CHEMISTRY

Code : SS-41-Chem

PAPER & SOLUTION

Time : 3 $\frac{1}{4}$ Hours **M.M. 56**

GENERAL INSTRUCTIONS TO THE EXAMINEES :

1. **Candidate must write first his / her Roll No. on the question paper compulsorily.**
2. **All the questions are compulsory.**
3. **Write the answer to each question in the given answer-book only.**
4. **For questions having more than one part the answers to those parts are to be written together in continuity.**
5. **If there is any error / difference / contradiction in Hindi & English versions of the question paper, the question of Hindi version should be treated valid.**
6.

Q. Nos.	Marks per questions
1 – 13	1
14 – 24	2
25 – 27	3
28 – 30	4

7. **Question Nos. 21, 27, 28, 29 and 30 have internal choices.**

SECTION-A

Q.1 Write the value of axial distances and axial angles of triclinic crystal. **[1]**

Sol. Axial distance

$a \neq b \neq c$

Axial angle

$\alpha \neq \beta \neq \gamma \neq 90^{o}$

Q.2 Write the definition of Kohlrausch law of independent migration of ions. **[1]**

Sol. Limiting molar conductivity of an electrolyte is equal to the sum of limiting molar conductivity of the anion and cation of the electrolyte

Q.3 Give half cell equation of daniell cell takes place at cathode. **[1]**

Sol. $Cu^{+2}(aq) + 2e^{-} \longrightarrow Cu(s)$

Q.4 Write the unit of velocity constant for second order reaction. **[1]**

Sol. Unit of k for second order reaction = mol^{-1} litre sec^{-1}

Q.5 For reaction $2N_2O_5 \rightarrow 2N_2O_4 + O_2$ the half life time is 6.93 sec, determine the rate constant. **[1]**

Sol. Reaction $2N_2O_5 \longrightarrow 2N_2O_4 + O_2$

Is first order reaction

$$t_{½} = \frac{0.693}{k}$$

$$k = \frac{0.693}{6.93} = \frac{1}{10}$$

$k = 0.1\ sec^{-1}$

Q.6 Transition element form inertial compound. Give one reason. **[1]**

Sol. Transition elements form interstitial compound because they have voids or interstitial sites. When some small sized atoms like B,C,N, H etc are present in voids then resultant compounds in known as interstitial compound.

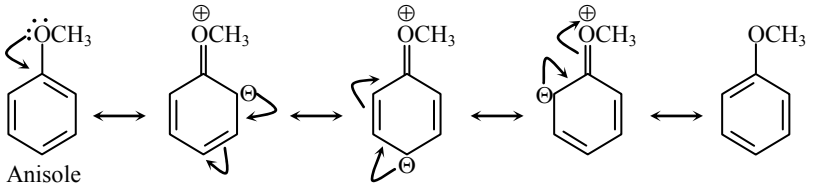
Q.7 Write the formula of each alkyl alcohol and benzyl alcohol **[1]**

Sol. $CH_3—CH_2—OH \Rightarrow$ ethyl alcohol

$C_6H_5—CH_2—OH \Rightarrow$ benzyl alcohol

Q.8 Give resonation structures of anisole. **[1]**

Sol.



Anisole

Q.9 Write chemical equation of Cannizaro reaction. **[1]**

Sol. $HCH = O \xrightarrow{\text{Conc.KOH}} HCOOK + CH_3OH$

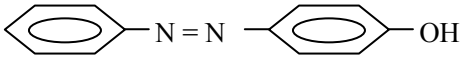
2 mole

(no α - H)

Q.10 Chloro acetic acid is stronger acid than acetic acid. Give one reason. **[1]**

Sol. In chloro acetic acid , Cl group present behave as –I group

Q.11 Write the name of following compounds

(A) $C_6H_5N_2^{\oplus}\ HSO_4^{\ominus}$ (B)  **[1]**

Sol. (A) benzene diazonium hydrogen sulphate

(B) p-hydroxey azo benzene

Q.12 Identify the type of following drugs and write its types. **[1]**

(A) Valium (B) Cimetidine

Sol. (A) Valium → Tranquillizer

(B) Cimetidine → Antacid

Q.13 Write the chemical formula of Teflon and P.V.C **[1]**

Sol. Teflon → $-(-CF_2 — CF_2-)_n$

PVC → $-(-CH_2 — \underset{\displaystyle Cl}{\underset{|}{CH}}-)_n$

SECTION-B

Q.14 (A) Give any one difference between anisotropy and isotropy nature of solid.
(B) Electric conductivities of solid (X) is 10^4 - 10^7 ohm^{-1} m^{-1} and solid (Y) is 10^{-20} - 10^{-10} ohm^{-1} m^{-1}. Identify solid (X) and solid (Y) and write their name **[1 + ½ + ½]**

