LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – CHEMISTRY

SECOND SEMESTER – APRIL 2010

CH 2954 - NUCLEAR AND RADIO CHEMISTRY

Date & Time: 23/04/2010 / 1:00 - 4:00   Dept. No.   Max. : 100 Marks

PART – A

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

1. What are isotones? Give an example.

2. What is the relationship between nuclear spin, and quadrupole moment?

3. What are magic numbers? What is the significance of the number?

4. Hail-life of Po^{210} is 140 days. Calculate the number of days after which ¼ g of Po will be left from 1 g of the isotope.

5. What is Auger effect?

6. What are spurs and δ-rays?

7. What is Geiger-Nuttal rule?

8. What are fissile and fertile nuclei? Give two examples.

9. Why is heavy water instead of ordinary water used as a moderator in swimming pool reactor?

10. Mention any two applications of isotopes as radiopharmaceuticals.

PART – B

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

11. Discuss the semi empirical mass equation and its application to support liquid drop model of nuclei.

12. Compare the range and ionizing power of α, β and γ radiation

13. The activity of a radioactive substance falls to 12.5% in 90 days. Compute the half–life and decay constant of the isotope.

14. Explain the tunnel mechanism of α decay from radioactive nuclei

15. Explain the principles involved in chemical dosimetry.

16. Explain the Hart and Boag's experiment of detecting the hydrated electron.

17. Discuss the principles involved in ionization and scintillation counters.

18. Explain the following types of nuclear reaction:

i) electron capture reaction   ii) fusion reaction

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19. How do charged particles interact with matter?

20. What is the principle of isotopic dilution analysis.

21. What are F-centres? How it is related with aqualuminescenes?

22. What is positron annihilation? Mention the application of this process

PART C

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

23. Discuss the shell model of nucleus.

24. a) Derive the relationship between $t_{1/2}$ and t_{avg} .

    b) What are spallation reaction? Explain with an example..

25. How do the concepts of Nuclear magnetic resonance help as a source for Massbauer spectral analysis.

26. Explain the principles and working mode of Geiger counters.

27. What are hydrated electrons? How are they obtained? Explain the properties of hydrated electrons.

28. Explain the principles of Neutron activation analysis and dating of objects.

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