

(Choose the correct option, only one is correct)

1. In the compound $\text{CoCl}_3 \cdot 5\text{NH}_3$ [3]

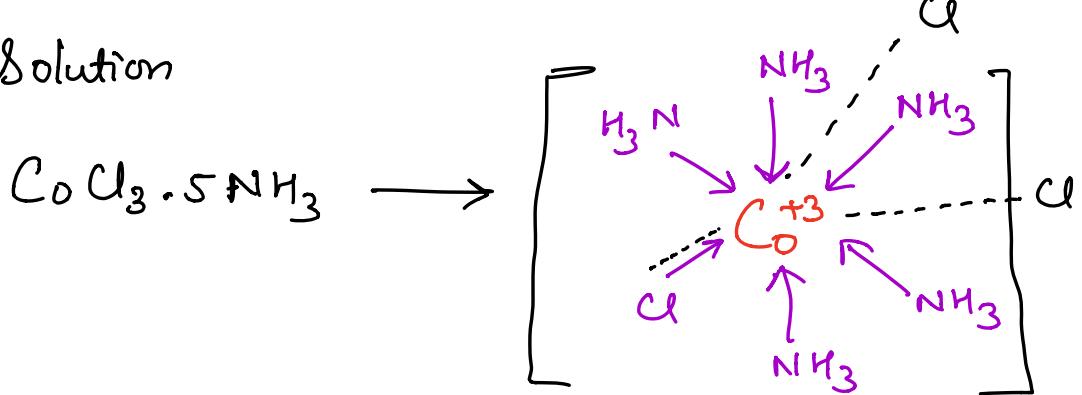
- (A) all the Cl show primary valency (PV) only
(B) two Cl show (PV) and one Cl secondary valency (SV)
(C*) two Cl show (PV) and one Cl (PV) as well as (SV)
(D) all the Cl show (SV)

1. यौगिक $\text{CoCl}_3 \cdot 5\text{NH}_3$ में [3]

- (A) सभी Cl परमाणु केवल प्राथमिक (PV) संयोजकता दर्शाते हैं
(B) दो Cl परमाणु प्राथमिक संयोजकता (PV) और एक Cl परमाणु द्वितीयके संयोजकता (SV) दर्शाते हैं।
(C) दो Cl परमाणु प्राथमिक संयोजकता (PV) और एक Cl प्राथमिक संयोजकता (PV) के साथ द्वितीयक संयोजकता भी (SV) दर्शाते हैं।
(D) सभी Cl परमाणु द्वितीयक संयोजकता (SV) प्रदर्शित करते हैं

Ans. (C)

Solution



Clearly, two Cl show primary valency & one Cl shows both primary & secondary valency.

2. Which of the following statements is incorrect? [3]
- Co-ordination compounds and complexes are synonymous terms.
 - Complexes must give ions in the solution.
 - Complexes may give ions in the solution or may not give ions in the solution.
 - Generally complex ion does not dissociate into its component parts even in the solution.

2. निम्न कथनों में कौनसा गलत है ? [3]

- उपसर्वयोजी यौगिक और संकुल समानार्थी पद हैं।
- संकुल, विलयन में आयन देते ही हैं।
- संकुल, विलयन में आयन दे सकते हैं, या नहीं भी दे सकते।
- सामान्यतः संकुल आयन विलयन में भी इसके अवयव भागों में वियोजित नहीं होते।

Ans. (B)

Solution

- (A) Coordination compounds are often referred as complex compounds.
- (B) Complexes may or may not give ions in solution. for eg.
- $$K_4[Fe(CN)_6] \rightarrow 4K^+ + [Fe(CN)_6]^{4-}$$
- $$[Ni(CO)_4] \rightarrow \text{no ions}$$
- (C) Given above.
- (D) Complex ions do not dissociate into their constituent ions generally. This is what separates them from simple salts or double salts.

