**C 41794** (Pages : 3) Name..... .....

Reg. No..... .....

# SECOND SEMESTER B.Sc. DEGREE EXAMINATION, APRIL/MAY 2013

(CCSS)

Chemistry

CH2 B03—CORE COURSE II— THEORETICAL CHEMISTRY

Time : Three Hours Maximum : 30 Weightage

Section **A**

*Answer all* twelve *questions.*

*I.* 1 According to Bohr model of an atom, the electrons revolve round the nucleus in :

(a) Orbitals. (b) Subshells.

(c) Electron clouds. (d) Orbits.

2 The maximum number of 3d electrons that can have $s = -\frac{1}{2}$ are

(a) 3. (b) 5.

(c) 7. (d) 10.

3 The wave number of the light emitted by a certain source is $2 \times 10^6$ m. The wave length of this light is :

(a) 500 nm. (b) 200 nm.

(c) 5 x 107m. (d) 500 nm.

4 The condition for orthogonality is :

(a) fl) = . (13) $_{r}$ 11) , Bt=0 .

(c) $\iiint \psi \psi^* \delta\tau =$ . (d) iffIK *6c = 10

5 The kinetic energy part of Hamiltonian operator $\hat{H}$ is ———————

6 For an equation A $f(x) = c\, f(x)$, then $c$ is called ———————

7 The bond order of NO molecule is ———————

8 What is ungerade orbital ?

9 What is meant by bond order ?

Turn over

10 What type of hybridization is present in $SF_6$ molecule ?

11 Which theory is applicable to explain good electrical conductivities of metals ?

12 Why metals like Li, Be, Na etc. have low densities ?

(12 x ¼ = 3 weightage)

## Section B

*Short answer.*
*Answer all* **nine** *questions.*

II. 13 What types of metals are used in photoelectric cells ? Give *one* example.

14 Write down the expression for energy of an electron in the $n^{th}$ Bohr orbit.

15 What is meant by a well behaved wave function ?

16 What are the $n$, $l$ and m values for the outermost electron in the ground state of sodium atom ?

17 What are isoelectronic species ? Give *one* example of ions *or* molecules iso electronic with NO+ ion.

18 Is $B_2$ molecule paramagnetic *or* diamagnetic ? Discuss.

19 What is sp hybridization ? Give an example.

20 What shapes are associated with the molecules involving $sp^3 d^2$ and $sp^3 d^3$ hybridisation ? Give *one* example each.

21 Calculate the uncertainty in the position of a particle whose uncertainty in momentum is 1. 65 x

(9 x 1 = 9 weightage)

## Section C

*Short paragraph questions.*
*Answer any* **five** *questions.*

III. 22 Discuss the atomic spectrum of hydrogen.

23 Explain the defects of Bohr atom model.

24 What are the postulates of quantum mechanics ?

25 Draw the radial probability distribution curves of 2s, 2p, and 3s orbitals. Explain.

26 Explain the different between MO theory and VB theory.

27 Apply MO theory to CO molecule and draw the diagram.

28 Explain the conductivity of metals with band theory.

(5 x 2 = 10 weightage)

## Section D

*Essay questions.*
*Answer any* **two** *questions.*

IV. 29 Using Bohr's postulates derive an equation for radius of an orbit and energy of the electron in an orbit.

30 What are quantum numbers ? Discuss the significance of each quantum number. What are the possible values of '1' if n = 4.

31 Explain the concept of hybrization taking $PC1_5$ and $IF_7$. Draw their geometries.

(2 x 4 = 8 weightage)