C 25097 **(Pages 2)** **Name.....**

Reg. No.....

SECOND SEMESTER B.Sc. DEGREE EXAMINATION, MARCH 2012

(CCSS)

Chemistry—Core Course

CH 2B 03—THEORETICAL CHEMISTRY

Time : Three Hours Maximum : 30 Weightage

Section A

I. Answer *all* twelve questions :

1 The wave character of electron was experimentally verified by :

(a) de Broglie. (b) Einstein.

(c) Germer. (d) Schrodinger.

2 The radius of second Bohr orbit is :

(a) 0.53 nm. (b) 0.053/4 nm.

(c) 0.053 x 2^2 nm. (d) 0.053 x 2 nm.

3 The splitting of spectral lines in the magnetic field is called :

(a) Stark effect. (b) Zeeman effect.

(c) magnetic effect. (d) Quantum effect.

4 Which of the following is an operator ?

(a) dy/dx. (b) \12.

(c) d/dx. (d) $Sin^2 0$.

5 To every observable in classical mechanics, there corresponds a _____ operator in quantum mechanics.

6 4p orbitals have _____ radial nodes.

7 The bond order of B_2 molecule is _____

8 What is a Gerade Orbital ?

9 Name the most important ways of constructing molecular orbital.

10 What type of hybridization is present in BH_3 molecule ?

11 Give the name of the orbital which opposes the formation of a chemical bond.

12 What is the reason for the high density of most of the metals ?

(12 x ¼ = 3 weightage)

Turn over

Section B

II. Short Answer. Answer *all* nine questions :

13 What is Photoelectric effect ?

14 Why doesn't the wave nature of a moving cricket ball become evident to an observer ?

15 Write the time-independent Schrodinger wave equation.

16 What are the *n,* l and m values for an electron in the $3p_z$ orbital ?

17 What is LCAO principle ?

18 Write the electronic configuration of CO and NO.

19 Beryllium (Z = 4) has no unpaired electron in its ground state. However in all its compounds it shows divalency. Explain.

20 What is the geometry of PCl_5 molecule ? Explain.

21 What are the different series in the hydrogen spectrum ?

(9 x **1** = 9 weightage)

Section C

III. Short essays or paragraph questions. Answer any *five* questions from seven :

22 Give the important postulates of Bohr theory.

23 Derive the de Broglie relation.

24 Give a diagrammatic representation of the s and d orbitals.

25 What are Laplacian and Hamiltonian operators ? Explain.

26 Distinguish between BMO and ABMO.

27 Apply MO theory to O_2 molecule. Work out its electronic configuration and account for the paramagnetism of O_2.

28 Explain the properties of metals using free electron theory.

(5 x 2 = 10 weightage)

Section D

IV. Essay questions. Answer any *two* questions :

29 Give an experiment to support for the wave nature of electrons.

30 Explain the terms radial distribution function and radial distribution curves. Draw the radial distribution curves for 1s, 2s, 2p, 3s, 3p and 3d orbitals of hydrogen atom.

31 Discuss the shape of the following molecules on the basis of hybridization CH_4, IF_5 and SF_6.

(2 x 4 = weightage)