VEER NARMAD SOUTH GUJARAT UNIVERSITY M.Sc.-I (CHEMISTRY)
PROPOSED SYLLABUS TO BE EFFECTIVE FROM JUNE 2018
PAPER-III (PHYSICAL CHEMISTRY)

Max. Marks: 100 (External – 70 + Internal – 30) **Total Periods: 45**

SEMESTER-I

UNIT-I: CHEMICAL KINETICS **12 Periods**

Theories of Unimolecular gas reactions: Lindemann theory, Kinetics of some complex reactions (i)Reversible reactions(only first order opposed by first order) (ii)Consecutive reactions(A→B→C); Steady state treatment or approximation, Enzyme catalysed reactions, Kinetics of general Chain reaction, Kinetics of photochemical reactions(H_2-$Cl_2$and H_2-Br_2) ,
Kinetics , Mechanism ,determination of activation energy and chain length of some organic decomposition (i) decomposition of ethane (ii) decomposition of acetaldehyde, Effect of Ionic strength on rates of ionic reactions (Primary and secondary salt effect)
Numerical.

UNIT- II: THERMODYNAMICS **11 Periods**

Introduction to Laws of thermodynamics, state and path functions and their applications, thermodynamic description of various types of processes,Maxwell's relations, Partial molar quantities, Calculation of partial molar quantities, determination of partial molar volume and partial molar enthalpy, Ideal and non-ideal liquid mixtures,Thermodynamics functions of mixing of non-ideal solutions (i) free energy of mixing (ii) entropy of mixing (iii) volume of mixing and (iv) enthalpy of mixing ,Excess functions(μ_E ,G_E , S_E ,H_E and V_E) for non ideal solutions and expression for excess thermodynamic functions.
Numerical

UNIT –III STATISTICAL THERMODYNAMICS **11 Periods**

Basics of Statistical thermodynamics(Assembly ,Canonical ensemble, occupation numberstatistical weight factor, probability),Thermodynamic probability,Probability and entropy, Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac statistics. Lagrange's methods of multipliers, Partition function,Thermodynamic properties in term of partition functions(i) Internal energy (ii) Heat Capacity (iii) Third law of thermodynamics(iv) Helmholtz free energy (v) Enthalpy (vi) Gibb's free energy(vii) Chemical potential (viii) Equilibrium constant Molecular partition functions for an ideal gas , Derivation for Translational, Rotationaland Vibrational partition functions
Numerical.

UNIT-IV: POLYMER CHEMISTRY **11 Periods**

Types of polymers, Stereochemistry of polymers, Kinetics of polymerization (Addition and Condensation),Thermodynamics of polymerization, Phase techniques of polymerization (Bulk, solution, suspension and emulsion), Number & Mass average Molecular mass, Polydispersity Index (P.D.I) Molecular mass determination by Viscometry and Osmometry, Thermal transitions in polymer: glass transition temperature and its significance,
Numerical

Reference Book:

1. Physical Chemistry, Atkins, P.W., W.H. Freeman (2017) 10 thediton

2. Thermodynamics for chemist Samuel Glasstone, East-West Press Pvt. Ltd. (2008)

3. Principles of Physical Chemistry**Puri B.R., Sharma L.R. and Pathania, M.S.,** Vishal Publishing Co. 41th ed. (Kinetics of some complex reactions (i) Reversible reactions(only first order opposed by first order), Consecutive reactions page no. 700-704) Kinetics of general Chain reaction page no. 706-708 Kinetics of photochemical reactions(H_2-Br_2) page no. 351-352Maxwell's relations page no. 565 Number &Mass average Molecular mass,Polydispersity Index(P.D.I) Molecular mass determination by Viscometry and Osmometry page no. 1036 -1042

Maxwell-Boltzmann, Bose-Einstein and Fermi-Dirac statistics. Lagrange's methods of multipliers, page no. 629-635
Molecular partition function for an ideal gas , Derivation for Translational, Rotational
And Vibrational partition functions page no. 636-641

4. **Chemical KineticsLaidlerK.J.TATAMcGRAW-HILL PUBLISHING COMPANY LTD.,** (Theories of unimolecular gas reactions: Lindemann theory Page No. 143-147) Steady state treatment or approximation page no. 327-328 Enzyme catalysed reactions page no. 474-477 Kinetics of photochemical reactions(H_2-Cl_2 and H_2-Br_2) page no. 360-364 ,327-328 ,358-359 Kinetics, Mechanismand determination of activation energy and chain length of some organic decomposition

(i) decomposition of ethane (ii) decomposition of acetaldehyde page no. 386-390

5. **Principles of Chemical Kinetics, James E. House, Elsevier Publication**

6. Kinetics and Mechanism of Chemical Transformations,Rajaraman, J. and Kuriacose, J., McMillan (2008).

7. Kinetics of chemical reactionsS.K. Jain , Vishal Publications

Mechanismand determination of activation energy and chain length of some organic decomposition (i) decomposition of ethane (ii) decomposition of acetaldehyde page no. 141-143 , 144-145Effect of Ionic strength on rates of ionic reactions (Primary and Secondary Salt Effect) page no. 160-162 Kinetics of polymerization (Addition and Condensation) page no. 192-195

8. A Text Book of Physical chemistry K.L.Kapoor Vol-5 Macillan India Ltd. 2007

Effect of Ionic strength on rates of ionic reactions (Primary and Secondary Salt Effect) page no. 164-167

9. An Introduction to Chemical Thermodynamics R P Rastogi and R R Mishra

VIKASH PUBLISHING HOUSE PVT LTD. 6th edition Introduction to Laws of thermodynamics, state and path functions and their applications, thermodynamic description of various types of processes page no. 1-15 , 42-47 Maxwell's relations page no. 254-258Partial molar quantities(Partial molar volume ,Internal energy, enthalpy, entropy ,Gibb,s free energy and Work function) page no. 318-325 Thermodynamics functions of mixing of non-ideal solutions (i) free energy of mixing (ii) entropy of mixing (iii) volume of mixing and (iv) enthalpy of mixing page no. 396- 397 Calculation of partial molar quantities determination of partial molar volume and partial molar enthalpy page no. 402-413

Excess functions(μ_E ,G_E , S_E ,H_E and V_E) for non ideal solutions and expression for excess thermodynamic function. Page no. 397-398
(Assembly,Canonicalensemble,occupation number , statistical weight factor, probability page no. 269-273Thermodynamic probability ,Probability and entropy page no. 274-278Partition functionpage no. 284Thermodynamic properties in term of partition functions (i) Internal energy (ii) Heat Capacity (iii) Third law of thermodynamics(iv) Helmholtz free energy (v) Enthalpy (vi) Gibb's free energy(vii) Chemical potential (viii) Equilibrium constant page no.
286- 291

10. Advanced Physical Chemistry D.N.Bajpai S.CHAND& COMPANY LTD. 2nd edition

Effect of Ionic strength on rates of ionic reactions (Primary and secondary salt effect) Page no. 508-512Partition function page no. 275-276 Derivation for Translational, Rotationaland Vibrational partition functions page no. 278-282.

11. Polymer science by V.R.Gowarikar. WILEY EASTERN LTD.

Types of polymers (12). Stereochemistry of polymers (46). Kinetics of polymerisation (105). Phase techniques (71). Number and mass average molecular mass, PDI (90). Molecular mass determination by viscometry and osmometry (404, 392). Glass transition temperature (150)