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 2007
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. It is very difficult to separate the lanthanides because
   a) They occur only in trace quantities
   b) Their compounds are volatile
   c) They occur together
   d) They have similar ionic radii and chemical properties due to lanthanide contraction

2. Ilmenite is an ore of
   a) Zr b) Mo c) Ti d) Co

3. In the structure of $Fe_2(CO)_9$ between the two Fe atoms, there are
   a) 3 carbonyl groups b) only one carbonyl group
   c) 2 carbonyl groups d) all carbonyl groups

4. The geometry of $[Ni(NH_3)_4]^{2+}$
   a) Square planar b) Tetrahedral c) Tetragonal d) distorted octahedron

5. Identify which among the rare earth elements do not occur naturally
   a) Praseodymium b) Promethium c) Thulium d) Lutetium

6. The uranyl ion is represented by
   a) UO_2^+ b) UO_2^{2+} c) UO_3^+ d) UO^{2+}

7. Calcium titanate is known as
   a) pervoskite b) ilmenite c) rutile d) siderite

8. V^{3+} has the electronic configuration
   a) d^2 b) d^4 c) d^3 d) d^1

9. Which of the following pairs of lanthanides resemble each other very closely
   a) La & Lu b) Ce & Pr c) Eu & Yb d) Pr & Nd

10. The highest known oxidation state of manganese is
    a) +4 b) +5 c) +7 d) +8

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II State whether true or false:

11. Titanium tetrachloride is a ionic compound.
12. The four coordinated complexes always have square planar geometry.
13. Niobium and Tantalum can be separated by solvent extraction using kerosene.
14. Molybdenum and tungsten form polyacids.
15. $Ni(CO)_4$ has a square planar structure.
16. When the octahedral crystal splitting energy is larger, low spin or spin-paired complexes are formed.
17. Zn2+ generally forms four coordinated complexes.
18. Manganese forms a mononuclear carbonyl.
19. $Fe(CO)_5$ has a trigonal bipyramidal structure involving dsp3 hybridization.
20. The similarities in properties between zirconium and hafnium are attributed to lanthanide contraction.

I11 Fill in the blanks :

21. The name of the complex $[Pt(CH_3NH_2)_2(NH_3)_2]Cl_2$ is _____.
22. Cu^{2+} forms a stabler complex with ethylenediamine than with ammonia because of _____.
23. The crystal field energy is larger for an octahedral complex than for a _____.
24. Among the following ligands pyridine, CN^-, F^- and NH_3, _____ has the lowest ligand field strength.
25. The geometry of [Cr(CO)6] as predicted by valence bond theory is _____.
26. The formula of pentacarbonyl manganese(I) ion is _____.
27. Thorium is extracted from _____ ore.
28. The ionic radii of the rare earth elements _____ from La to Lu.
29. The formula of the complex potassium pentacyanonitrosyl ferrate (II) is _____.
30. $[FeF_6]^{4-}$ has _____ unpaired electrons.

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TIME : 2½ HOURS **MAX.MARKS : 70**

SECTION – B **(5x6=30)**

Answer any five questions:

1. Distinguish between mononuclear carbonyls. Discuss the preparation and structure of a binuclear carbonyl of iron.

2. Explain Sidgwick's EAN rule with suitable examples. Give its merits and limitations.

3. Name an ore of titanium. How is titanium extracted from it ?

4. Discuss any three points of similarities and three dissimilarities between Fe, Co & Ni.

5. What are strong field and weak field ligands? Explain with suitable examples.

6. What is lanthanide contraction and what are its consequences?

7. Explain the isomerism observed in Pt(II) and Pt(IV) coordination complexes.

SECTION – C **(2x20=40)**

Answer any two questions:

8. a) What are spin-paired(low spin) and spin-free(high spin) complexes? Explain with examples using CFT.
   b) How does CFT account for the colour of coordination complexes?

9. Give the preparation, properties and structure of ferrocene based on MOT.

10. Name the important ore of uranium. How is uranium extracted from it? What are the uses of uranium? Discuss the position of actinides in the periodic table.

11. How is CFT used to explain the stability and magnetic properties and reactivity of octahedral complexes? Calculate the spin only magnetic moment for a d^4 high spin octahedral complex.

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