

C 82109

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Name.....

Reg. No.....

**SECOND 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) $+ 1.312 \times 10^6 \text{ J mol}^{-1}$. (b) $- 1.312 \times 10^6 \text{ J mol}^{-1}$.
(c) $+ 1.312 \times 10^6 \text{ J}$. (d) $- 1.312 \times 10^6 \text{ J}$.

4. $\int \psi^* \psi \delta\tau = 0$ 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 l . (d) m and l .

Turn over

- 7 The following H_2^+ , He_2^+ 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 E_g is _____.

(12 × ¼ = 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 O 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 × 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 O theory to CO molecule. Draw the diagram.
- 27 Illustrate the formation of bonding and anti bonding Π molecular orbitals.
- 28 Explain the electrical property of metals using Fermi model.

(5 × 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 O theory.

(2 × 4 = 8 weightage)