the sides of the test tube and the substance turns blue. It on cooling water is added to the residue it turns to its original colour. The substance is [3]

(A) Iodine crystals (B) Copper sulphate crystals

(C) Cobalt chloride crystals (D) Zinc oxide
- The solid laboratory reagent 'A' gives the following reactions - [3]

(i) it imparts green colour to the flame

(ii) its solution does not give a precipitate on passing H_2S

(iii) when it is heated with solid $\text{K}_2\text{Cr}_2\text{O}_7$ and concentration H_2SO_4 , a red gas is evolved. When this gas passed into aqueous solution of NaOH , turns it yellow -

Identify 'A'

(A) PbCl_2 (B) BaCl_2 (C) NaCl (D) None of these
- When NH_4OH is added in $\text{Hg}_2(\text{NO}_3)_2$ solution, the ppt formed is [3]

(A) Hg_2O

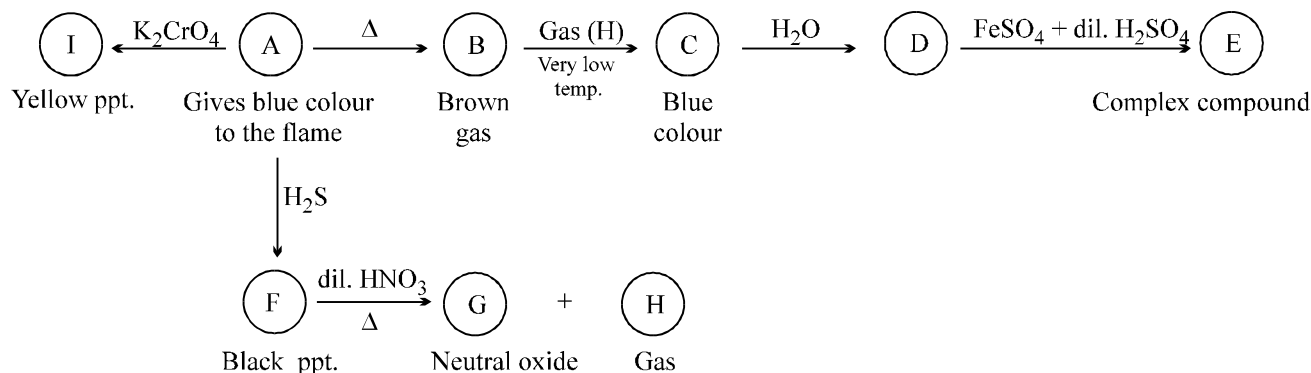
(B) $\text{Hg} + \text{HgO}$

(C) $2\text{Hg} + \text{HgO} \cdot \text{Hg}(\text{NH}_2)\text{NO}_3$

(D) $\text{HgO} \cdot \text{Hg}(\text{NH}_2)\text{NO}_3$

Question No. 7 to 9 (3 questions)

[9]



7. Yellow ppt. of compound (I) is insoluble in
 (A) NaOH (B) CH_3COOH (C) dil. HNO_3 (D) None
8. Type of hybridization of complex (E)
 (A) sp^3d^2 (B) d^2sp^3 (C) sp^3 (D) dsp^2
9. Type of hybridization of central atom of gas (B)
 (A) sp (B) sp^2 (C) sp^3 (D) No hybridization

Match the column :

10. Match the column -

[3]

Column-I

(Radical which can decolorize
acidic solution of MnO_4^-)

Column-II

(Given salt)

- | | |
|--------------------------------------|--------------------------------|
| (A) Only acidic radical | (P) $\text{Sn}(\text{NO}_3)_2$ |
| (B) Only basic radical | (Q) KNO_2 |
| (C) both radical | (R) FeC_2O_4 |
| (D) neither acidic nor basic radical | (S) Na_2CO_3 |
| | (T) BaSO_3 |

FILL THE ANSWER HERE

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RACE # 44

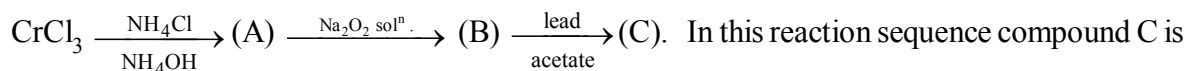
INORGANIC CHEMISTRY

MM : 30

TIME : 15 Min.

