



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – CHEMISTRY

THIRD SEMESTER – NOVEMBER 2017

16PCH3MC01- MAIN GROUP ELEMENTS AND NUCLEAR CHEMISTRY

Date: 01/11/2017
Time: 09:00-12:00

Dept. No.

Max. : 100 Marks

Part-A

Answer ALL questions.

(10 × 2 = 20)

1. Compare the structures of graphite and boron nitride.
2. What are crown ethers? Cite an example with its IUPAC name.
3. Give the mechanism of hydrosilylation reaction.
4. What is tungsten bronze? Mention its uses.
5. Write chemical equations to support Cl_2O as oxidizing and halogenating agent.
6. Complete the following chemical reactions
 - (i) $\text{XeF}_2 + \text{I}_2 \rightarrow ?$
 - (ii) $2\text{XeO}_3 + 4\text{NaOH} + 6\text{H}_2\text{O} \rightarrow ?$
7. How is Grignard reagent prepared?
8. List out any four fluorinating agents.
9. Mention the moderators used in a nuclear fission reactor.
10. Why are the nuclear fusion reactions not exploited for energy production?

Part-B

Answer any EIGHT questions.

(8 × 5 = 40)

11. Describe the structure of C_{60} fullerene.
12. (a) How is $(\text{CH}_3)_6\text{B}_3\text{N}_3$ synthesized from boron trichloride?
(b) Complete the following chemical equations:
$$\text{B}_3\text{N}_3\text{H}_6 + \text{H}_2\text{O} \rightarrow$$
$$\text{B}_2\text{H}_6 + 2\text{NH}_3 \rightarrow$$
13. How is sulphur tetranitride synthesized? Give the structure and any three of its chemical reactions.
14. Discuss the types of bonding in B_4H_{10} .
15. a) Arrange the following boranes in the increasing order of acidity and give reason.
 $\text{B}_2\text{H}_6, \text{B}_4\text{H}_{10}, \text{B}_5\text{H}_9, \text{B}_{10}\text{H}_{12}$
b) What are the evidences for $3c-2e^-$ bond in diborane?
16. Write a brief note on the preparation, properties and structure of XeF_4 .
17. Give the synthetic applications of organolithium compounds.
18. How is absolute alcohol prepared?

19. Mention the nuclear reactions which take place in sun.
20. Explain the working of a scintillation counter.
21. Give the principle of carbon dating and its applications.
22. What are the merits of neutron activation analysis?

Part-C

Answer any FOUR questions.

(4 × 10= 40)

23. Justify the following statements:
 - (a) Borazine is considered as inorganic benzene.
 - (b) Zeolite is considered as molecular sieve. (5+5)
24. (a) Discuss the preparation, properties and structure of $C_2B_{10}H_{12}$.
(b) How are silicates classified? Give the basic unit and write two examples for each type.
(5+5)
25. Write a brief note on PSEPT theory and predict the structure of
(a) $N_2B_4H_6$ (b) B_5H_{11} (c) $B_3H_7Fe_2(CO)_6$ (d) $B_9C_2H_{11}^{2-}$
26. What are air sensitive compounds? Give a few examples. How are they used in synthetic reactions?
27. (a) How many α and β particles are emitted in the conversion of ${}_{92}U^{232}$ to ${}_{82}Pb^{208}$?
(b) Explain any four factors affecting nuclear stability. (6+4)
28. (a) Describe the working principle of a conventional nuclear reactor.
(b) What is the principle involved in breeder reactor. (5+5)

\$\$\$\$\$\$\$\$\$\$