LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

FOURTH SEMESTER – APRIL 2010

CH 4952 - NUCLEAR & SOLID STATE CHEMISTRY

Date & Time: 29/04/2010 / 9:00 - 12:00 Dept. No. | | Max. : 100 Marks

PART – A

Answer **all** the questions (10 x 2 = 20)

1. What are isotopes and isotones?
2. Complete the following:
   ^{236}U ---------→ ---------- + 7 α + 2 β^- + γ
3. What are magic numbers? Why are they called so?
4. Draw (210) and (111) planes in a cube
5. What is the relationship between nuclear spin,I and quadrupole moment?
6. What is F- center?
7. What is Cerenkov radiation?
8. Mention any two methods to get hydrated electrons?
9. What is Geiger-Nuttal rule?
10. What is nuclear spallation reaction? Give an example.

PART – B

Answer **any eight** questions (8 x 5 = 40)

11. What are transUranium elements? Give the synthesis of any two transuranium elements.
12. What are the differences between Frenkal and Schottky defects?
13. What is Auger effect? Mention the applications of this effect.
14. What are spurs and δ- rays?
15. Discuss the principles involved in Fricke's dosimetry
16. A unit cell consists of a cube in which there are anions (B) at each corner and one at the centre and cations (A) at the centre of each face. How many cation and anions make up the unit cell? What is the simplest formula(Ax By) for the compound?
17. Write note on i) miller indices ii) space lattice
18. What are stoichiometric defects? How are they caused?
19. Name any four crystal system. Give the characteristics of any two of them.
20. Differentiate between cubic close packing and hexagonal close packing.
21. What are the postulates of liquid drop model of nuclei? How does it support the calculation of binding energy?
22. Differentiate nuclear fission and nuclear fusion reactions. b) Complete the nuclear reaction:
    $_{12}Mg^{24}$ ($_0n^1$, $_1H^1$), ----------, $_{17}Cl^{35}$($_2He^4$, $_0n^1$) ----------

PART C

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

23. Explain any five factors affecting the nuclear stability.
24. How does shell model explain the periodicity in nuclear properties?
25. a) Derive the relationship between $t_{1/2}$ and t_{avg} .

    b) The activity of a radioactive isotope falls to 12.5% in 90 days. Compute the half-life and decay constant of the isotope.
26. Explain the principles and working mode of Geiger counters.
27. Explain the principles involved in X-ray diffraction and neutron diffraction methods.
28. What is radius ratio rule? Describe the crystal structure of rutile and cesium chloride.

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