3. Consider the following complexes: [3]

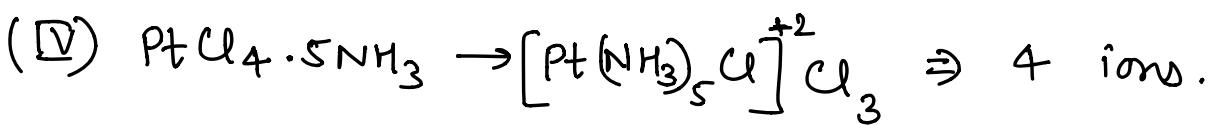
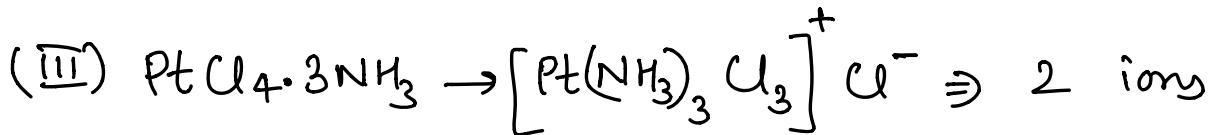
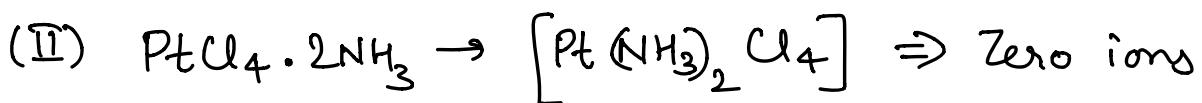
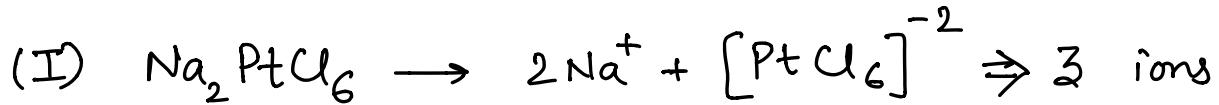


Their electrical conductances in an aqueous solutions are:

- (A*) 256, 0, 97, 404
(C) 256, 97, 0, 404

- (B) 404, 0, 97, 256
(D) 404, 97, 256, 0

Solution



More ions, means more conductivity.

Order ; IV > I > III > II .

Ans A.

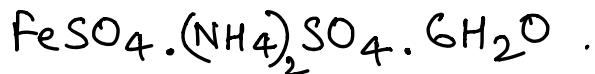
Solution

(A) This is a double salt.



It will give test of all ions.

(B) This is also a double salt.



(c) $K_3[Fe(CN)_6]$ is a complex salt.

It will dissociate in $3K^+ + [Fe(CN)_6]^{-3}$.

Hence will not give test of all ions

(D) $\text{Fe}_2(\text{SO}_4)_3$ is a simple salt & gives test of all ions

Solution

CrCl₃ → 3 Cl are responsible for oxidation state (+3) of Cr.

Primary valency = 3.

$\text{CoCl}_2 \rightarrow 2 \text{ Cl}$ are responsible for oxidation state (+2) of Co.

Primary valency = 2.

$\text{PdCl}_2 \rightarrow$ 2 Cl are responsible for oxidation state (+2) of Pd.

Primary valency = 2.

6. Select the correct statement according to Werner theory :
- (A) In coordination compounds metals show two types of linkages (valences)-primary and secondary.
 - (B) The primary valences are normally ionisable and are satisfied by negative ions.
 - (C) The secondary valences are non ionisable. These are satisfied by neutral molecules or negative ions. The secondary valence is equal to the coordination number and is fixed for a metal.
 - (D) The ions/groups bound by the secondary linkages to the metal have characteristic spatial arrangements corresponding to different coordination numbers.

6. Ans. (ABCD)

Solution

All statements are postulates of Werner Theory hence all statements are correct.