Sol. (A) The value of physical properties such as refractive index, are obtain same in all direction represents isotropy nature of solid
The value of physical properties are obtain different in different direction represent anisotropy nature of solid.
(B) Solid (X) represent conductor
Example – metals.
solid. (Y) represent Insulators
Example - Rubber

Q.15 Write only chemical equations for following reactions. **[1+ 1]**
(A) When Ammonia react with atmospheric oxygen in the presence of catalyst.
(B) When sulphuric acid react with sulphur trioxide.

Sol. (A) $4NH_3 + 5O_2 \xrightarrow{Pt/Rh} 4NO + 6H_2O$

(B) $H_2SO_4 + SO_3 \longrightarrow H_2S_2O_7$

Q.16 (A) Write only the types of hybridisation of central atom present in XeF_2 and XeF_4.
(B) Explain the reason of different length of equatorial and axial bond in the structrue of PCl_5 **[1 + 1]**

Molecules	Hybridization of central atom

Sol. (A)

XeF_2	sp^3d
XeF_4	sp^3d^2

(B) Hybrid orbitals forming equatorial bonds have greater s-character than hybrid orbital forming axial bonds hence, axial bonds in PCl_5 are larger then equatorial bonds.

Q.17 (A) Explain denaturation of alcohol.
(B) Give chemical equation to obtain primary alcohol from grignard reagent. **[1 + 1]**

Sol. (A) When ethanal is subjected with small quantity of $CuSO_4$ & pyridine, then it is unfit for drinking is known as denaturation of alcohol

(B) $R—MgX + H—CH=O \longrightarrow R—CH_2—O—MgX \xrightarrow{H_2O/H^{\oplus}} \underset{1^{o}\text{ alcohol}}{R–CH_2–OH} + Mg\begin{matrix}X\\OH\end{matrix}$

Q.18 (A) Give two examples of Bio degradable polymer.
(B) Give the name of both monomers used in formation of terylene. **[½ + ½ +1]**

Sol. (A) (1) Poly β-hydroxy butyrate Co-β-hydroxy volarate (PHBV)
(2) Nylon 2,6- polymer of glycine & amino caproic acid

(B) $HO—CH_2—CH_2—OH + H—O—C(=O)-C_6H_4-C(=O)—O—H \longrightarrow -(O-(CH_2)_2-O—C(=O)-C_6H_4-C(=O))_n-$

Ethylene glycole — Tere phathalic acid — Terelene

Q.19 (A) Write any two differences between soap and detergent.

(B) In which work saccharine is used. **[½ + ½ +1]**

Sol. (A)

Soap	Detergent
They are produced from natural ingredients.	They are made from synthetic source.
They are the Na-salt of long chain carboxylic acid	They are Na-salt of long chain benzene sulphonic acid
They are not useful when water is hard.	They are used for washing purpose even that water is hard.
They the biodegradable.	They are non biodegradable.

(B) It is used around the world in such products as soft drinks, tabletop sweeteners. It is also used in cosmetic products, vitamins and pharmaceuticals.

Q.20 (A) Write the name of two metals which used in maximum composition in mischmetal.

(B) Calculate the value of magnetic moment of V^{+2}. **[1 + 1]**

Sol. (A) Major constituents of mischmetal are La and Ce.

(B) Electronic configuration of V^{+2} =$[Ar]4s^0 3d^3$

It has 3 unpaired e^-

Magnetic moment (μ) = $\sqrt{n(n+2)}$ BM

here, n = no. of unpaired e^-

μ of V^{+2} = $\sqrt{3(3+2)}$ BM

$\approx$ 3.9 BM

Q.21 (A) Give both chemical equations of 'Mond process' used in nickel refining.

