



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – CHEMISTRY

FIFTH SEMESTER – NOVEMBER 2011

CH 5506 - TRANSITION ELEMENTS AND NUCLEAR CHEMISTRY

Date : 02-11-2011
Time : 9:00 - 12:00

Dept. No.

Max. : 100 Marks

PART - A

Answer ALL the questions

(10 x 2=20)

1. Why do transition elements exhibit various oxidation states?
2. State any two toxic effects of cadmium.
3. “The lanthanide elements show the common stable oxidation state of +3” – comment.
4. List out the differences between lanthanides and actinides.
5. What are high spin complexes? Give an example.
6. State and explain Sidgwick’s theory of effective atomic number rule.
7. Define the term: ‘n/p ratio’.
8. Mass defect in a nuclear fission is 0.213 a.m.u. Calculate the energy released.
9. Write the difference between nuclear reaction and chemical reaction.
10. Mention any two nuclear power projects in Indian and their role.

PART B

Answer any EIGHT of the following

(8 x 5=40)

11. Why transition metals act as catalysts? Give two examples of reactions catalyzed by them.
12. How is chromium extracted from its ore?
13. Write a note on lanthanide contraction.
14. Explain the electronic spectra of lanthanide compounds.
15. Explain the linkage – isomerism in complexes with two examples
16. Describe the splitting of d-orbitals in a tetrahedral complex.
17. What are the salient features of Pauling’s theory and explain the hybridization, geometry and magnetic properties of complex ions $[\text{CoF}_6]^{3-}$ and $[\text{Co}(\text{CN})_6]^{3-}$ based on Pauling’s theory?
18. Explain the radioactive displacement law with examples.
19. How is radioactivity determined using scintillation counter?
20. 2g of a radioactive element is reduced to 0.25g in 24 hours. What is the half-life of this radioactive element?
21. What is meant by nuclear cross section? Bring out its significance.
22. Write a note on Radio Carbon dating.

PART - C

Answer any FOUR of the following

(4 x 10=40)

23. a) How are vanadates and molybdates are synthesized?
b) Explain in detail the biological importance of zinc and cobalt.
24. a) How lanthanides can be separated by ion-exchange method?
b) Explain in detail the extraction of uranium.
25. a) Calculate the CFSE for the d^5 configuration under O_h field of geometry.
b) Give a comparative account of valence bond and crystal field theories proposed for complexes.
26. Describe the geometrical and optical isomerism of octahedral complexes.
27. Write notes on
- (i) Induced radioactivity
 - (ii) Shell model of the nucleus
 - (iii) Nuclear stability
28. a) Explain the principle of fast breeder reactors. Name the coolants, fuels and moderators used in nuclear reactors.
b) Give any four safety precautions observed in nuclear reactors.

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