

B.Sc. DEGREE (C.B.C.S.S.) EXAMINATION, MAY 2013

Second Semester

Core Course—THEORETICAL AND INORGANIC CHEMISTRY

(Common for B.Sc. Chemistry Model I, B.Sc. Chemistry Model II, B.Sc. Petrochemicals and B.Sc. Chemistry—Environmental and Water Management)

Time : Three Hours

Maximum Weight : 25

Section A

Answer all questions.

Each bunch of four questions carries a weight of 1.

- I. 1 An electron in an orbit closer to the nucleus has _____ energy.
2 Splitting of the spectral lines of an element in the presence of magnetic field is called _____.
3 _____ is the Einstein's photoelectric equation.
4 The designation given to sub levels having $n = 4, l = 3$ is _____.
- II. 5 Atomic radius of O = 74 pm ; but ionic radius of O^{2-} = _____ pm.
6 Electron affinity falls practically to zero for nitrogen because it possess _____.
7 Ionization energies are usually determined by _____ techniques.
8 _____ studies have been tremendously helpful in unravelling the structure of ionic solids.
- III. 9 Lattice energy plays an important role in predicting _____ of ionic compounds.
10 Dipole moment studies are helpful in defining the _____ of a molecule.
11 The inter orbital angle in the one of sp^3 hybridisation is _____.
12 Of the three compounds NH_3 , H_2O and HF _____ compound has maximum hydrogen bonding.
- IV. 13 Complete the following :—
$$^{133}_{56}Ba + {}^0_{-1}e \rightarrow \text{_____}$$

14 The half-life of Na-24 is 14.8 hours. Its decay constant is _____.
15 Slow neutrons are also called _____.
16 _____ reactions are common in the interior of stars.

(4 × 1 = 4)

Turn over

Section B

*Answer any five questions.
Each question carries a weight of 1.*

- 17 State the de Broglie relation.
- 18 Write the electronic configuration of Cu and Cr.
- 19 How does ionisation energy vary along a period ? Explain.
- 20 Arrange the following atoms in the increasing order of electron affinity :—
N, O, F, Cl.
- 21 Ice floats over water. How do you explain it at a molecular level ?
- 22 What are the postulates of VSEPR theory ?
- 23 Write the nuclear equation for the emission of an α particle from Th-232.
- 24 How does the liquid drop model explain the mechanism of nuclear fission ?

(5 × 1 = 5)

Section C

*Answer any four questions.
Each question carries a weight of 2.*

- 25 Explain packing fraction. How is it related to nuclear stability ?
- 26 What is Heisenberg's Uncertainty Principle ? Explain the significance of it.
- 27 Explain Born-Haber cycle with suitable example.
- 28 State and explain Fajan's rules.
- 29 Discuss the hybridisation of the central atom in PCl_5 and in SF_6 .
- 30 Explain the metallic properties bond on free electron theory.

(4 × 2 = 8)

Section D

*Answer any two questions.
Each question carries a weight of 4.*

- 31 Give an account of MO theory of diatomic molecules.
- 32 Explain role of dipole moment in the molecular structure with suitable example.
- 33 (a) Explain Bohr model of hydrogen atom.
(b) Compare and differentiate nuclear fission and nuclear fusion reactions.

(2 × 4 = 8)