(B) Draw a neat and labelled diagram of zone refining process. **[1 + 1]**

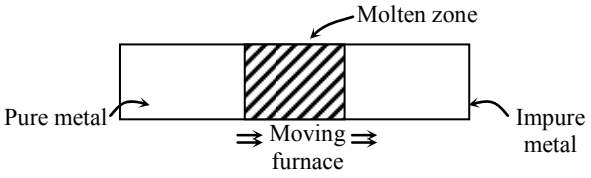
OR

(A) Give both chemical equations of leaching of silver in silver metallurgy by using sodium cyanide.

(B) Draw a neat and lebelled diagram of electrolytic cell for the extraction of aluminum. .

Sol. (A) Mond's process: - $\underset{\text{impure}}{Ni} + 4CO \xrightarrow{\Delta} \underset{\text{volatile}}{[Ni(CO)_4]} \xrightarrow{\Delta} \underset{\text{Pure}}{Ni} + 4CO\uparrow$

(B) Zone refining process :-

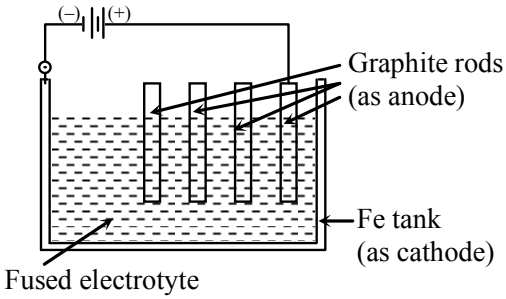


OR

(A) Leaching of silver by using sodium cyanide :-

$$\underset{\text{Powdered Ore}}{Ag_2S} + NaCN + H_2O + O_2 \longrightarrow Na[Ag(CN)_2] + S + NaOH$$

(B) Electrolytic cell for the extraction of aluminium :-



{ Fused mixture of Al_2O_3, cryolite (Na_3AlF_6) and fluorospar (CaF_2) }

Q.22 (A) Write the name of metal used in sacrificial electrode for the preventation of corrosion of iron metal how its prevent the corrosion.

(B) If $\wedge_m^\circ$ for NaCl, HCl and CH_3COOH are 110, 100 and 390 S cm^2 $mole^{-1}$ respectively. Determine the value of $\wedge_m^\circ$ for CH_3 COONa. **[1 + 1]**

Sol. (A) Zinc is used as sacrificial electrode for the preventation of corrosion of iron metal.

Standard oxidation potential of Zn is more than standard oxidation potential of Fe. So oxidation of Zn taken place. An electrochemical method is to provides a sacrificial of another metal (Like Zn, Mg etc. Which corrodes itself but saves the object.

(B) $\wedge_m^\circ (NaCl) = \lambda^\circ_{Na^+} + \lambda^\circ_{Cl^-} = 110$ — (1)

$\wedge_m^\circ (HCl) = \lambda^\circ_{H^+} + \lambda^\circ_{Cl^-} = 100$ — (2)

$\wedge_m^\circ (CH_3COOH) = \lambda^\circ_{CH_3COO^-} + \lambda^\circ_{H^+} = 390$ — (3)

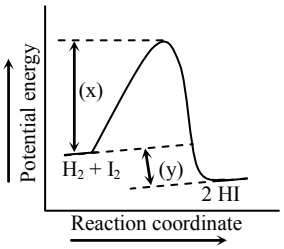
$\wedge_m^\circ (CH_3COONa) = \lambda^\circ_{CH_3COO^-} + \lambda^\circ_{Na^+} = ?$

Equation (1) + equation (3) – equation (2)

$\wedge_m^\circ (CH_3COONa) = 110 + 390 - 100$

$= 400$ S cm^2 mol^{-1}

Q.23



(A) Write suitable name of (x) and (y) denoted in above graph.

(B) Give definition of only (A) denoted in graph. **[1 + 1]**

Sol. (A) X denoted = Activation energy (Ea)

Y denoted = Enthalpy of reaction

(B) Activation energy (Ea) → the extra amount of energy absorbed by reactant molecules so as their energy must equal to the threshold energy.

The energy required to form intermediats called activated complex is known as activation energy

Q.24 (A) Write the name of dieases due to deficiency of vitamins 'A' and vitamins 'B'

(B) On the basis of 'Sugar differentiate D.N.A and R.N.A. **[1 + 1]**

Sol. (A) Vitamin A → Night blindness

Vitamin B → Beri berry

(B) DNA → It consist of β-De- oxy ribose sugar.

