

Board of Studies: Chemistry

Class: TYBSc (Chemistry)

Subject Code: CHEM3502

Subject: Inorganic Chemistry

Semester: V

QUESTION BANK

1) Multiple Choice Questions

1. Valence Bond theory was developed in the year

- a.1916 b.1927 c.1030 d.1932

2. The p orbital is in the shape of a.....

- a.sphere b.dumbell c.pear shaped lobe d. none of these

3. The bond angle in sp^3d^2 hybridization.....

- a90 b 120 c 180 d 109

4. Hybridization of $[Ni(CN)_4]^{2-}$

- a sp^3 b dsp^2 c sp^3d^2 d sp^3d

5. Hybridization of $[Ni(Cl)_4]^{2-}$

- a sp^3 b dsp^2 c sp^3d^2 d sp^3d

6. Hybridization of $[Fe(CO)_5]$

- a sp^3 b dsp^3 c sp^3d^2 d sp^3d

7. Hybridization of $[Co(NH_3)_6]^{3+}$

- a sp^3 b dsp^2 c sp^3d^2 d sp^3d

8. Possible isomer in $[Mabcdef]$ type....

- a.10 b12 c20 d 15

9. Which of the following complex shows zero CFSE

- a. $[Fe(H_2O)_6]^{3+}$ b. $[Co(H_2O)_6]^{3+}$

c. $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ d. $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$

10. Which of the following complexes shows zero crystal field stabilization energy?

- (a) $[\text{Co}(\text{H}_2\text{O})_6]^{3+}$
- (b) $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$
- (c) $[\text{Co}(\text{H}_2\text{O})_6]^{2+}$
- (d) $[\text{Mn}(\text{H}_2\text{O})_6]^{3+}$

11. Which of the following is paramagnetic?

- (a) $[\text{CoBr}_4]^{2-}$
- (b) $\text{Mo}(\text{CO})_6$
- (c) $[\text{Pt}(\text{en})\text{Cl}_2]$
- (d) $[\text{Co}(\text{NH}_3)_6]^{3+}$

12. For a high spin d^4 octahedral complex the crystal field splitting energy will be

- (a) $-1.6 \Delta_o$
- (b) $-0.8 \Delta_o$
- (c) $-0.6 \Delta_o$
- (d) $-1.2 \Delta_o$

13. Which of the following is a bidentate ligand?

- (a) Br
- (b) CH_3NH_2
- (c) $\text{C}_2\text{O}_4^{2-}$
- (d) CH_3CN

14. How many unpaired electrons are present in $[\text{CoF}_6]^{3-}$ complex?

- (a) 4
- (b) zero

(c) 2

(d) 3

15. Which of the following d orbitals take part in the octahedral complex with d^2sp^3 hybridisation?

(a) d_{xy} , d_{yz}

(b) d_{xz} , $d_{x^2-y^2}$

(c) $d_{x^2-y^2}$, d_{z^2}

(d) d_{z^2} , d_{xz}

16. The compound, which does not contain a metal-carbon bond is

(a) $K[Pt(C_2H_4)Cl_3]$

(b) C_2H_5MgBr

(c) $Ni(CO)_4$

(d) $Al(OC_2H_5)_3$

17. The correct increasing order of splitting power of ligands according to spectrochemical series is

(a) $Cl^- < OH^- < CN^-$

(b) $Cl^- < CN^- < OH^-$

(c) $OH^- < Cl^- < CN^-$

(d) $OH^- < CN^- < Cl^-$

18. Which of the following complexes has a magnetic moment of 1.73 BM?

(a) $[MnCl_6]^{4-}$

(b) $TiCl_4$

(c) $[Cu(NH_3)_4]^{2+}$

(d) $[CoCl_6]^{4-}$

19. Tetraamminecopper(II) sulphate is _____ in colour.

- (a) violet
- (b) blue
- (c) green
- (d) red

20. Which of the following complex do not obey EAN rule.....



2) Answer in one sentences

1) What is Mean by C.N?

2) Define Chelate

3) How many Valencies are in Werners complexes?

4) Give the oxidation state number of Cobalt in $[\text{Co}(\text{NH}_3)_6]\text{Cl}_3$

5) Define Polydentate ligand

6) Give possible isomers number in Square planar complex of $[\text{M}(\text{abcd})]$

7) Give Co ordination number in $[\text{Co}(\text{en})_3]\text{Cl}_3$

8) Calculate CFSE for $[\text{Co}(\text{NH}_3)_6]\text{Cl}_3$

9) Give the term symbol for Fe^{3+}

10) Give group theoretical symbol for s orbital

11) Which orbital present in between axis in d orbital

12) Give the term symbol for Mn^{2+}

!3) Which orbital present on the axis in d orbital

14) How many types of complexes?

