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Physical

Sub - Physical chemistry

Unit I - Quantum chemistry

Q-1) Short Answer - 1 Mark

i) State Pauli Exclusion principle - April 2018

ii) Eigen values associated with Hemilton operator - April 2018

iii) For a particle in a three diamensional box the state of system is characterized by three quantum numbers as nx, ny & nz with energy of $\frac{14h^2}{8ma^2}$ what is the degeneracy of the energy level represented by three quantum numbers

iv) Define Laplacian operator - April 2014, oct 2015

v) Give the criteria of well behaved function
NOV - 2014
Oct - 2015

vi) Eigen values associated with Hemilten operater are always - Nov 2014, oct 2015

vii) Mention the eigen values for angular momentum - April 2015

viii) what is the Hermitian operater? - April 2014

ix) write the term symbols for L=2, S=1

x) ~~State selection of particle confi~~ - April 2015

x) State selection of particle confirmed in the box system - April 2014, oct 2015

xi) Define Ladder operators - Nov 2014, oct 2015

xii) State expectations value theorem - Nov 2014

Q-2) Short Note - 4 Mark

i) Give the characteristics of well behaved function - April 2018

ii) Born interception of wave function - April 2018

iii) Concept of particle in a box system for understanding electronic spectra - April 2014 oct 2015

iv) Explain the eigen values of angular momentum - April 2015

v) Degeneracy & its importance using particle in a cubic box system - Nov ~~2015~~ 2014 April - 2015

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Q-3) Long Answer - 5/6/8/10 Mark

i) Explore the concept of commulating & non commulating operators with suitable examples - April 2018

ii) For a cubical box, what will be the the effect of streching of the box along x- direction on degeneracy & energy state represented by $\frac{6h^2}{8ma^2}$ - April 2018

iii) State postulates for quentum mechanics & discuss the properties of operators

iv) If ψ_1 & ψ_2 are eigen functions of Hermetion operator A with eigen values a_1 & a_2 respectively, then prove that ψ_1 & ψ_2 are orthorhombus - April 2014

v) Show that if two operators commulate, they have simultaneous non degenerate eigen function - April 2015

vi) Prove that eigen values associated with Hermetian operators are real - April 2015

II) Photochemistry — Physical

1) Fluorescence resonance energy transfer processes. - 4MK
April - 2014.
2) Distinguish between excimer, dimer, photodimer and an exciplex. - 5MK
3) The fluorescence intensity of a fluorophor is quenched 80% by addition of 0.01 M quencher concentration. Calculate half quenching concentration - 5MK
4) Construct Jablonski diagram and discuss possible photophysical pathways of deactivation for the excited molecules. - 4MK
5) Distinguish between excimer, exciplex and excited dimer with respect to their spectral characteristic - 6MK
6) Photoisomerization reaction - 4MK
7) Photodimerization reactions - 4MK

1) What is delayed fluorescence?
2) State Einstein's law of photochemical equivalence.
3) ~~Define~~ Distinguish between singlet and triplet states.
4) Calculate the term symbols for ground state of He.
5) What is the basic criteria for fluorescence resonance energy transfer (FRET) between donor and acceptor.
6) "Exciplex emission observed only in hetero atom." State Whether the statement is True or false.
7) Differentiate the nature of fluorescence spectrum of monomer emission and excimer emission.
8) Define the life time of electronically excited state.

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Electrochemistry

beats Question

1) what is electrophoretic effect ? - 2014

2) Write the expression for the electrical density (ρ) for univalent electrolyte (Apr - 2018)

3) Pt (H_2)g / H^+, is an example of first ~~order~~ or ~~Second order~~ kind of electrode (Apr - 2018)

4) Write the cell representation of third kind of electrode (Oct - 2015), (Oct - 2012)

5) The thickness of ionic atmosphere ..... as the concentratn of electrolyte increases (fill in the blank) (Oct - 2015)

6) As the concentratn of electrolyte increases the thickness of ionic atomsphere decreases state whether this statement is true or false (2015) (Apr - 2015), (Oct - 2014)

7) Construct the electrochemical cell in which the reaction is

$Ag^+ + Cl^- \longrightarrow AgCl$ (Apr - 2015)

8) Name the liquid fuels used in fuel cell (Apr - 2015)

9) Write the cell representation of first kind of electrode (Apr - 2014)

10) When the salt bridge is removed, the potential

of the electrochemical cell - - - - -
(Apr - 2014), (Oct - 2014)
fill the blank from following)
i) increases ii) decreases iii) remain constant iv) becomezer

11) A catalyst increases the rate of chemical reaⁿ by decreasing the activation energy. State whether this statement is true or false (Apr - 2014)

12) Write the cell representaⁿ of second kind of electrode (Oct - 2014)

13) The temperature coefficient for general reaⁿ is 2-3. True / False (Oct - 2012)

14) Represent alkaline storage battery (Oct - 2012)

15) Write equaⁿ for emf of a concentraⁿ cell with transference for HCl electrolyte (Oct - 201

16) In case of concentraⁿ cell with transference for HCl, if $a_2 > a_1$ then reaⁿ is non spontaneous. Whether the above statement is true or false (Oct - 2012)

Long answer Question & short answer

(Q.1) a) Describe the method of determining activity coefficient of an electrolyte using Conc. cell with transference [Apr-2009] [6M]

b) Describe in detail construct^n & working of acid storage battery [5M]

c) for a conc. cell, Ag/AgCl(s), HCl, HCl (a=1), AgCl(s)/Ag the emf obtained at 25°C is 194mV & transference no. of H^+ ion is 0.825. Calculate the activity coefficient of unknown HCl soln [5M] (Apr-2014)

