

UUCMS No.

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

B.M.S. COLLEGE FOR WOMEN, AUTONOMOUS

BENGALURU-560004

SEMESTER END EXAMINATION-APRIL/MAY- 2023

M.Sc. in Chemistry-I Semester

PHYSICAL CHEMISTRY-I

Course code: MCH103T

Time: 3 Hrs

QP Code: 11009

Max.Marks:70

Instruction: Answer Question No.1 and any FIVE of the remaining.

1. Answer any **TEN** questions

(2×10 =20)

- a) State the conditions for orthogonality of wave function
- b) An electron is confined in a one-dimensional box of length 10 \AA . Calculate its ground state energy in eV.
- c) What are operators? Give an example.
- d) Write the expression for Slater type orbitals
- e) What is Zeeman effect?
- f) Why are approximate methods needed in quantum mechanics?
- g) Write the units of rate constants for i) zero order ii) $3/2$ order reaction
- h) What are fast reactions? Why conventional methods cannot be employed to study these reactions.
- i) Collision theory fails to explain chain reactions. Give reason.
- j) What is an autocatalytic reaction? Give example.
- k) How does pH effect the rate of enzyme catalyzed reactions?
- l) Write the significance of Gibbs adsorption isotherm.

2. a) Write any four postulates of quantum mechanics..

- b) Set up and solve Schrodinger wave equation for the particle in a ring.

(4+6=10)

3. a) Write briefly on spin-orbit interaction.
- b) Discuss the application of variation method to He atom (4+6=10)
4. a) Explain lower and upper explosion limits by deducing the general rate expression for a branched chain reaction.
- b) Compare thermal and photochemical reactions of hydrogen and halogen. (6+4=10)
5. a) Outline the kinetics of acid-base catalyzed reactions.
- b) List any four postulates of BET theory. (6+4=10)
6. a) What is quantum mechanical tunneling. Explain
- b) Discuss the influence of ionic strength of the solution on the rate constant of an ionic reaction. (6+4=10)
7. a) What are radial and angular distribution functions. Give their significance
- b) Derive Michaelis Menten equation for an enzyme catalyzed reaction. (5+5=10)
8. a) How is a rigid rotor understood quantum mechanically? Explain
- b) Discuss surface films on liquids (5+5=10)