

STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI-86
(For candidates admitted during the academic year 2004 –05 & thereafter)
SUBJECT CODE: CH/MC/IC54
B.Sc. DEGREE EXAMINATION, NOVEMBER 2008
BRANCH IV- CHEMISTRY
FIFTH SEMESTER
REG.NO

COURSE : MAJOR CORE

PAPER : INORGANIC CHEMISTRY-III

TIME : 30 MINUTES

MAX.MARKS : 30

SECTION – A

(30x1=30)

ANSWER ON THE QUESTION PAPER ITSELF.

Answer all the questions.

I Choose the correct answer:

1. All three elements of iron group Fe, Co, Ni are
a) paramagnetic b) ferromagnetic c) diamagnetic d) anti ferromagnetic
2. The valence shell configuration of Ti group element can be represented by
a) $(n-1)d^5ns^1$ b) $(n-1)d^3ns^2$ c) $(n-1)d^2ns^2$ d) $(n-1)d^6ns^0$
3. The energy gap between t_{2g} and e_g sets is denoted by
a) $10Dq$ b) Dq c) $2\Delta_0$ d) $4Dq$
4. The most abundant lanthanide is
a) cerium b) lanthanum c) europium d) gadolinium
5. The primary and secondary valencies of the complex $[CO(NH_3)_3Cl_3]$ respectively are
a) 3,3 b) 3,6 c) 6,3 d) 6,6
6. The CFSE for a low spin octahedral complex of a d^7 ion is
a) $2.4\Delta_0$ b) $-1.8\Delta_0$ c) $1.2\Delta_0$ d) $-0.6\Delta_0$
7. $[FeF_6]^{4-}$ has four unpaired e^-s . The number of unpaired electrons in $[Fe(CN)_6]^{4-}$ is
a) four b) two c) nil d) one
8. The element that does not occur in nature
a) rhenium b) iridium c) rhodium d) technitium
9. Lithium dialkyl cuprate is used in
a) Grignard reaction b) Posner Whitesides – House synthesis
c) Wittig reaction d) Hunsdiecker reaction
10. Which of the following compounds is paramagnetic
a) $Cr(CO)_6$ b) $V(CO)_6$ c) $Ni(CO)_4$ d) $Fe(CO)_5$

II Fill in the blanks :

11. Ru and Os have a maximum oxidation state of _____.
12. The metal present in Vitamin B₁₂ is _____.
13. _____ was the first Inorganic chemist to be awarded the Nobel prize in chemistry.
14. $[CO(NH_3)_5NO_3]SO_4$ shows _____ (positive or negative) test with $CaCl_2$.
15. _____ is not rejected by human body and so it is used for making screws for fracture repairs.

I11 State whether true or false:

16. $[Fe(CN)_6]^{4-}$ is diamagnetic and it is a high spin complex.
17. $Fe_2(CO)_9$ has a metal-metal bond.
18. $La(OH)_3$ is the most basic while $Lu(OH)_3$ is least basic.
19. t_{2g} orbitals are called axial orbitals.
20. $[Fe(CO)_4]^{2-}$ is isoelectronic with $Ni(CO)_4$

IV Match the following

- | | | |
|-------------------------|---|-------------------------------|
| 21. $[CoCl_4]^{2-}$ | - | Tetrahedral and diamagnetic |
| 22. $[Fe(H_2O)_6]^{2+}$ | - | Tetrahedral and paramagnetic |
| 23. $[Fe(CN)_6]^{2-}$ | - | Octahedral and paramagnetic |
| 24. $[Zn(NH_3)_4]^{2+}$ | - | Square planar and diamagnetic |
| 25. $[Pt(NH_3)_4]^{2+}$ | - | Octahedral and diamagnetic |

V Answer in one or two sentences:

26. What is Wilkinson's catalyst?
27. Calculate the EAN for $[Mn(CN)_4]^{2-}$.
28. What is the eluent in the separation of lanthanides by ion-exchange chromatography?
29. How is $Mn_2(CO)_{10}$ prepared?
30. How is ferrocene prepared?

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SECTION – B

(5x6=30)

Answer any five questions:

1. How is Titanium extracted from its ore?
2. Discuss the significance of the following in analysis.
a) Oxine b) Cupferron c) Ferroin indicator
3. Account for the following
[Ni(CO)₄] is tetrahedral and diamagnetic but [Ni(CO)₄]²⁻ is square planar but diamagnetic.
4. What are the assumptions and limitations of crystal field theory?
5. Discuss the type of hybridisation and shapes of the following and predict their magnetic behaviour
a) Cr(CO)₆ b) Fe(CO)₅
6. Explain with examples the geometrical isomerism exhibited by 4-coordinated complexes.
7. Give the IUPAC name of the following
a) [Cr(NCS)₄(NH₃)₂]⁻ b) [Ni(CO)₃Py] c) [Cu(en)₂]SO₄

SECTION – C

(2x20=40)

Answer any two questions:

8. a) What is the significance of spectrochemical series of ligands? Explain.
b) Discuss the structure and bonding in ferrocene.
c) Give the postulates of Werner's theory of coordination complexes. (6+8+6)
9. a) How is crystal field theory used to explain the stability, magnetic properties and reactivity in octahedral complexes.
b) Give a comparative account of the oxides of Manganese family.
c) Explain John Teller distortion observed in square planar complexes. (8+6+6)
10. a) Give a comparative account of Lanthanides and Actinides.
b) Discuss the structure of metal carbonyls.
c) What are the applications of Organo Lithium compounds. (6+8+6)
11. a) How are Lanthanides separated by ion exchange chromatography? (6)
b) What is Lanthanide contraction? Discuss its consequences. (3+5)
c) How is Uranium extracted from Pitchblende? (6)

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