Note : Spatial arrangement means arrangement in space.

(Matching List)

7. Select the correct code in the given following matching list

List I

(Formula and Colour)

(P) $[\text{Co}(\text{NH}_3)_6]\text{Cl}_3$ (Yellow)

(Q) $[\text{CoCl}(\text{NH}_3)_5]\text{Cl}_2$ (Purple)

(R) $[\text{CoCl}_2(\text{NH}_3)_4]\text{Cl}$ (Green)

(S) $[\text{PtCl}_2(\text{NH}_3)_2]$ (Deep Yellow)

List II

(Solution conductivity corresponds to)

(1) 1 : 1 electrolyte

(2) 1 : 2 electrolyte

(3) 1 : 3 electrolyte

(4) 0 : 0 electrolyte

Select correct code for your answer :

(P) (Q) (R) (S)

(A) 2 3 1 4

(C) 2 3 4 1

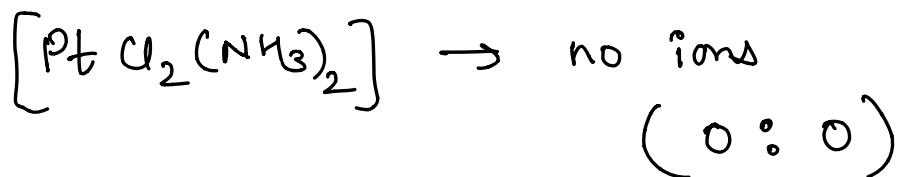
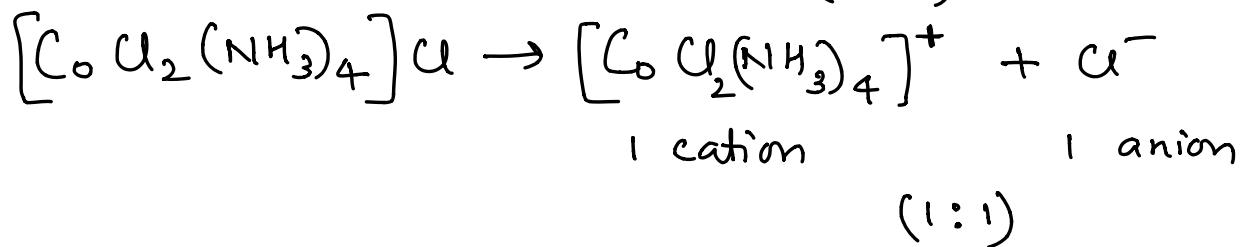
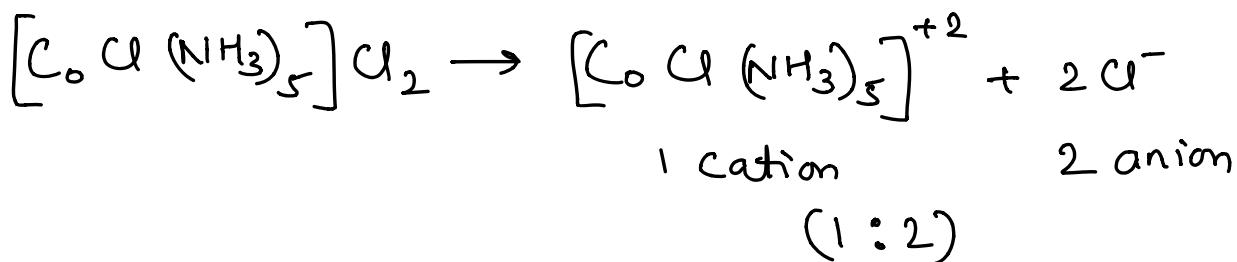
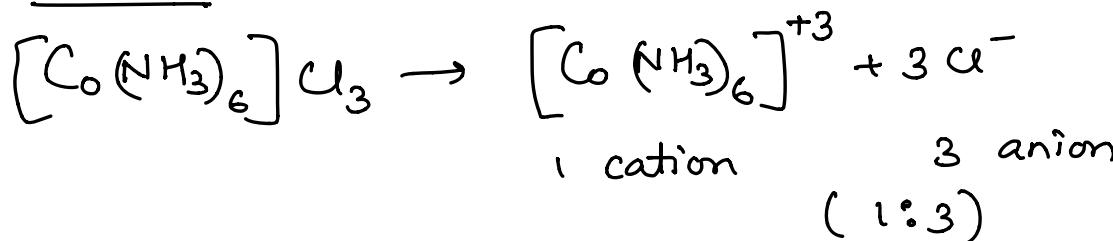
(P) (Q) (R) (S)