RNA → It consist of β-D-ribose sugar

SECTION-C

Q.25 (A) Due to low concentration of oxygen in blood, climber become weak and unable to think clear-

(i) Write specific name of above condition.

(ii) Explain the reason of such condition.

(B) 30 gm of ethanoic acid present in 100gm of water, determine molality of ethanoic acid in water.

[1 + 1 + 1]

Sol. (A) (i) Anoxia

(ii) At high altitudes, pressure becomes low. So low concentration oxygen in blood according to Henry law. The partial pressure of oxygen is less than that at the ground

Henry law – At constant temperature, the solubility of a gas. In a liquid is directly proportional to the pressure of the gas.

(B) Mass of ethenoic acid (solute = 30gm

Mass of water (solvent) = 100gm

Molar mass of $CH_3COOH = 24 + 4 + 32 = 60$gm

$$\text{Molality (m)} = \frac{\text{number of moles of soluts}}{\text{mass of solvent in Kg}}$$

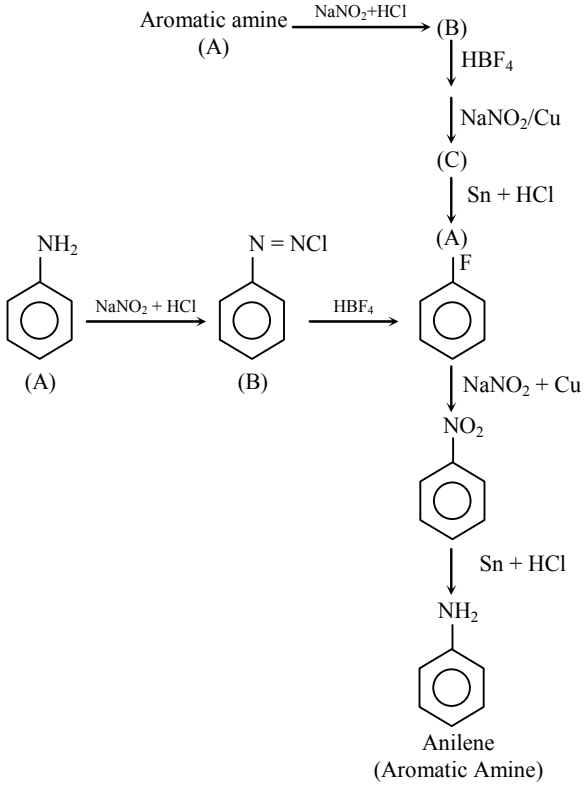
$$n_{solute} = \frac{30}{60} = \frac{1}{2}$$

$$m = \frac{1 \times 1000}{2 \times 100}$$

$$m = \frac{10}{2} = 5 \text{ mol/kg}$$

Q.26 Compound [A] is an aromatic amine which react with $NaNO_2$ + HCl at 273 – 278 K and form compound [B]. Compound [B] react with HBF_4 and the obtained product on further heating, in the presence of $NaNO_2$ and Cu form compound [C]. Compound [C] reduced in the presence of Sn + HCl to re-formed compound [A]. Write general name of 'A', 'B' and 'C' and write equation of all reaction involved. **[½+ ½ + ½+ ½+ ½+ ½]**

Sol.



Q.27 Write the equation of chemical reaction and name of reaction to obtain following compounds (A) and (B) from CH_3CHO.

(A) But – 2 –enal

(B) Chloroform **[1+1+1]**

OR

Write the equation of chemical reaction and name of to obtain following compounds (A) and (B) from CH_3COOH.

(A) Ethane

(B) Mono chloro acetic acid.

Sol. (A) $CH_3–CH=O \xrightarrow{\text{Dil NaOH}} \underset{\underset{OH}{|}}{CH_3–CH}–CH_2–CH=O \xrightarrow[H^+/\Delta]{-H_2O} \underset{\text{But –2–enal}}{CH_3–CH=CH–CH=O}$

It is aldol condensation reaction

(B) $CH_3–CH=O \xrightarrow{Cl_2+NaOH} \underset{\text{Chloroform}}{CHCl_3}+HCOONa$

It is chloroform reaction

OR

(A) $CH_3–COOH \xrightarrow{KOH/\Delta} \underset{\text{ethane}}{CH_3–CH_3}$

Kolbe's electrolysis

(B) $CH_3–COOH \xrightarrow{Cl_2+P/\Delta} \underset{\underset{Cl}{|}}{CH_2–COOH}$

Hell-volhard zelinsky Reaction (H.V.Z reaction)

Monochloro acetic acid

SECTION-D

Q.28 1. One of the factory of city bained by pollution board because factory owner not arrange a chamber on chimney.

