

LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034



B.Sc. DEGREE EXAMINATION – CHEMISTRY

FIFTH SEMESTER – APRIL 2022

UCH 5504 – TRANSITION ELEMENTS AND NUCLEAR CHEMISTRY

Date: 16-06-2022

Dept. No.

Max. : 100 Marks

Time: 09:00 AM - 12:00 NOON

Part – A

Answer ALL Questions

(10 x 2 = 20)

1. Differentiate calcination and roasting.
2. What is aluminothermic process?
3. Give the name and electronic configuration of the lanthanide which is used in MRI agents.
4. What is sodium nitroprusside? Mention its uses.
5. List out the types of iron with their compositions.
6. What are transuranic elements? Mention their significances.
7. Complete the nuclear reactions: i) ${}_{13}\text{Al}^{27}({}_2\text{He}^4, {}_0\text{n}^1) \rightarrow ?$ ii) ${}_6\text{C}^{12}({}_0\text{n}^1, {}_{-1}\text{e}^0) \rightarrow ?$
8. Half-life period of ${}_{53}\text{I}^{125}$ is 60 days. What percentage of the original radioactivity would be present after 240 days?
9. What are fissile and fertile isotopes? Give an example for each.
10. What is the role of $\text{Tc}^{99\text{m}}$ in radiopharmaceuticals?

Part – B

Answer any EIGHT Questions

(8 x 5 = 40)

11. Write a brief note on i) zone refining process ii) Van-Arkel process of refining.
12. Discuss the properties of exhibiting variable oxidation state and catalytic properties of I row transition elements with suitable examples.
13. Highlight any five similarities of copper and nickel by giving the chemical reactions.
14. Compare the properties of elements of iron triad.
15. Discuss the shell structure of nuclei.
16. Highlight the application of Ellingham diagram in metallurgy.
17. How are individual lanthanides separated by ion-exchange chromatographic method?
18. Explain the following terms with suitable examples: i) isotopes ii) isobars iii) isotones. (3)
19. How does n/p ratio affect the nuclear stability? (3)
20. Differentiate nuclear fusion and nuclear fission reactions with suitable examples.
21. Write a brief note on the types of radioactive series.
22. How is radioactivity measured using scintillation counter?

Part – C

Answer any FOUR Questions

(4 x 10 = 40)

23. Write a brief note on the different steps involved in the extraction of metal from its ores.
24. What is lanthanide contraction? Discuss its consequences in affecting the properties of other elements.
25. How is uranium extracted from its ores? (5+5)
26. Discuss in detail any five factors affecting nuclear stability of the nucleus.
27. Describe the working principle of nuclear reactor.
28. Write a brief note on
 - a) Geiger -Nuttal rule
 - b) Soddy - Fajans group displacement law
 - c) Fertile and fissile nuclei.

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