(B) 3 2 1 4

(D) 2 1 3 4

7. Ans. (B)

Solution



8. Select the correct code in the given following matching list

List I

(Formula)

- (P) $\text{PdCl}_2 \cdot 4\text{NH}_3$
- (Q) $\text{NiCl}_2 \cdot 6\text{H}_2\text{O}$
- (R) $\text{PtCl}_4 \cdot 2\text{HCl}$
- (S) $\text{CoCl}_3 \cdot 4\text{NH}_3$

List II

(Moles of AgCl precipitated per mole of the compounds with excess AgNO_3)

- (1) 0
- (2) 2
- (3) 2
- (4) 1

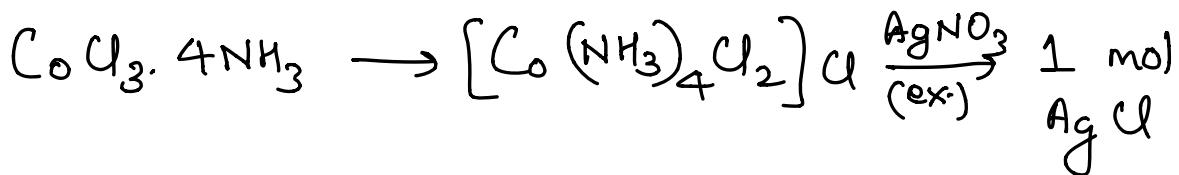
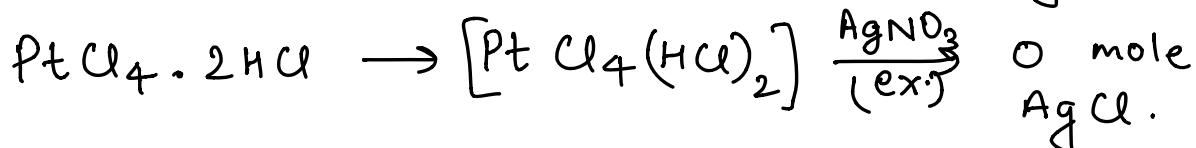
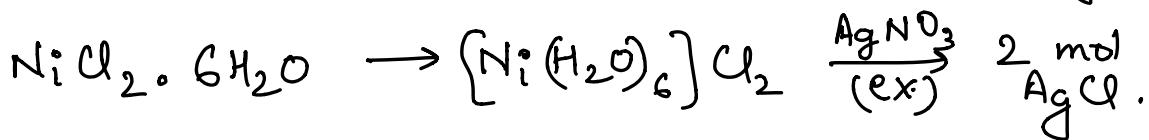
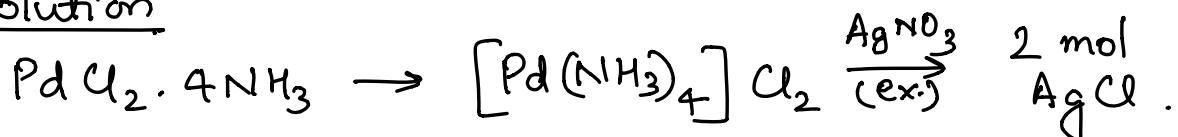
Select correct code for your answer :