(a) Write the name of chamber which not installed by factory owner.

(b) Draw neat and labelled diagram of above chamber.

2. (a) Define coagulating value of sol.

(b) Arrange the following ions in increasing order on the basis of their coagulating values.

PO_4^{3-}, Cl^{-1}, SO_4^{2-} **[1+1+1+1]**

OR

1. (a) Which type of emulsion is 'Vanishing cream'. Write its appropriate name.

(b) Draw neat and labeled diagram of above emulsion.

2. (a) What is shape selective catalysis?

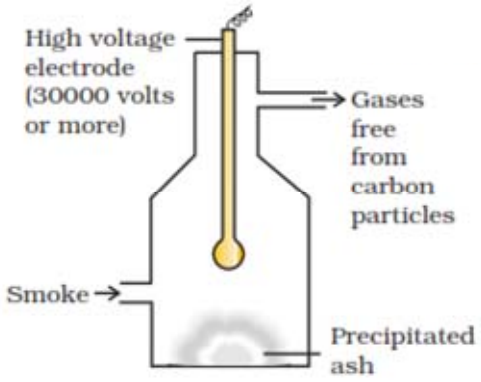
(b) Write the name of adsorbent used in following –

(i) To remove colouring matter from solution.

(ii) In gas mask. **[1+1+1+½+½]**

Sol. 1. (a) Cottrell's smoke precipitator

(b) Diagram



Cottrell smoke precipitator

2. (a) The minimum concentration of an electrolyte in mille moles per litre required to causes precipitation of a sol. In two hours is called coagulating value of sol

(b) Smaller the coagulation value higher will be coagulating power of an ion

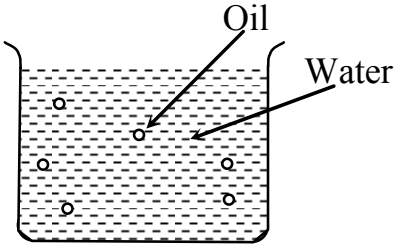
$$\underset{\text{Increasing order of coagulatin values}}{PO_4^{3-} < SO_4^{2-} < Cl^-}$$

OR

1. (a) Oil is dispersed phase and water is dispersion medium. It is liquid-liquid colloidal solution

Appropriate name → Oil in water

(b) Diagram



2. (a) Those catalytic reactions in which salt depends on the pore size of the catalyst and also on the shape and size of the reactant and product molecules.

(b) (i) Animal Charcoal removes colours of solution by adsorbing coloured impurities

(ii) Activated charcoal of mixture of adsorbents

Q.29 1. Write the chemical equation of following reaction.

(a) Swarts reaction

(b) Sandeyer's reaction.

2. (a) (i) $CH_3—Br + KOH \rightarrow CH_3OH + KBr$

(ii) $CH_3—\underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}}}—Br + KOH \rightarrow CH_3—\underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{\overset{|}{\underset{|}{C}}}}—OH + KBr$

Which types of nucleophilic subsitution are in above reaction (i) and (ii)

(b) Write two differences between mechanism of reaction (i) and (ii) **[1+1+1+1]**

OR

1. Write the chemical equation of following reaction

(a) Wurtz reaction

(b) Finkelstein reaction

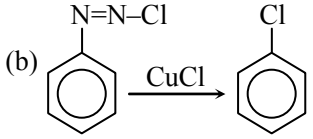
2. (a) $\underset{\text{Compound 'z'}}{\overset{\displaystyle C_2H_5}{\overset{|}{\underset{|}{C}}}(H)(CH_3)} \xleftarrow[y]{(ii)} \underset{\text{Compound 'x'}}{\overset{\displaystyle C_2H_5}{\overset{|}{\underset{|}{C}}}(H)(x)(CH_3)} \xrightarrow[y]{(i)} \underset{\text{Compound 'y'}}{\overset{\displaystyle C_2H_5}{\overset{|}{\underset{|}{C}}}(H)(y)(CH_3)}$

Write the names of process to obtain compound (y) and compound (z) from compound (x) in above nucleophilic reaction (i) and (ii).

