LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

SIXTH SEMESTER – **APRIL 2023**

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

Date: 03-05-2023 Dept. No. Max. : 100 Marks

Time: 09:00 AM - 12:00 NOON

Part – A

Answer ALL questions **(10 x 2 = 20 Marks)**

1. Differentiate roasting and calcination process of treating ores.
2. Illustrate with any two examples of d-block elements exhibiting catalytic properties.
3. Differentiate the properties of lanthanides and actinides.
4. List out the isotopes of actinides used as nuclear fuel in nuclear reactor.
5. Highlight the significances of various types of platinum.
6. What are the elements present in iron triads?
7. The relative atomic mass of copper is 63.5. Calculate the percentage of the isotope of $_{29}Cu^{63}$ and $_{29}Cu^{65}$ present in it.
8. State Geiger-Nuttal law.
9. What are fissile and fertile isotopes? Give an example for each.
10. What is the role of Tc^{99m} in radiopharmaceuticals?

Part – B

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

11. Explain the role of Ellingham diagram in explaining the thermodynamics of reduction process.
12. Discuss any five similarities between copper and nickel.
13. How is titanium extracted from its ore?
14. Discuss any five common properties of Fe, Co and Ni group elements.
15. Discuss the catalytic properties of I row transition elements with suitable examples.
16. How are individual lanthanides separated by ion-exchange chromatographic method?
17. Highlight the similarities and gradation in the properties of copper group elements.
18. What is lanthanide contraction? Discuss its consequences in affecting the properties of other group elements.
19. i) How does the binding energy per nucleon affect the nuclear stability? (2)
    ii) The observed mass of $_{26}Fe^{56}$ is 55.9375amu. The mass of proton and neutron are 1.00732 and 1.00866amu respectively. Calculate the binding energy per nucleon in Mev. (3)
20. Define the following with suitable examples: isotones, isobars and isotopes
21. Derive the relationship between decay constant and half-life time of radioactive disintegration.
22. How is the activity of radioisotope measured by using GM counters?

Part – C

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

23a. Write a note on the heat treatment of steel.

b. Highlight the unique properties of the following process: i) Mond process ii) zone.

24. How is uranium extracted from its ores?
25. Explain the different steps involved in concentrating ores.
26. Discuss in detail any five factors affecting nuclear stability of the nucleus.
27. Describe the working principle of nuclear reactor.

28a. Describe the principle involved in radio-carbon dating.

b. Explain the following types of nuclear reactions with suitable examples.
   (i) fission (ii) fusion (iii) spallation

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