

B.Sc. DEGREE (C.B.C.S.) EXAMINATION, JUNE 2018**Second Semester**

Core Course—CH2CRT02—THEORETICAL AND INORGANIC CHEMISTRY

(Common to Chemistry M I, Chemistry M II Industrial Chemistry and Chemistry M III—Petrochemicals)

[2017 Admissions only]

Time : Three Hours

Maximum : 60 Marks

Part A

*Answer any ten questions.
Each question carries 1 mark.*

1. Why doesn't the wave nature of moving cricket ball become evident to an observer ?
2. What are the n , l and m values for an electron in the $3p_z$ orbital ?
3. Define the term lattice energy.
4. What is LCAO principle ?
5. Why is the bond formed from a hybrid orbital stronger than that from a pure orbital ?
6. State Fajan's rules.
7. What are the limitations of Free electron theory of metals ?
8. Which of the following molecules have no resultant dipole moment ?
(a) CF_4 . (b) CH_3Cl .
(c) SF_6 . (d) XeF_2 .
9. Which has a higher first ionisation energy N_2 or O_2 ? Why ?
10. Most of the compounds formed by transition metals are coloured. Give reason.
11. Give the equation for the laboratory preparation of $K_2Cr_2O_7$?
12. The magnetic and spectral properties of lanthanides differ from those of $3d$ and $4d$ block elements. Explain why ?

(10 × 1 = 10 marks)

Part B

*Answer any six questions.
Each question carries 5 marks.*

13. State and explain the principles relevant in the filling up of atomic orbitals.
14. Give an experimental support for the wave nature of electron.

Turn over

15. Discuss the hybridisation of the central atom in PCl_5 and in SF_6 .
16. What is Born-Haber cycle ? Discuss with respect to NaCl .
17. Apply molecular orbital theory to hetero nuclear diatomic molecules.
18. Compare the bond length, magnetic behaviour and bond energy of O_2^{2+} , O_2^{2-} , and O_2 .
19. Explain the following with suitable example :
 - (a) Ionisation energy.
 - (b) Electronegativity.
 - (c) Inert pair effect.
20. Explain the following, properties of transition elements :
 - (a) Magnetic properties.
 - (b) Variable oxidation.
21. Discuss the resemblances in properties of :
 - (a) Co and Ni.
 - (b) Co and Fe.

(6 × 5 = 30 marks)

Part C

*Answer any two questions.
Each question carries 10 marks.*

22. Discuss the valence bond theory and its limitations applied in chemical bonding with an example.
23. What are Vander waals forces ? Explain different types of such intermolecular forces.
24. (a) What are lanthanides ? How is it separated by ion exchange method.
(b) What are the causes and consequences of lanthanide contraction.
25. Explain the preparation, properties structure and uses of KMnO_4 .

(2 × 10 = 20 marks)