- | | | | |
|-------|-----|-----|-----|
| (P) | (Q) | (R) | (S) |
| (A) 2 | 4 | 1 | 3 |
| (C) 2 | 3 | 1 | 4 |

- | | | | |
|-------|-----|-----|-----|
| (P) | (Q) | (R) | (S) |
| (B) 4 | 2 | 1 | 3 |
| (D) 2 | 1 | 3 | 4 |

8. Ans. (C)

Solution



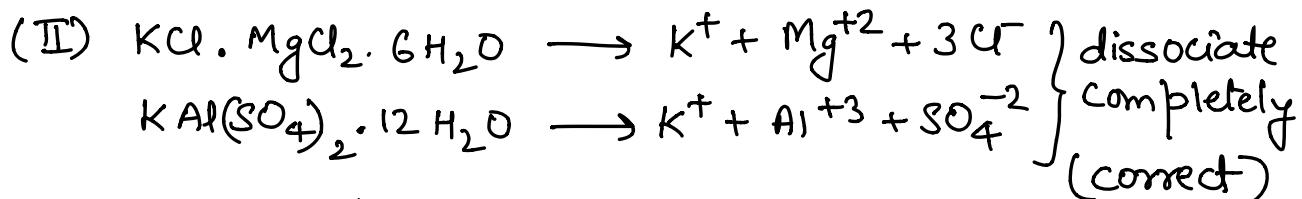
(Integer)

9. Find the number of correct statement(s) is/are :-
- Both double salts as well as complexes are formed by the combination of two or more stable compounds in stoichiometric ratio
 - double salts such as carnallite, $\text{KCl} \cdot \text{MgCl}_2 \cdot 6\text{H}_2\text{O}$, potash alum, $\text{KAl}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$, etc. dissociate into simple ions completely when dissolved in water
 - complex ions such as $[\text{Fe}(\text{CN})_6]^{4-}$ of $\text{K}_4\text{Fe}(\text{CN})_6$, do not dissociate into Fe^{2+} and CN^- ions
 - Mohr's salt, $\text{FeSO}_4 \cdot (\text{NH}_4)_2\text{SO}_4 \cdot 6\text{H}_2\text{O}$ does not, dissociate into simple ions completely when dissolved in water
 - $[\text{CoCl}_2(\text{NH}_3)_4]\text{Cl}$ complex dissociate into Co^{3+} and Cl^- ions

Ans. (3)

Solution

(I) Both double & complex salts are formed by combination of two or more stable compounds in stoichiometric ratio. (correct)

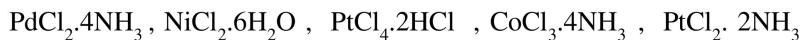


(III) $[\text{Fe}(\text{CN})_6]^{4-}$ do not dissociate into Fe^{+2} & CN^- .
 (correct)

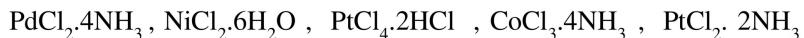
(IV) $\text{FeSO}_4 \cdot (\text{NH}_4)_2\text{SO}_4 \cdot 6\text{H}_2\text{O} \rightarrow \text{Fe}^{+2} + 2\text{NH}_4^+ + 2\text{SO}_4^{-2}$
 (dissociate completely)
 (incorrect)

(V) $[\text{CoCl}_2(\text{NH}_3)_4]\text{Cl} \rightarrow [\text{CoCl}_2(\text{NH}_3)_4]^+ + \text{Cl}^-$
 (incorrect)

10. In the given following compounds, the total number of compounds which contains secondary valences of metals is six : [4]



10. दिये गये निम्न यौगिकों में ऐसे यौगिकों की कुल संख्या बताइये जिनमें ध्रातुओं की द्वितीयक संयोजकताएँ छः हैं।



10. Ans. (3)

Solution

