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**QUESTION BANK FOR COORDINATION COMPOUNDS**

1. What is the coordination number of each type of ions in a rock-salt type crystal

structure?

2. Give an example of linkage isomerism?

3. Which of the following is more stable complex and why?

[𝑪𝒐(𝑵𝑯𝟑)𝟔]𝟑+ 𝐚𝐧𝐝 [𝑪𝒐(𝒆𝒏)𝟑]𝟑+

4. For the complex [𝑭(𝒆𝒏)𝟐𝒄𝒍𝟐]𝑪𝒍, (en=ethylene diamine), identify

(i) The oxidation number of iron,

(ii) The hybrid orbits and the shape of the complex,

(iii) The magnetic behavior of the complex.

(iv) The number of geometrical isomers,

(v) Whether there is an optical isomer also, and

(vi) name of the complex. (At. No. of Fe = 26)

5. Name the following coordination compounds according to IUPAC system of

nomenclature:

(i) [𝐂(𝐍𝐇𝟑)𝟒(𝐇𝟐𝐎)𝐂𝐥]𝐂𝐥𝟐

(ii) [𝐂𝐫𝐂𝐥(𝐞𝐧)𝟐𝐂𝐥, (𝐞𝐧 = 𝐞𝐭𝐡𝐚𝐧𝐞 − 𝟏, 𝟐 − 𝐝𝐢𝐚𝐦𝐢𝐧𝐞)

6. Write the IUPAC name of the complex [𝑪(𝑵𝑯𝟑)𝟒𝑪𝒍𝟐]+. What type of isomerism

does it exhibit?

7. (i) Write down the IUPAC name of the following complex:

[𝐂𝐫(𝐍𝐇𝟑)𝟐𝐂𝐥𝟐(𝐞𝐧)]𝐂𝐥 (𝐞𝐧 = 𝐞𝐭𝐡𝐲𝐥𝐞𝐧𝐞𝐝𝐢𝐚𝐦𝐢𝐧𝐞)]

(ii) Write the formula for the following complex:

Pentaamminenitrito-o-Cobalt(III).

8. (a) What is a ligand? Give an example of a bidentate ligand.

(b) Explain as to how the two complexes of nickel, [𝐍(𝐂𝐍)𝟒]𝟐−and Ni(𝐂𝐎)𝟒 have

different structures but do not differ in their magnetic behavior. (Ni = 28)

9. (i) Draw the geometrical isomers of complex [𝑷𝒕(𝑵𝑯𝟑)𝟐𝑪𝒍𝟐].

(ii). On the basis of crystal field theory, write the electronic configuration for 𝒅𝟒 ion

if Δ𝐨< 𝐏.

(iii). Write the hybridization and magnetic behavior of the complex

[𝑵𝒊(𝑪𝑶)𝟒]. (At. no. of Ni = 28).

10. (i) What type of isomerism is shown by the complex [𝐂𝐨(𝐍𝐇𝟑)𝟔] [𝐂𝐫(𝐂𝐍)𝟔]?

(ii) Why a solution of [𝐍(𝐇𝟐𝐎)𝟔]𝟐+ is green while a solution of [𝐍𝐢(𝐂𝐍)𝟒]𝟐− is colourless? (At. no. of Ni = 28).

(iii) Write the IUPAC name of the following complex: [𝐂(𝐍𝐇𝟑)𝟓 (𝐂𝐎𝟑)]𝐂𝐥.

11. (a) What is the basis of formation of the spectrohemical series?

(b) Draw the structures of geometrical isomers of the following coordination

complexes:

[𝑪(𝑵𝑯𝟑)𝟑 𝑪𝒍𝟑] and [𝑪𝒐𝑪𝒍𝟐(𝒆𝒏)𝟐]+

(en = ethylenediamine and atomic number of Co is 27).

12. Giving a suitable example for each, explain the following:

(i) Crystal field splitting

(ii) Linkage isomerism

(iii) Ambidentate ligand

13. Compare the following complexes with respect to structural shapes of units, magnetic behaviour and hybrid orbitals involved in units:

[𝑪𝒐(𝑵𝑯𝟑)𝟔]𝟑+, [𝑪𝒓(𝑵𝑯𝟑)𝟔]𝟑+, 𝑵𝒊(𝑪𝑶)𝟒

𝑨𝒕. 𝑵𝒐𝒔: 𝑪𝒐 = 𝟐𝟕, 𝑪𝒓 = 𝟐𝟒, 𝑵𝒊 = 𝟐𝟖

14. Explain the following terms giving a suitable example in each case:

(i) Ambident ligand

(ii) Denticity of a ligand

(iii) Crystal field splitting in an octahedral field.

(iv) Chelating ligand

14. (a) What type of isomerism is shown by the complex [𝑪𝒐(𝑵𝑯𝟑)𝟓(𝑺𝑪𝑵)]𝟐+?

(b) Why is [𝑵𝒊𝑪𝒍𝟒]− paramagnetic while [𝑵𝒊(𝑪𝑵)𝟒]𝟐− is diamagnetic ?

(Atomic number of Ni = 28).

(c) Whey is low spin tetrahedral complexes rarely observed?

15. Using valence bond theory explain the geometry and magnetic property of pentacarbonyl iron (0)

16. With the help of crystal field theory, predict the number of unpaired electrons in [Fe (H2O) 6] 2+ and [Fe (CN) 6] 4-

17. Name the following coordination entities and describe their structures:

i. [Fe (CN) 6] 4-

ii.[Co (NH3) 5Cl] SO4

b. What type isomerism is exhibited by [Co (en) 3]3+

c. Draw the geometrical isomers of complex [Pt (NH3)2Cl2]

18. a. CuSO4.5H2O is blue in colour while CuSO4 is colourless. Why?

b. Using crystal field theory, draw energy level diagram, write electronic configuration of the central metal atom/ion and determine the magnetic moment value in the following :  
(i) [CoF6]3– , [Co(H2O)6]2+, [Co(CN)6]3–

c. Write the hybridization and shape of [𝑪𝒐𝑭𝟔] 𝟑−. (Atomic no. of Co = 27)