(Pages : 3) **D – 5010**

Reg. No. : .....

Name : .....

First Semester B.Sc. Degree Examination, March 2018
First Degree Programme Under CBCSS
Complementary Course I for Botany/Zoology/Microbiology
CH 1131.3/CH 1131.4 : THEORETICAL CHEMISTRY
(2013 – 2016 Admissions)

Time : 3 Hours Max. Marks : 80

SECTION – A

Answer **all** questions. Answer in **one** word to maximum of **two** sentences. **Each** question carries **one** mark.

1. Give the time independent Schrödinger wave equation and explain the terms.
2. Write the electronic configuration of Cu and Cr.
3. What is meant by lanthanide contraction ?
4. Give an example of a molecule having intramolecular hydrogen bonding.
5. State the LCAO principle.
6. Which indicator can be used in the titration of a weak base vs strong acid ?
7. Define the term molarity.
8. Why is starch indicator added towards the end of the titration in iodometric titrations ?
9. Give an example of an organometallic compound used as an antiseptic.
10. State the 18 electron rule regarding the formation of an organometallic compound.

(10×1=10 Marks)

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SECTION – B

Short answer type (**Not** to exceed **one** paragraph). Answer **any 8** from the following. **Each** question carries **two** marks.

11. Calculate the wavelength of the radiation emitted when the electron in the hydrogen atom excited to the 5th energy level returns to the 2nd energy level. (Rydberg constant = $1.097 \times 10^7\ m^{-1}$).

12. Explain the principles relevant in the filling up of atomic orbitals.

13. Distinguish between bonding and antibonding molecular orbitals.

14. Compare the bond order and stability of O_2, O_2^- and O_2^+.

15. State and explain Fajan's rule.

16. Which has a higher boiling point – o-nitrophenol or p-nitrophenol ? Why ?

17. What is the principle made use of in volumetric analysis ?

18. Differentiate between primary and secondary standards with examples.

19. How will you prepare 100 ml of 0.5 N $K_2Cr_2O_7$?

20. What are metallocenes ? Give an example.

21. What are Grignard reagents ? Mention any two applications.

22. Explain the term hapticity with reference to organometallic compound.

(8×2=16 Marks)

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SECTION – C

Short essay (**Not** to exceed **120** words). Answer **any 6** from the following. **Each** question carries **four** marks.

23. Derive the expression for spectral frequency from Bohr equation.

24. Discuss the atomic spectrum of hydrogen.

25. Draw the MO diagram of C_2 molecule and calculate the bond order and explain its stability and magnetic behaviour.

26. Using VSEPR theory predict the geometry of BeF_2 and CH_4.

27. The H-N-H bond angle in NH_3 is 107° though the state of hybridization of N is sp^3. Why ?

28. Discuss briefly the theory of permaganometric titrations.

29. What is the principle applied in colorimetric titration ?

30. Outline the preparation and uses of organoboron and organoarsenic compounds.

31. Write a note on the role of silylated derivatives of bioactive organic compounds in agriculture. **(6×4=24 Marks)**

SECTION – D

Long essay. Answer **any two** questions from the following. **Each** question carries **fifteen** marks.

32. a) Give the important postulates of Bohr theory.

    b) What are the different quantum numbers ? Discuss the significance of each quantum number.

33. Explain the Born-Haber cycle with an example. Discuss its applications.

34. a) Discuss the various theories of acid-base indicators.

    b) Explain the theory of complexometric titrations.

35. a) Discuss briefly the classification of organometallic compounds based on the nature of the metal carbon bond.

    b) Comment on the environmental aspects of organometallic compounds.

(2×15=30 Marks)

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