SF OND SEMESTER B.Sc. DEGREE (SUPPLEMENTARY/IMPROVEMENT) EXAMINATION, APRIL/MAY 2015

(UG–CCSS)

Core Course—Chemistry

CH 2B 03—THEORETICAL CHEMISTRY

Time : Three Hours   Maximum : **30** Weightage

I. **Objective type questions (Answer all *twelve* questions) :**

1 **According to John Dalton, atom is regarded as :**

   (a) **Divisible.**   (b) **Indivisible.**

   (c) **Soft and Smeared out.**   (d) **None of these.**

2 **One of the following principles is the direct consequence of the dual nature of matter and light :**

   (a) **Pauli's exclusion principle.**

   (b) **Heizenberg's uncertainty principle.**

   (c) **Aufbau principle.**

   (d) **None of these.**

3 **The ionization energy for the Hydrogen atom has a value of :**

   (a) **+ 1.312 x 106 J mol .**   (b) **– 1.312 x 10^6 J mol .**

   (c) **+ 1.312 x 10^6 J.**   (d) **– 1.312 x 10^6 J.**

4. $_{yr}$ * w Si = 0 **is condition for :**

   (a) **Orthonormality.**   (b) **Orthogonality.**

   (c) **Normalization.**   (d) **None of these.**

5 **The points where the probability of finding the particle is zero are called :**

   (a) **Antinodes.**   (b) **Nodes.**

   (c) **Stationary Point.**   (d) **Zero Point.**

6 **The radial wave function depends on the quantum numbers :**

   (a) **n and *s*.**   (b) **n and m.**

   (c) **n and 1.**   (d) **m and 1.**

7 The following H_2^+, He; and O_2 are all :

    (a) Diamagnetic.   (b) Paramagnetic.

    (c) Unstable.   (d) Stable.

8 N_2 molecule is diamagnetic due to :

    (a) Unpaired electron.   (b) Paired electron.

    (c) Bond order zero.   (d) None of the above.

9 The bond angle in SF_6 is :

    (a) 180°.   (b) 120°.

    (c) 109°.   (d) 90°.

10 Bond order is directly proportional to :

    (a)   Bond strength.

    (b)   Bond length.

    (c)   Both strength and bond length.

    (d)   None of these.

11 If the forbidden band width between valence band and the conduction band is large, then the substance will be an _____

12 For typical semi conductor Eg is _____

(12 x $^1/_4$ = 3 weightage)

II. Short answer type question (Answer all *nine* questions) :

13 What is the significance of Sommerfeld's theory ?

14 How are matter waves different from electromagnetic waves ? Give *one* difference.

15 What is the significance of Schrödinger equation ?

16 Why is orbitals are spherically symmetrical ?

17 What is LCAO principle ?

18 Write down the M 0 configuration of C_2 molecule.

19 What is the geometry of PCl_5 molecule ? Why ?

20 What is meant by Fermi level ?

21 Write the four quantum numbers of unpaired electron in copper atom in its ground state ?

(9 x 1 = 9 weightage)

III. Short essay *or* paragraph questions (Answer any *five* questions) :

22 Explain the defects of the Bohr atom model.

23 Derive the de Broglie relation.

24 What are the conditions that a wave function must meet for it to be an acceptable wave function ?

25 Sketch the radial probability distribution curves for 3s and 3p.

26 Apply M 0 theory to CO molecule. Draw the diagram.

27 Illustrate the formation of bonding and anti bonding II molecular orbitals.

28 Explain the electrical property of metals using Fermi model.

(5 x 2 = 10 weightage)

IV. Essay Questions (Answer any *two* questions) :

29 (a) Give the important postulates of Bohr's atomic theory.

(b) Discuss how Bohr theory explains the formation of the line spectrum of hydrogen.

30 Explain the time independent Schrödinger wave equation: How it is applied to particle in an one dimensional box ?

31 Compare and contrast V B and M 0 theory.

(2 x 4 = 8 weightage)