

STELLA MARIS COLLEGE (AUTONOMOUS) CHENNAI – 86  
(For candidates admitted from the academic year 2009–10 & thereafter)

SUBJECT CODE : CH/PC/CO24  
M.Sc. DEGREE EXAMINATION APRIL 2011  
BRANCH IV – CHEMISTRY  
SECOND SEMESTER

REG.NO .....

COURSE : CORE

PAPER : COORDINATION CHEMISTRY

TIME : 30 MINS

MAX. MARKS :20

SECTION – A

TO BE ANSWERED ON THE QUESTION PAPER ITSELF.

Answer all the questions.

(20 x 1= 20)

I CHOOSE THE CORRECT ANSWER:

- Which is the most stable complex ion among the following  
a)  $[Ba(OH)]^+$       b)  $[Mg(OH)]^+$       c)  $[Be(OH)]^+$       d)  $[Ca(OH)]^+$
- Number of stereo isomers exhibited by the complex,  
 $[Pt Br Cl I (NO_2) (C_5H_5N) (NH_3)]$  is  
a) 15                      b) 30                      c) 45                      d) 60
- The CFSE value of  $d^5$  low spin octahedral is  
a) 16 Dq                      b) 20 Dq                      c) 0 Dq                      d) 4 Dq
- Which is strong field ligand?  
a)  $Cl^-$                       b)  $F^-$                       c)  $CN^-$                       d)  $I^-$
- Ground energy state for the  $d^2$  free ion is  
a)  $^1D$                       b)  $^1G$                       c)  $^3P$                       d)  $^3F$
- The correct increasing order of trans-directing ability is  
a)  $Cl^- < Br^- < Py < NH_3$                       b)  $Py < NH_3 < Cl^- < Br^-$   
c)  $NH_3 < Cl^- < Br^- < Py$                       d)  $NH_3 < Py < Cl^- < Br^-$
- The experimental magnetic moment (in B.M) is the highest for  
a)  $Sm^{3+}$                       b)  $Eu^{3+}$                       c)  $Ga^{3+}$                       d)  $Pm^{3+}$
- The absorption band of  $[Ti(H_2O)_6]^{3+}$  at  $20,400 \text{ cm}^{-1}$  of crystal field origin can be assigned to  
a)  $2E_g \rightarrow 2T_{2g}$       b)  $5T_{2g} \rightarrow 5E_g$       c)  $2T_{2g} \rightarrow 2E_g$       d)  $5E_g \rightarrow 5T_{2g}$
- Non heme iron-sulfur protein involved in electron acceptor in photo synthesis is  
a) Chlorophyll      b) Ferredoxin      c) haemoglobin      d) myoglobin
- The pH dependence shown by hemoglobin is known as  
a) cooperativity effect      b) Hill effect      c) Bohr effect      d) Chelate effect

**II FILL IN THE BLANKS:**

11. Irvin-William order of stability of complexes is consistent with \_\_\_\_\_ concept.
12. In  $dsp^3$  hybridised orbitals,  $d$  orbitals involved is \_\_\_\_\_ of the inner shell.
13. Tanabe-Sugano diagram is useful in the interpretation of \_\_\_\_\_ in one electronic spectra.
14. The blue colour of  $CuSO_4 \cdot 5H_2O$  is due to absorption around \_\_\_\_\_  $c. m^{-1}$ .
15. The ligand in vit B<sub>12</sub> has \_\_\_\_\_ structure, while that in chlorophyll has \_\_\_\_\_ structure.

**III ANSWER IN ONE OR TWO SENTENCES:**

16. Write the linkage photo isomerization product of  $[Co(NH_3)_5(NO_2)^2]^+$ .
17. State Jahn-Teller effect.
18. Explain Racah parameter.
19. Why  $[Fe(CN)_5(NH_3)]^{3-}$  has a less negative isomer shift than  $[Fe(CN)_6]^{4-}$  ?
20. Why do transition elements form co-ordination compounds?

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TIME : 2 HOURS & 30 MINS

MAX. MARKS :80

SECTION – B

Answer any five questions.

(5x8=40)

1. Explain the factors affecting the stability of coordination compounds.
2. Name the different kinds of isomerism possible in coordination compounds. Give one example of each kind.
3. Discuss carefully and concisely the splitting of d-orbitals in the case of  
(i) Octahedral Complexes (ii) Tetrahedral Complexes.
4. What is trans effect? Explain it with suitable examples. Discuss polarization theory.
5. Describe the ESR spectra of
  - a) bis – Salicyaldimine copper (II)
  - b)  $[(NH_3)_5 - Co - O - O - Co(NH_3)_5]^{3+}$  (4+4)
6. Discuss the role played by metal ions in biological system.
7. Write a note on biological fixation of nitrogen.

SECTION – C

Answer any two questions.

(2x20=40)

8.
  - a) Describe the photo substitution reactions of chromium and cobalt complexes.
  - b) Discuss the stereochemistry of complexes exhibiting coordination number 4 and 6. (10+10)
9.
  - a) Discuss the factors influencing the magnitude of crystal field splitting.
  - b) Draw and explain Mössbauer spectra of
    - (i)  $K_4[Fe(CN)_6]$
    - (ii)  $K_3[Fe(CN)_6]$
    - (iii)  $Na_2[Fe(CN)_5NO]$
  - c) Explain the utility of Orgel diagram. (8+9+3)
10.
  - a) Write a brief notes on macrocyclic compounds.
  - b) Illustrate the structure of myoglobin and hemoglobin. Describe in detail the role played by these bio-inorganic compounds in biological system.