(b) Which type of nucleophilic substitution mechanism involved to obtain compound (z) from compound (x). Write the name of mechanism. **[1+1+1+1]**

Sol. 1. (a) $R-Cl \underset{R-Br}{\overset{or}{\xrightarrow{NaI/Acetone}}} R-I$

Swarts reaction

(b) 

Sandmayre reaction

2. (a) (i) $CH_3–Br \rightarrow 1°\text{halide} \rightarrow SN_2$ reaction

(ii) $\begin{matrix} CH_3 \\ CH_3 \\ CH_3 \end{matrix}\!\!>\!C–Br \rightarrow 3°\text{ halide} \rightarrow SN_1$ reaction

(b)

	SN_2	SN_1
(i)	No intermediate formed only transtion state is formed	Intermediate is carbocation
(ii)	2^{nd} order reaction	1^{st} order reaction

OR

1. (a) $R-Cl \underset{2\,\text{mole}}{\xrightarrow{Na/ether}} R-R + NaCl$

(b) $R-Cl \underset{R-Br}{\overset{or}{\xrightarrow[or\ Hg_2F_2]{AgF}}} R-I$

2. (a) (i) Y is formed by retention process

(ii) Z is formed by inversion process

(b) It is bimolecular nucleophilic substitution reaction and the name of mechanism is SN_2

Q.30 (i) Define primary and secondary valency of metal ions proposed by Werner theory.
(ii) Write primary and secondary valency of Co in $[Co(NH_3)_6]\ Cl_3$.
(iii) Write structural formula of Ni $(CO)_4$ and $Cr(CO)_6$.
(iv) Draw the structure which shows Synergic bonding interaction in a carbonyl Complex. **[1+1+1+1]**

OR

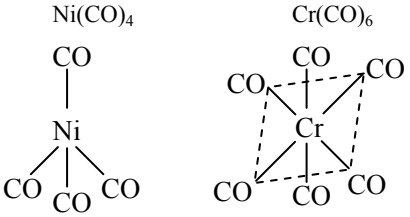
(i) Define linkage and ionization isomerism.
(ii) Which isomerism show by $[Co(NH_3)_6]\ [Cr(CN)_6]$ and $[Cr(NH_3)_6]\ [Co(CN)_6]$. Write name.
(iii) Draw the diagram which show the transition of an electron in $[Ti(H_2O)_6]^{3+}$
(iv) What impact takes place on metal complex due to transition of an electron in $[Ti(H_2O)_6]^{3+}$.

[1+1+1½+½ = 4]

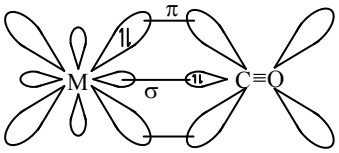
Sol. (i) Primary valency :- It is satisfied by anions and it depends on oxidation state of central metal.
Secondary valency :- It is satisfied by ligands and it equals to the co-ordination number of central metal.

(ii) $[Co(NH_3)_6]Cl_3$
Primary valency of Co = +3
Secondary valency of Co = 6

(iii)



(iv) Structure showing synergic bonding :-



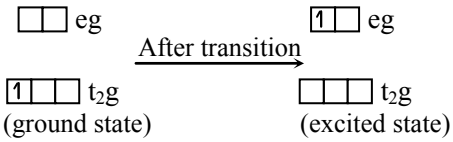
Vacant orbital of metal forms σ-bond with paired orbital of ligand CO.
Paired d-orbital of M forms π*-orbital of ligand CO.

OR

(i) Linkage isomerism :- It arises if any ambidentate ligand is present
eg. $[Co(NH_3)_5(NO_2)]SO_4$ and $[Co(NH_3)_5(ONO)]SO_4$
Ionisation isomerism :- It arises if any anionic ligands is exchanged with anion present outside of co-ordination sphere.
Eg. $[Co(NH_3)_5Cl]SO_4$ and $[Co(NH_3)_5SO_4]Cl$

(ii) $[Co(NH_3)_6][Cr(CN)_6]$ and $[Cr(NH_3)_6][Co(CN)_6]$ are co-ordination isomers.

(iii) $[Ti(H_2O)_6]^{3+}$
$Ti^{3+} = [Ar]\ 4s^0 3d^1$



(iv) Due to transition of an electron in $[Ti(H_2O)_6]^{3+}$, this complex becomes coloured.