Single correct :

1. In the reaction sequence: [3]



- (A) Na_2CrO_4 (B) $\text{Na}_2\text{Cr}_2\text{O}_7$ (C) $\text{Cr}(\text{OH})_3$ (D) PbCrO_4

2. Fe^{2+} and Fe^{3+} can be distinguished by [3]

- (A) $\text{K}_3[\text{Fe}(\text{CN})_6]$ (B) $\text{K}_4[\text{Fe}(\text{CN})_6]$ (C) KSCN (D) All

3. $\text{Mg}_3\text{N}_2 \xrightarrow{\text{H}_2\text{O}} \text{A}(\text{gas}) \xrightarrow[\Delta]{\text{CuO}} \text{B} + \text{C}(\text{g}) + \text{H}_2\text{O}$ [3]

C(g) can be obtained by heating

- (A) $(\text{NH}_4)_2\text{SO}_4$ (B) $(\text{NH}_4)_2\text{Cr}_2\text{O}_7$ (C) NH_4NO_3 (D) NH_4Cl

4. Calcium imide on hydrolysis will give gas (B) which on oxidation by bleaching powder gives gas (C), gas (C) on reaction with magnesium give compound (D). (D) on hydrolysis gives again gas (B). (B), (C) and (D) are respectively [3]

- (A) NH_3 , N_2 , Mg_3N_2 (B) N_2 , NH_3 , MgNH
(C) N_2 , N_2O_5 , $\text{Mg}(\text{NO}_3)_2$ (D) NH_3 , NO_2 , $\text{Mg}(\text{NO}_2)_2$

5. The compound present in borax bead is [3]

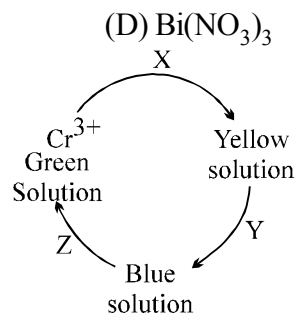
- (A) B_2O_3 (B) NaBO_2 (C) NaBO_3 (D) $\text{NaBO}_2 + \text{B}_2\text{O}_3$

6. Brown ppt. (A) of II group sulphide dissolve in HNO_3 gives (B) which gives white ppt (C) with NH_4OH . (C) on reaction with HCl gives solution (D) which gives white turbidity on addition of water. What is (D). [3]

- (A) BiCl_3 (B) $\text{Bi}(\text{OH})_3$ (C) BiOCl (D) $\text{Bi}(\text{NO}_3)_3$

7. In this sequence X, Y, Z are respectively [3]

- (A) Acidified H_2O_2 ; Alkaline H_2O_2 ; Acidified H_2O_2
(B) Alkaline H_2O_2 ; Acidified H_2O_2 ; $\text{Zn}^{+2} / \text{HCl}$
(C) Acidified H_2O_2 ; Heat; Alkaline H_2O_2
(D) Alkaline H_2O_2 ; Acidified H_2O_2 ; On standing



8. **Statement-1:** NH_4^+ and K^+ cations can be distinguished by using Nessler's reagent or HClO_4 . [3]

Statement-2: NH_4^+ gives brown ppt. with Nessler's reagent where as K^+ forms white ppt. of KClO_4 with perchloric acid.

- (A) Statement-1 is true, statement-2 is true and statement-2 is correct explanation for statement-1.
(B) Statement-1 is true, statement-2 is true and statement-2 is NOT the correct explanation for statement-1.
(C) Statement-1 is false, statement-2 is true.
(D) Statement-1 is true, statement-2 is false.

Assertion/reason :

9. **Statement-1:** In the brown ring compound, Fe is in the +1 oxidation state [3]

Statement-2: Experimental spin only magnetic moment found for this compound is 3.87 BM

(A) Statement-1 is true, statement-2 is true and statement-2 is correct explanation for statement-1.

(B) Statement-1 is true, statement-2 is true and statement-2 is NOT the correct explanation for statement-1.

(C) Statement-1 is false, statement-2 is true.

(D) Statement-1 is true, statement-2 is false.

Match the Column :-

10. Match the column-I with column-II.

Note that column-I may have more than one matching options in column-II. [3]

Column - I	Column -II
(A) Sodium nitroprusside	(P) $\mu = 0$ B.M.
(B) Brown ring complex	(Q) octahedral
(C) Complex of Ag formed during its extraction	(R) $\mu = \sqrt{15}$ B.M.
(D) Potassium ferrocyanide	(S) NO^+ ligand

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