**(1126)**

# B.A./B.SC. (General) Vth Semester (0005) Examination

# 0453

## CHEMISTRY

## (Physical Chemistry-A)

(Same for B.Sc. Microbiology
and Food Technology)

## Paper : XIX

Time : 3 Hours]                                        [Maximum Marks : 22

**Note :-** (i) Attempt one question from each Unit, Question No. 9 is compulsory.

(ii) Use of Logarithm tables or Calculator (non-programmable) is allowed.

## Unit-I

1. (a) What is the concept of particle in onedinensionai box ? What is the Schrodinger wave equation for such a case ? How can this -3 equation be solved for $\psi$ and E ?                    2

   (b) Write the expression for the angular and the radial wave function, what do different symbols signify ?                    2

2.  (a)  What are the postulates of quantum mechanics ?    2

    (b)  Find the commutator of the operators for momentum and position, the two conjugate properties of Heisenberg's uncertainty principle.    2

## Unit-II

3.  (a)  What do you understand by Linear Combination of Atomic Orbitals (LCAO). How can it be applied to $H_2^+$ ion to calculate its energy ?    2

    (b)  Derive the values of the coefficients of atomic orbitals in the three $sp^2$ hybrid orbitals.    2

4.  (a)  Using LCAO approximation, wrire down the complete wave function for a heteronuclear diatomic molecule AB, assuming that it has 90% covalent character and 10% ionic character.    2

    (b)  Represent diagrammaiiealiy the formation of bonding and antibonding molecular orbitals formed by combination of 2s with 2s and 2p with 2p orbitals. How are they designated ?    2

## Unit-III

5. (a) What are photochemical reactions ? List the main points of difference between a photochemical reaction and thermochemical reaction. 2

(b) State and explain first and second laws of photochemistry. 2

6. (a) Draw Jablonski diagram depicting various processes occurring in the excited state. 2

(b) What is the energy in kcais of one mole of photons of wavelength 2573Å ? 2

## Unit-IV

7. (a) Write short notes on 'Fluorescence' and 'Phosphorescence'. What is the difference between them ? 2

(b) A certain system absorbs $3.0 \times 10^{16}$ quanta of light per second. On irradiation for 20 minutes, 0.002 mole of the reactant was found to have reacted. Calculate the quanaim efficiency of the process. 2

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8. (a) On the basis of mechanism, how can you justify that quantum yield of photolysis of HI is 2 ? 2

(b) Explain the term 'PhotosensitizatiorT with at least two suitable examples. 2

# Compulsory Question

9. (i) How do spectral distribution curves of black body radiation prove Stefan-Boltzmann's law ?

(ii) How is the variation method used to obtain the correct wave function ?

(iii) What do you understand by gerade and ungerade molecular orbitals ?

(iv) What is physical significance of extinction coefficient or absorptivity ?

(v) Give the photolysis of ammonia.

(vi) What are photoinhibitors ? How do they work ?
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