C 62676 **(Pages : 3)** **Name.....**

Reg. No.....

SECOND SEMESTER B.Sc. DEGREE EXAMINATION, MAY 2014

(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 Rutherford's nuclear model :

(a) Electrons fall into the nucleus.

(b) Electrons do not fall into the nucleus.

(c) Nucleus and the revolving electrons have large space in between.

(d) Centrifugal force and electrostatic attraction do not balance.

2 The de Broglie wavelength is given by :

(a) $\lambda = \frac{2\pi r}{n}$. (b) $= \frac{}{my}$.

(c) = (d) $= \frac{}{p \times c}$

3 The Paschen series of lines occurs in the :

(a) UV region. (b) Visible region.

(c) Infrared region. (d) None of the above.

4 The following is a non-linear operator :

(a) log. (b) $\frac{d}{}$

(c) $\frac{d^2}{dx^2}$ (d) None of these.

5 The lowest irremovable energy associated with a system is called :

(a) Excited state. (b) Zero point energy.

(c) Ground state. (d) Quantized state.

ngular wave function depends on the quantum numbers :

(a) n and 1. (b) m and 1.

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

Turn over

7 Out of the following which has smallest bond length :

(a) O_2. (b) O_2.

(c) O_2. **(d)**

8 The energy of bonding MO is _____ than the energy of the atomic orbitals.

(a) Greater. (b) Lower.

(c) Equal. (d) None of these.

9 The quantity bond order indicates :

(a) Relative force. (b) Relative stability.

(c) Relative shape. (d) None of these.

10 The geometry of the IF_7 molecule is :

(a) Triagonal bipyramid. (b) Tetrahedral.

(c) Pentagonal bipyramid. (d) Octahedral.

11 If the forbidden band width is small, between valance band and conduction band, then the substance will be a _____

12 Diamond is an insulator because its forbidden band is _____

(12 x ^{1},/4, = 3 weightage)

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

13 What is meant by photoelectric effect ?

14 What is Rydberg constant R ?

15 Define nodal plane.

16 What is a Hamiltonian operator ?

17 The bond in is longer than that of H_2. Why ?

18 Write down the MO configuration of CO molecule.

19 Mention the hybridization of Be in BeH_2 molecule and B in BH_3 molecule.

20 Why is the bond formed from a hybrid orbital stronger than that from a pure orbital ?

21 What is a conductor and semiconductor based' on band theory ?

(9 x 1 = 9 weightage)

III. Short Essay *or* Paragraph Questions. Answer any *five* questions :

22 Compare and contrast particle and wave nature.

23 Give the main applications of de Broglie concept.

24 Explain the significance of the wave function ψ.

25 Write down the Schrodinger wave equation for the H-atom in spherical polar co-ordinates. Explain the symbols.

26 Apply MO theory to 0_2 and draw the diagram.

27 Describe the LCAO method of constructing molecular orbitals.

28 Write short note on free electron theory of metals.

(5 X 2 = 10 weightage)

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

29 Explain the merits and demerits of Bohr theory of atom. How is it modified by Sommerfeld ?

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 Give an account of MO theory of homonuclear diatomic molecules.

(2 X 4 = 8 weightage)