LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc., DEGREE EXAMINATION – **CHEMISTRY**

FOURTH SEMESTER – **APRIL 2015**

CH 1019 – NUCLEAR AND SOLID STATE CHEMISRY

Date : 24/04/2015   Dept. No.   Max. : 100 Marks
Time : 09:00-12:00

PART-A

Answer ALL questions. Each question carries two marks.   *(10 x 2 = 20 marks)*

1. How do neutrons help stabilizing the nucleus?
2. Differentiate space- and point groups.
3. What is nuclear isomerism? Cite an example.
4. Why do α-particles have small range?
5. State Geiger-Nuttal rule.
6. Define glide plane and screw axis.
7. Why does γ-ray emission occur after any nuclear processing?
8. What are superconductors?
9. What is piezoelectric effect?
10. What are Weiss indices?

PART-B

Answer any EIGHT questions. Each question carries five marks.   *(8 x 5 = 40 marks)*

11. Explain the mechanism of γ-ray emission.
12. What are mesons? Describe their role in stabilizing nucleus.
13. What are magic numbers? Mention their significance.
14. Account for the fact that ^{63}Cu and ^{65}Cu exist in nature, but not ^{64}Cu.
15. Explain hot atom chemistry citing an example.
16. What are (n, γ) reactions? Mention their significance.
17. Write a note on crystal defects.
18. Explain the characteristics of metallic crystals.
19. Highlight the working principle of a dye sensitized solar cell.
20. Describe the band theory and explain the properties of metals and semiconductors.
21. What is surface relaxation?
22. Explain the principle of LEED technique.

PART-C

Answer any FOUR questions. Each question carries ten marks.   *(4 x 10 = 40 marks)*

23. a) Explain factors which affect the stability of a nucleus.
    b) Write a note on nuclear fusion.
24. Discuss the advantages and disadvantages of producing energy using nuclear fission.
25. Explain the working principles and advantages of different types of radio particle counters.
26. a) What is p-n junction? Describe its characteristics.
    b) Describe the working principle of photovoltaic cell.
27. Describe the crystal systems and their characteristic symmetry features.
28. a) Explain the principle and the procedures involved in single crystal X-ray diffraction and collecting intensity data.
    b) Explain the heavy atom method in analyzing the intensity data from X-ray diffraction.

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