MANIPAL ACADEMY of HIGHER EDUCATION
(Institution of Eminence Deemed to be University)

Reg.No.									

DEPARTMENT OF SCIENCES, II SEMESTER M.Sc. (Chemistry)
END SEMESTER EXAMINATIONS, MAY/JUNE 2023
PHYSICAL CHEMISTRY – II [CHM 5203]
(CHOICE BASED CREDIT SYSTEM - 2021)

Time: 3 Hours Date: 26-05-2023 MAX. MARKS: 50

Note (i) Answer ALL questions
(ii) Draw diagrams, and write equations wherever necessary

		Marks	CO	BL
1A	Write the working of Li ion battery with a schematic diagram.	4	1	2
1B	Give reasons for the following i) Concentration polarization can be eliminated. ii) Inert anode is used in the chromium electroplating. iii) Surface activation is required in electroless plating.	3	1	3
1C	Emf of Weston Cadmium cell is 1.0183 V at 293 K and 1.0181 V at 298 K. Calculate ΔG, ΔH and ΔS of the cell reaction at 298 K.	3	1	3
2A	The speed of a 1g projectile is known to be within 1×10^{-6} ms^{-1}. Calculate the minimum uncertainty in its position. (Given: h = 6.626 $\times10^{-34}$ Js)	2	2	2
2B	All quantum mechanical operators need not commute with one another. Justify	2	2	3
2C	Obtain the expression for the energy levels and wave functions for a particle in one-dimensional box and give their graphical representation.	6	2	2
3A	Write fourth and fifth postulates of quantum mechanics.	2	2	2
3B	Explain the requirements of acceptable wave function.	2	2	3
3C	Set up Schrodinger wave equation for a particle rotating around the sphere of constant radius. Separate the variables and solve for Ө equation	6	2	2
4A	With appropriate experimental evidence, explain the dual nature of particle.	2	2	2
4B	What is meant by a rigid rotor and harmonic oscillator?	2	3	3
4C	Justify the statement. Evaluation of potential energy Hamiltonian is difficult for multi electron system. Give an account on self-consistent field approximation.	6	3	3
5A	Depict the pi bond order of allyl radical	2	4	3
5B	Write Born Oppenheimer approximation equation and expand their terms.	2	4	2
5C	Apply Huckel Molecular Orbital Theory to elucidate the structure of butadiene molecule. Give a graphical representation of Huckel Molecular Orbital for the molecule	6	4	2

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