

SECOND SEMESTER B.Sc. DEGREE (SUPPLEMENTARY)
EXAMINATION, DECEMBER 2012

(CCSS)

Chemistry

CH 2B 03—THEORETICAL CHEMISTRY

Time : Three Hours

Maximum : 30 Weightage

I. Objective Type Questions :

*Answer all **twelve** questions.*

1 Ejection of electrons from the surface of soft metals by light is called :

- (a) **Thermionic** emission. (b) Compton effect.
(c) Zeeman effect. ~~—————~~ (d) ~~Photo electric effect.~~

2 According to uncertainty principle, the product of the uncertainties in the position and momentum is never smaller than :

- (a) h . (b) $h/2$.
(c) $h/2\pi$. ~~—————~~ (d) ~~$h/4\pi$.~~

3 The energy of electron in second orbit of **hydrogen atom** is :

- (a) $-328.02 \text{ kJ mol}^{-1}$. (b) **$328.02 \text{ J mol}^{-1}$** .
(c) $328.02 \text{ kJ mol}^{-1}$. (d) **$328.02 \text{ J mol}^{-1}$** .

4 The following is a linear operator :

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

5 The number of nodes for a given energy level is equal to :

- (a) n . (b) $n - 1$.
(c) $n - 2$. (d) $n + 1$.

6 For $n = 3$, the value of angular momentum quantum number can't be :

- (a) Zero. (b) 1.
(c) 2. (d) 3.

Turn over

7 The bond order in N_2^+ ion is :

- (a) 1.5. (b) 2.5.
(c) 2.0. (d) 3.0

8 The energy of **antibonding** M.O. is _____ than the atomic orbital.

- (a) Greater. (b) Lower.
(c) Equal to the atomic orbitals. (d) None of these.

9 The bond order is inversely proportional to :

- (a) Bond length. (b) Bond strength.
(c) Energy. (d) None of these.

10 The hybridization in SF_6 molecule is

- (a) d^1sp^5 . (b) sp^3d^2 .
(c) sp^3d . (d) dsp^3 .

11 Though the electrons are free in metals having large mean free path they do not escape from the metallic crystal, because _____

12 A _____ band will make a solid conducting.

(12 x 3 = 36 weightage)

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

13 What do you mean by dual nature of electron ?

14 What is **quantisation** of energy ?

15 What is **Eigen** value of **Eigen** function ?

16 What is the probability of locating an electron along a, boundary surface ?

17 Arrange the following molecules in the order of increasing bond lengths. O_2 , N_2 , F_2 , H_2 .

18 What are the measured properties of H_2^+ ion ?

19 What is sp^3 hybridization ? Give one example.

20 Mention the hybridization and geometry of PCl_6 and IF_7 .

21 Write the meaning of $(\pi 2py)^2$ notation.

(9 x 1 = 9 weightage)

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

22 Give the important postulates of Bohr's atomic theory.

23 Discuss the Heisenberg's Uncertainty Principle.

- 24 What are Laplacian and Hamiltonian operators ? Explain.
- 25 What are quantum numbers ? Explain their significance.
- 26 Compare and contrast bonding and **antibonding** molecular orbitals.
- 27 Distinguish between orbit and orbital.
- 28 Discuss the hybridization of the central atom in BH_3 and CH_4 .

(5 x 2 = 10 weightage)

IV Essay questions. Answer any *two* questions.

- 29 State and explain the postulates of quantum mechanics.
- 30 Derive expressions for the radius of the n^{th} electron orbit in a hydrogen atom and for the velocity and energy of an electron revolving in it.
- 31 Give an account of M.O. theory of diatomic molecules.

(2 x 4 = 8 weightage)