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ICH 403



I Semester M.Sc. Degree Examination, April 2021
INDUSTRIAL CHEMISTRY
Physical Chemistry

Time : 3 Hours

Max. Marks : 70

Instructions : 1) Answer **any five** questions from Part A and **any five** questions from Part B.

2) Figures to the **right** indicate marks.

PART – A

Answer **any five** questions :

(5×2=10)

1. a) In the hydrogen spectrum, what is the wavelength of light associated with the $n = 2$ to $n = 1$ electron transition ?
- b) Explain the significance of eigen function and eigen value.
- c) How does entropy change in a reaction ? Write the expression for entropy changes for finite variations at constant T.
- d) What are the factors affecting the rate law ?
- e) What do you mean by linear polarization resistance ? Write the Stern-Geary equation and explain the terms involved.
- f) State any two applications of electroless plating.
- g) Write the principles of cell design.
- h) What is Kolbe's electrolytic method ?

PART – B

Answer **any five full** questions :

(5×12=60)

2. a) Obtain first order correction terms for energy and wave function using perturbation theory.
- b) Derive Einstein's photoelectric equation.
- c) What are the important assumptions of molecular orbital theory and valence bond theory ?

(5+3+4)

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3. a) How the Born-Oppenheimer approximation simplifies molecular Hamiltonian operators? Deduce expression for it.
b) Derive the linear momentum operator of a particle moving in x direction.
c) Verify the Heisenberg's uncertainty principle for the ground state of a one dimensional simple harmonic oscillator. (4+3+5)
4. a) Explain the physical significance of entropy.
b) Derive Kirchhoff's equation. How is it useful in thermodynamics ?
c) What is steady state approximation ? Explain its significance. (3+6+3)
5. a) Illustrate kinetics of consecutive reactions with a suitable example.
b) Outline the principle and applications of electrophoretic painting. (6+6)
6. a) Explain the types of corruptions with appropriate examples.
b) Describe how the corrosion could be prevented by cathodic and anodic prevention method. (6+6)
7. a) Discuss the importance of metal finishing and processing.
b) How the electrophoretic painting differs from electroforming ?
c) Explain the fundamentals of electroplating of copper with neat labeled diagram. (4+4+4)
8. a) Describe the mechanism of industrial production of potassium hydroxide.
b) Discuss the electro-synthesis of adiponitrile.
c) Explain the electro-inorganic synthesis of ozone. (4+4+4)
9. a) Discuss the computation of costing of an electrolytic process.
b) What are the qualitative aspects of general considerations of electrochemical engineering ?
c) Explain the electro reduction of nitrocompounds with suitable example. (5+4+3)
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