2) Describe construction & working of acid storage battery. (Apr-2014)

3) Derive the relationship bet^n rational activity coefficient (f), practical activity coefficients (fc; fm) of an electrolyte soln [6M] (Apr-2018)

4) Calculate the ionic strength of 0.1M Copper chloride soln. [4M] (Apr-2018)

5) a) Derive stern-volumer relation for bimolecular collision fluroscence quenching (6M) (Apr-2015)

b) Discass Emf method of determination of activity coefficient of an electrolyte (6M) (Apr-2018), (apr-2014)

6) EMF method for the determinat^n of instability constant [4M] (Apr-2018)

7) a) Describe in detail the emf method of determinat° dissociat° constant of weak acid [6M] - (Oct - 2014)

b) Obtain an expression for the potential ψ_i on the ion due to ionic atmosphere in dilute soln.. - (Apr - 2014). [6M]

c) Calculate the ~~ionic~~ thickness of ionic atmosphere in 0.1N soln of 1:1 salt in nitrobenzene at 25°C (D = 34.8) [4M] (Apr - 2018)

8) Acid storage battery [6M] (Oct - 2015), (Apr - 2015), (Oct - 2012)

9) Determinat° of instability constant of silver-ammonia complex [4M] (Oct - 2015), (Apr - 2014), (Oct - 2014), (Oct - 2012)

10) explain relaxation & electrophoretic effect (6M) - (Apr - 2015), (Oct - 2014)

11) Describe in detail the accurate method of dissociat° constant of weak acid by emf measurements (6M) (Apr - 2014)

12) Alkaline storage battery (4M) (Apr - 2014) (Oct - 2014), (Oct - 2012), (Apr - 2009)

13) Give an account of dissociation constant of monobasic weak acid by approximate emf methods (Oct - 2012)

14) How will you determine the activity coefficient by using the emf values of conc. cell without transference? (Oct - 2012)

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IV) Chemical Kinetics Physical

- ~~Short~~ beats. [1 M]

1) Write the eqn for the rate of the reaⁿ,
   2A + B → product [April-18]
2) "presence of catalyst does not alter the equilibrium constant in a reversible reaction" state whether this statment is true or false. (April-18)
3) Give the name of eqn which expresses variation of rate constant with temperature. (April-18)
4) 'A catalyst increases the rate of chemical reaction by increasing the activation energy' state whether this statment is true or false. (oct-15)
5) What is positive & negative salt effect. (oct-15, April-14.)
6) Mention the factor's on which rate of reaction depends. (oct-15)
7) 'A catalyst increase the rate of chemical reaction by decreasing the activation energy' state whether this statment is true or false. (April-14)
8) If for any reaⁿ, the rate is equal to the rate of the reaⁿ at all concentration, then what is the order of this reaction. (April-14)
9) What will be the order of reaⁿ when rate of reaⁿ doubles upon increasing the concentration of reactant four times. (NOV-14)
10) Mentain the factor's on which rate of enzyme catalyzed reactions depends. (NOV-14)

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- Short answer questions - [6M]

1) What is steady state approximation & using this principle discuss kinetic's of decomposition of ozone. (April-14, 18)
2) Discuss EMF method of determination of activity coefficient of an electrolyte. (April-18)
3) Describe in detail the EMF method of determination dissociation constant of weak. (Oct-15)
4) Discuss kinetics of reaction bet^n NO_2 & F_2 (NOV-14, Oct-15.)
5) Discuss conductivity method of following kinetic's of reaction with suitable example. (Oct-15)
6) Discuss the factors affecting enzyme catalyzed reaction. (Oct-15)
7) Derive the rate law equation for the decomposition N_2O_5. (April-15)
8) Discuss kinetics of enzyme catalyzed reactions. (April-14, 15)
9) Discuss kinetics of homogenous acid-base catalyzed rea^n with suitable example (NOV-14.)

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- Short Notes - [4 M]

1) From the following data show that the decomposition of N_2O_5 in CCl_4 solution at 48°C is a first order reaⁿ.

Time in minute	10	15	20	∞
Volm of O_2 evolved.	6.30	8.95	11.40	34.35

[April-18]

2) Give a brief Comment on factor's affecting enzyme catalysis. [April-18]

3) primary salt effect [April-18]

4) EMF method for the determination of instability Constant. (April-18)

5) Consequences of ozone layer depletion (April-18)

6) primary & secondary salt effect (April-14, Oct-15.)

7) Kinetics of acid base catalyzed reaⁿ. (Oct-15.)

8) for given reaⁿ at temp. T, the velocity Const, K is expressed as, $K = A.e^{-27000K^1/T}$. Given, $R = 2\ cal\ mol^{-1}K^{-1}$, Calculate the values of energy of activation. (April-15.)

9) The optical rotation of cane sugar in 0.5N lactic acid at 25°C at various time intervals are given below.

Time in minute.	0	1435	11360	infinity
Angle of rotation.	34.50	31.10.	13.98.	-10.77

Show that reaⁿ is first order. (April-14)

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10) The half period of the reaⁿ, $N_2O_5 \rightarrow 2NO_2 + \frac{1}{2}O_2$ is 2.4 hours at 30 °C. What time would be required to reduce 5×10^{10} molecules of N_2O_5 to 10^8 molecules. ? (NOV-14)

11) Kinetics of decomposition of nitrogen pentaoxide. (April-14.)

- Long answer questions [10 M].

1) Discuss kinetics of thermal decomposition of N_2O_5 & derive rate law eqⁿ. (April-2009)