15) Calculate CFSE for d^5 (low spin) system

16) Which hybridization is present in $\text{K}_3[\text{Fe}(\text{CN})_6]$?

17) Define ligand.

18) Name the different kinds of isomerism possible in coordination complex

19) Name the geometrical isomers formed by $[\text{Co}(\text{en})_2\text{Br}_2]^+$

20) How many unpaired electrons are present in $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$

3) Answer the following

1. Give the assumptions of Valence bond theory

2. What is nephelauxetic effect? Give the nephelauxetic series

3. What is Spectrochemical series? Give the Spectrochemical series

4. Give the assumptions of Crystal field theory

5. Discuss the geometrical isomerism in square planar complexes

6. Discuss the geometrical isomerism in Octahedral complexes

7. Discuss the Optical isomerism in Octahedral complexes

8. Define term isomerism. Give the classification of isomerism

9. What are the postulates of Werner Theory?

10. State whether following complexes obey EAN rule or not a.

$\text{K}_3[\text{Fe}(\text{CN})_6]$ b. $\text{K}_4[\text{Fe}(\text{CN})_6]$

11. The ligand like CO , CN^- and PX_3 are poor electron donor ligands still they form strong bond in their complexes Explain.

12. What type of Hybridization is shown by the complex $[\text{Cu}(\text{NH}_3)_6]^{2+}$

13. What type of Hybridization is shown by the complex $[\text{Fe}(\text{CO})_5]$

14. What type of Hybridization is shown by the complex $[\text{Fe}(\text{CN})_6]^{3-}$

15. What type of Hybridization is shown by the complex $[\text{Ni}(\text{NH}_3)_4]^{2+}$

16. Calculate CFSE for a. d^1 system b. Cu^{2+} c. Mn^{2+} (low spin) d. Fe^{3+} (high spin)

17. Give the Difference between Inner and Outer orbital complexes

18. Give the drawbacks of Valence bond theory

19. Draw the MO energy level for $[\text{Co}(\text{CN})_6]^{3-}$ without π bonding and describe the magnetic properties.

20. Calculate term symbol for a. Cu^{2+} b. Co^{3+} c. Fe^{2+} d. Ti^{2+}

4) Write note on

1) Werners Theory

2) pi Acid ligands

3) Sidgwick Theory

4) Cis trans isomerism

5) Optical isomerism

6) Electroneutrality principle

7) Nephelauxetic effect

8) Term Symbol

9) Stereoisomerism

10) Structural Isomerism

11) Charge transfer spectra

12) CFSE

13) Magnitude of $10Dq$

14) Ionisation isomerism

15) Coordination isomerism

16) Cis trans isomerism

17) Back Bonding

18) With pi bonding Complex

19) Strong Field splitting complexes

20) Weak Field splitting complexes

5) Answer in Brief

1. Compare VBT, CFT and MOT in the term of magnetic properties and magnetic moments
2. Explain Jahn Teller distortion of octahedral complexes. What is Jahn Teller Stabilization energy ? Explain with suitable example
3. Draw the MO energy level for $[\text{Co}(\text{CN})_6]^{3-}$ and $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ without pi bonding and describe the magnetic properties
4. Define term Isomerism? Discuss the Optical isomerism in Octahedral complexes
5. Define term Isomerism? Discuss the Geometrical isomerism in Square planar and Octahedral complexes
6. Draw the MO energy level for $[\text{Co}(\text{F})_6]^{3-}$ and $[\text{Ni}(\text{NH}_3)_6]^{3+}$ without pi bonding and describe the magnetic properties
7. Define term Isomerism? Discuss the Structural isomerism in Octahedral complexes
8. What are the postulates of Werner Theory? Give the difference between First and Second coordination sphere
9. Give in detail Multiple bonding in complexes with suitable examples
10. Define EAN rule Describe EAN rule with suitable example. Give the limitations of EAN rule.
11. Which factor affect on magnitude of $10 Dq$? Explain with suitable examples.
12. Discuss Sidgwick theory of bonding in complexes and give its applications What are the merits and demerits of this theory?
13. Explain the bonding in $[\text{Fe}(\text{CN})_6]^{3-}$ on the basis of VBT Calculate the magnetic moment.
14. Calculate term symbol for a. Ni^{2+} b. Co^{2+} c. Fe^{3+} d. Ti^{2+}
15. Give the assumptions of VBT, CFT and MOT
16. Give the Limitations of VBT, CFT and MOT

17. Give the Inner and Outer orbital complexes from d^4 to d^{10} orbitals with suitable examples

18 Discuss the evidence for crystal field stabilization energy.

19. What is d-d transitions? Give in detail Spectrochemical series With degeneracy of d orbital with example.

20. What factors led in the development of Molecular Orbital Theory?