



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION - CHEMISTRY

SECOND SEMESTER – APRIL 2013

CH 2954 - NUCLEAR AND RADIO CHEMISTRY

Date : 04/05/2013

Dept. No.

Max. : 100 Marks

Time : 9:00 - 12:00

Part – A

Answer *all* the questions

(10 x 2 = 20)

1. What is meant by nuclear isomerism?
2. What is meant by binding energy of a nucleus?
3. Derive a relationship between $t_{1/2}$ and decay constant of a radioactive isotope?
4. When does a nucleus emit gamma ray?
5. Explain electron capture with an example.
6. What is group displacement law?
7. What are compound nuclei?
8. What is meant by enriched uranium?
9. Give principle of carbon dating?
10. Why are electrons not found inside the nucleus?

Part – B

Answer any *eight* questions

(8 x 5 = 40)

11. What is the role of mesons in stabilizing the nucleus? What are various types of mesons?
12. What are 'magic numbers'? What is its significance?
13. Explain Geiger-Nuttall Rule and its application.
14. An isotope of plutonium with mass number 240 disintegrates to form stable ^{208}Pb . Assuming only α and β^- particles are emitted, deduce the number of α and β^- emitted in this process.
15. Why are nuclear fusion reactions not employed for energy tapping?
16. Natural isotopic abundance of ^{85}Rb and ^{87}Rb are 72% and 28% respectively. Calculate the atomic weight of rubidium obtained from natural sources?
17. Explain the principle of scintillation counters?
18. Mention any two coolants used in a nuclear reactors and advantages of using these coolants.
19. Account for the fact that ^{39}K and ^{41}K are known but not ^{40}K .
20. What are thermal neutrons? How are they obtained?
21. Briefly explain 'Auger effect'?
22. Explain the principle of Mossbauer spectroscopy.

Part – C

Answer any **four** questions.

(4 x 10 = 40)

23. Describe an experiment which proves that the size of nucleus is much smaller than than the size of an atom.
24. What are the salient features of 'liquid drop model' of nucleus? How does this theory explain [i]nuclear fission and [ii]nuclear fusion (4+6)
25. Discuss advantages and disadvantages of using neutron diffraction technique in comparison with electron diffraction technique.
26. Draw a signal size to applied potential graph for a radio particle and explain different regions in it.
27. Discuss the production, properties and models for solvated electrons.
28. Explain neutron activation analysis and advantages of this technique.
