LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

SIXTH SEMESTER - APRIL 2022

16/17/18UCH6MC02 - TRANSITION ELEMENTS AND NUCLEAR CHEMISTRY

Date: 17-06-2022	Dept. No.	Max. : 100 Marks
Time: 01:00 PM - 04:00 PM		

Part – A

Answer all the questions

 $(10 \times 2 = 20)$

- 1. Most of the transition elements are colored in solid or in solution. Justify.
- 2. In the first row of transition elements, Fe, Co and Ni are more paramagnetic than rest of the elements. Justify.
- 3. List out the reagents added in the froth flotation process.
- 4. What is meant by passivity of iron?
- 5. Highlight any two differences between the properties of I row and other two rows of transition elements.
- 6. Cite the metals which are occurring in its native state.
- 7. Complete the nuclear reaction. (i) ${}_{13}\text{Al}^{27}({}_{2}\text{He}^{4},{}_{0}\text{n}^{1})$ ----- (ii) ${}_{6}\text{C}^{12}$ (${}_{0}\text{n}^{1},{}_{-1}\text{e}^{0}$) -----
- 8. Give the name and electronic configuration of the lanthanide which is radioactive.
- 9. What are the actinides used as nuclear fuel in nuclear reactor?
- 10. What are fissile and fertile isotopes? Give an example for each.

Part – B

Answer any eight questions

 $(8 \times 5 = 40)$

(2)

- 11. How is vanadium extracted from its ore?
- 12. Discuss any five common properties of Fe, Co and Ni group elements.
- 13. Discuss the properties of exhibiting variable oxidation state and catalytic properties of I row transition elements with suitable examples.
- 14. How are individual lanthanides separated by ion exchange chromatographic method?
- 15. (i) How does the binding energy per nucleon affect the nuclear stability?
 - (ii) The observed mass of $_{26}$ Fe 56 is 55.9375amu. The mass of proton and neutron are 1.00732 and 1.00866 amu respectively. Calculate the binding energy per nucleon in Mev. (3)
- 16. Explain the nuclear fusion and nuclear spallation reaction with suitable examples.
- 17. How is the activity of radioisotope measured by using GM counters?
- 18. Draw Ellingham diagram and explain its uses.
- 19. Distinguish between atom bomb and hydrogen bomb.
- 20. Define the following with an example: i) isotopes ii) isotones iii) isobars iv) nuclear isomers
- 21. Compare the properties of lanthanides and actinides.
- 22. How is radioactivity measured by Geiger-Muller counters?

Part - C

Answer any four questions

 $(4 \times 10 = 40)$

- 23. How is uranium extracted from its ores?
- 24. (i) What is lanthanide contraction?
 - (ii) Discuss its consequences in affecting the properties of other elements.

(5+5)

- 25. Discuss in detail any five factors affecting nuclear stability of the nucleus.
- 26. Derive the relationship between decay constant and $t_{1/2}$ of radioactive disintegration reaction.
- 27. Describe the working principle of nuclear reactor.
- 28. (i) Describe the principle involved in radio-carbon dating.

(5+5)

(ii) Enlist the applications of nuclear isotopes in Industry.

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