MAR IVANIOS COLLEGE (AUTONOMOUS)
THIRUVANANTHAPURAM

Reg. No. :…… **Name :…….**

First Semester B.Sc. Degree Examination, November 2015
First Degree Programme under CBCSS
Complementary Course: Chemistry – I (for Botany and Zoology)
AUCH131.2a / AUCH131.2e: Theoretical Chemistry

(*for 2015 Admissions Only*)

Time: **3** Hours Max. Marks: **80**

SECTION – A

*Answer **ALL** questions in a word or one or two sentences.*

1. What is Rydberg equation ?
2. Which series in the atomic spectrum of hydrogen appears in the ultraviolet region ?
3. What is Zeise's salt ?
4. Give an example of an organoboron compound.
5. Name an acid – base indicator.
6. In sp^3, sp^2 and sp hybridized carbon atom the p character is maximum in _____.
7. Give an example of an internal indicator used in dichrometric titrations.
8. If n = 3 and l = 0, the orbital can be designated as _____.
9. What is meant by a standard solution ?
10. The shape and hybridization of PCl_5 molecule are _____.

(10 × 1 = 10 Marks)

SECTION – B

*Answer any **EIGHT** questions, not exceeding a paragraph.*

11. What is molarity ? Calculate the molarity of Na_2CO_3 solution prepared by dissolving 0.53 g pure anhydrous Na_2CO_3 in 500 mL of water (Molecular mass of Na_2CO_3 = 106).

12. What is meant by hapticity of a ligand ? Give an example.
13. What are quantum numbers ? Mention all values of *l*, *m* and *s*, when n = 3.
14. What are Grignard reagents ? How they are prepared ?
15. What is a self – indicator ? Give an example.
16. Distinguish between primary standard and secondary standard with examples.
17. Sketch the shapes of d_{xy} and d_z^2 orbitals.
18. Write the Schrodinger wave equation and discuss the terms.
19. What are redox indicators ? Give example.
20. What is Fajan's rule ?
21. Explain dsp^2 hybridization with an example.
22. Calculate the weight of oxalic acid required to prepare 0.1 N, 250 mL solution.

(8 × 2 = 16 Marks)

SECTION – C

*Short essay type : Answer any **SIX** questions.*

23. i). Name and state the principles governing the electronic configuration in an atom.
    ii). Explain the stability of half – filled and fully filled orbitals with suitable examples.
24. Discuss different applications of organometallic compounds in medicine.
25. Discuss lanthanide contraction.
26. Discuss some of the biological and environmental aspects of organometallic compounds.
27. Write a note on i). antitumor drugs and ii). sp^3d^2 hybridization.
28. Discuss the Born – Haber cycle taking NaCl as an example.
29. i). Sketch the different series of spectral lines appearing in the atomic spectrum of hydrogen.
    ii). Calculate the wavelength of the first line in Balmer series of hydrogen spectrum ($R = 109678\ cm^{-1}$).
30. Discuss different types of hydrogen bonding with examples.
31. Discuss the shapes of CH_4 and C_2H_2 on the basis of hybridization.

(6 × 4 = 24 Marks)

SECTION – D

*Long essay type : Answer any **TWO** questions.*

32. Draw the MO diagram of CO, NO and O_2^{2-} and explain its bond order, bond length and stability.

33. i). Discuss the organometallic compounds with pi – bonded ligands.
    ii). What are metallocenes ? Explain with suitable examples.
    iii). Explain the bonding in ferrocene and its structure.

34. i). State the postulates of Bohr Theory and derive an expression for the radius of Bohr orbital of hydrogen atom.
    ii). Describe the shapes of *s* and p orbitals based on quantum mechanical concept.

35. Discuss the principles of the following:
    i). Permanganometric titrations.
    ii). Iodometric titrations.
    iii). Complexometric titrations.
    iv). Colorimetric titrations.

(2 × 15 = 30 Marks)

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