

[4]

Or

Discuss the application of perturbation theory to helium atom.

3. (a) Explain the method of self-consistent field.
(b) Determine the term symbols for the ground state electronic configuration of carbon.

Or

Discuss the Huckel theory of Conjugated system for Ethylene molecule.

4. What are characteristics of Chain reactions ? Discuss the reaction kinetics of photochemical H_2-Cl_2 reaction.

Or

Discuss Lindemann theory of unimolecular reactions. Explain its limitations also.

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Roll No.....

M.Sc. I Semester Examination, April-2021

CHEMISTRY

Paper III

(Physical Chemistry)

Time : 3 Hours]

[Maximum Marks : 80

Note : All questions are compulsory. Question Paper comprises of 3 sections. **Section A** is objective type/Multiple Choice questions with no internal choice. **Section B** is short answer type with internal choice. **Section C** is long answer type with internal choice.

SECTION 'A'

1×8=8

(Objective Type Questions)

Answer all questions :

1. If $^{10}C_r = ^{10}C_{r+4}$, then find the value of 5C_r ?
2. Find the value of $\int_{10}^{100} \frac{RT}{V} dv$.
3. Write the value of zero point energy of a particle of mass ' m ' moving in one dimensional box of width ' O '.

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4. Define Hamiltonian operator.
5. Write Huckel secular equation for 1, 3 Butadiene.
6. Define step up and step down operators.
7. Give the relationship between half life period and initial concentration of a n th order reaction.
8. Write Michaelis-Menten equation for enzyme catalysed reaction.

SECTION 'B'

6×4=24

(Short Answer Type Questions)

Note : Answer the following questions in 250 words.

1. Find the value of $\int \frac{x^4}{x^2 + 1} dx$.

Or

If $u = \log \left(\frac{x^2 + y^2}{xy} \right)$, then find the value of $\frac{\partial u}{\partial y}$.

2. Explain the main postulates of quantum mechanics.

Or

Write short notes on generalized angular momentum.

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3. Define Lande g-factor.

Or

What is extended Huckel theory ? Explain.

4. Explain the influence of ionic strength on the rate of ionic reactions.

Or

Show that for a first order reaction, the time required for 99.9% completion of the reaction is 10 times that required for 50% completion.

SECTION 'C'

12×4=48

(Long Answer Type Questions)

Note : Answer the following questions in 500 words.

1. Find the maximum and minimum value of function

$$y = 2x^3 - 15x^2 + 36x + 10.$$

Or

If $\frac{dx}{dt} = k(a - x)(b - x)$, then find the value of k .

2. Calculate the energy and wave function of a particle moving in one dimensional box, with the help of Schrodinger wave equation.

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P. T. O.