LOYOLA COLLEGE (AUTONOMOUS) CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – **CHEMISTRY**

FIFTH SEMESTER – **NOVEMBER 2024**

UCH 5504 – TRANSITION ELEMENTS AND NUCLEAR CHEMISTRY

Date: 18-11-2024 Dept. No. Max. : 100 Marks

Time: 09:00 am-12:00 pm

SECTION A

Answer ANY FOUR of the following **4 x 10 = 40 Marks**

1. Discuss the iron triad and its significance.
2. Explain the preparation, properties and applications of cast iron.
3. Describe the MacArthur-Forrest cyanide process.
4. Outline the chemical properties of uranium halides.
5. Analyse the oxidation states of lanthanides.
6. Explain the liquid drop model and its application in nuclear stability.
7. Summarize the processes of radioactive decay emphasizing α, β and γ-decays.
8. Examine the components and functioning of a fast breeder reactor.

SECTION B

Answer ANY THREE of the following **3 x 20 = 60 Marks**

9. a) What are the similarities and differences among Cu, Ag and Au? (10)
   b) Compare the lower oxidation states of first-row d-block elements with other d- block rows. (10)
10. a) Discuss the high-temperature chemical reduction methods. (10)
    b) Outline the methods of metal purification using zone refining and van-Arkel process. (10)
11. a) Discuss the safety and environmental considerations of uranium extraction. (10)
    b) Highlight the similarities and differences between actinides and lanthanides. (10)
12. a) What are Geiger and scintillation counters? How do they detect radiation? (10)
    b) The mass defect of a nucleus is 0.05 amu, calculate the binding energy of the nucleus in MeV. (5)
    c) What is the difference between natural and induced radioactivity? (5)
13. a) Discuss the advantages and limitations of radiopharmaceuticals in medical diagnostics. (10)
    b) Outline the principle and processes involved in the explosion of an atomic bomb. (10)
14. a) Explain the Ellingham diagram. (10)
    b) Summarize the carbon-nitrogen cycle and the proton-proton cycle in stars. (10)
