LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – CHEMISTRY

FIFTH SEMESTER – APRIL 2010

CH 5506 - TRANSITION ELEMENTS AND NUCLEAR CHEMISTRY

Date & Time: 27/04/2010 / 1:00 - 4:00   Dept. No.   Max. : 100 Marks

PART – A

Answer ALL questions.   **(10 x 2 = 20 marks)**

1. What happens when zinc is added to acidified ammonium vandate?

2. What are metal cluster compounds? Give an example.

3. Orbital contributions to magnetic moments of lanthanide ions are significant. Why?

4. List out the salient features of electronic spectra of actinides.

5. Write down the IUPAC names of the following complexes:

      a. $K[Cr(oxal)_2(H_2O)_2].3H_2O$ b.$[NiCl(en)_2(NH_3)]Cl$

6. Illustrate Fac and Mer isomers of six-coordinate octahedral complexes.

7. What are pi-mesons and K-mesons?

8. What is positive beta decay?

9. Why is technetium 99 m is used for diagnostic purposes?

10. Explain orbital electron capture.

PART – B

Answer any EIGHT questions.   **(8 x 5 = 40 marks)**

11. Discuss the toxic effects of lead and mercury and the detoxification methods as
    applicable to them.

12. How is titanium extracted from its ores?

13. How is neptunium synthesized? What are its uses? Mention its oxidation states.

14. Write a note on occurrence and isolation of uranium.

15. The hexaquo manganese (II) ion contains five unpaired electrons, while the hexacyano- ion contains
    only one unpaired electron. Explain, using Crystal Field Theory.

16. What is meant by spectrochemical series? Explain.

17. Determine the CFSE as a multiple of Δ_o for the following:

   (a) $[Fe(H_2O)_6]^{2+}$ (b) $[Cr(CN)_6]^{4-}$ (c) $[Cr(NH_3)_6]^{3+}$

(P.T.O)

18. ^{1210}Po has a half-life of 138.38 days. If 4.00 mg of ^{210}Po were allowed to decay for 30.0 days, how much would remain?

19. What is binding energy? How is it related to the stability of nuclei?

20. Discuss the shell model of nucleus on the basis of closed shells of magic numbers.

21. Fill in the blanks of the following nuclear equations.

     a. $^{238}_{92}U \rightarrow \alpha +$ ___

     b. $n + {}^{1}H \rightarrow$ ___

     c. $^{17}_{8}O + \beta \rightarrow {}^{14}_{6}C +$ ___
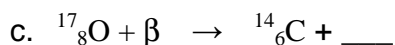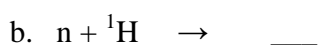
22. What are fissile and fertile nuclei? Explain.

PART – C

Answer any FOUR questions   **(4 x 10 = 40 marks)**

23. a) How is potassium dichromate prepared?   (4)

    b) Write briefly on interstitial nitrides and carbides.   (6)

24. a) Write a brief note on complexes of lanthanides.

    b) Explain the various methods of separation of lanthanides.   (3+7)

25. a) List out the major drawbacks of VBT.   (3)

    b) Mention the main postulates of VB theory of coordination compounds. How does it explain the magnetic properties and shapes of $[Cr(NH_3)_6]^{3+}$ and $[Fe(CN)_6]^{3-}$?   (7)

26. a) What are chelates? Why are chelated complexes more stable than similar complexes with monodentate ligands?   (7)

    b) How are d-orbitals split, when a transition metal ion is placed in an octahedral field?   (3)

27. Describe the functioning of scintillation counter. List out the advantages of scintillation counter

28. Describe the liquid drop model for nuclear structure. How does it explain fission process?

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