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-II

UNIT-I:THEORIES OF ELECTROLYTIC CONDUCTANCE AND OVER VOLATEGE

11 Periods

Debye-Huckel theory of strong electrolytes, relaxation effect and electrophoretic effect, Debye Falkenhagen effect, Weineffect.Ionic strength and its determination ,Debye-Huckel limiting law. Activity and activity coefficient, determination of activity coefficient by (i) solubility (solubility product principle) (ii) EMF method (cell without transference), Determination of dissociation constant of monobasic acid by conductance method and approximate EMF method, Electrolytic polarization, Dissolution and Decomposition potential, Concentration polarization, Decomposition potential and its determination, over voltage, determination of over voltage,theories of over voltage:combination of atom as slow process (Tafel theory)

Numerical.

UNIT-II: SURFACE CHEMISTRY   **11 Periods**

Adsorption Multilayer Adsorption, the BET adsorption isotherms, derivation of BET equation, determination of surface area and area of cross section of molecules by BET equation.Derivation of Langmuir equation from BET equation. Explanation of different adsorption isotherms, Change in enthalpy ,entropy and free energy of adsorption, Adsorption at the surface of liquid : Gibbs adsorption isotherms (derivation).Thermodynamic treatment of adsorption,Surface –Active substances, orientations of surfactants on the surface of solution , surface inactive substances, surface pressure,Insoluble surface films on liquid

Numerical

UNIT-III: COLLOIDS: **11 Periods**

Types of colloidal systems, preparation of lyophobic colloidal, Properties of Colloidal systems: (i) electrical properties origin of charges on colloidal, electrical double layer, Zeta potential and its determination by electrophoresis, factor affecting zeta potential, explanation on DLVO theory of colloid stability (ii) Electrokinetic properties: Electrophoresis, elecroosmosis.

Surface active agents, critical micellar concentration (CMC), factors affecting the CMC of surfactants, thermodynamics of micellization: mass action and phase separation model, solubilisation, emulsion, types of emulsion, methods for determination of types of emulsion, microemulsion, types of microemulsion, theories of microemulsion.

UNIT IV: MOLECULAR SPECTROSCOPY   **12 Periods**
Molecular spectra, **Microwave spectroscopy** (Rotational spectroscopy): The Rotation of molecules,
Linear molecule, Symmetric tops ,Spherical tops, Asymmetric tops, Rotational spectra of rigid
diatomic molecule ,Intensities of spectral lines , Effect of isotopic substitution, Techniques and
instrumentation of rotational spectrum,
IR Spectroscopy: Classical frequency of harmonic oscillator,The classical potential energy of
harmonic vibration of a diatomic molecule, Quantum expression of potential energy, energy level
diagram, Relative population of energy levels ,Mechanism of interaction with radiation, selection
rule, determination of force constant, Amplitude of vibration, The anharmonicvibrationor oscillator ,
Morse potential , Vibrational energy of diatomic molecule following the Morse potential, energy
level diagram, vibrational transitions.
Vibrational –Rotational spectra of diatomic molecule(CO molecule) Application of Vibrational
rotational spectra
Numerical

Reference Book:
1. Atkins, P.W., Physical Chemistry, W.H. Freeman (2017) 10 thediton
2. Samuel Glsstone, Introduction to Electro chemistry, East-West Press Pvt. Ltd. (2008)
3. Puri, B.R., Sharma, L.R., and Pathania, M.S., Principles of Physical Chemistry, Vishal Publishing
Co. (2017-18) 45th ed. Debye-Huckel theory of strong electrolytes, relaxation effect and
electrophoretic effect, Debye Falkenhagen effect, Wein effect. Ionic strength and its determination
,Debye-Huckel limiting law page 866- 874Insoluble surface films on liquid page no.1025

Types of colloidal systems, preparation of lyophobic colloidal, Properties of Colloidal
systems: (i) electrical properties origin of charges on colloidal, electrical double layer,
Zeta potential and its determination by electrophoresis, factor affecting zeta potential,
explanation on DLVO theory of colloid stability (ii) Electrokinetic properties:
Electrophoresis, elecroosmosis. Page no. 989-1001
4. Fundamentals of Molecular Spectroscopy C N Banwell TATA McGRAW-HILL15th edition

Molecular spectra page no.-1Microwave spectroscopy (Rotational spectroscopy): The
Rotation of molecules Linear molecule, Symmetric tops ,Spherical tops Asymmetric tops,
Rotational spectra of rigid diatomic molecule ,Intensities of spectral lines , Effect of
isotopic substitution page no. 40-53Techniques and instrumentation of rotational spectrum
page no. 66 –67Quantum expression of potential energy, energy level diagram, Relative
population of energy levels ,Mechanism of interaction with radiation, selection rule,
determination of force constant, The anharmonic vibration or oscillator , Morse potential,
Vibrational energy of diatomic molecule following the Morsepotential, energy level
diagram, vibrational transitions.Vibrational –Rotational spectra of CO molecule
Application of Vibrational rotational spectrapage no. 72-88
5. A Text Book of Physical chemistry K. L. Kapoor Vol-4 Macillan India Ltd. 3rd edition

Classical frequency of harmonic oscillator ,The classical potential energy of harmonic
vibration of a diatomic molecule, Quantum expression of potential energy, energy level
diagram, Relative population of energy levels ,Mechanism of interaction with radiation,
selection rule, determination of force constant, Amplitude of vibration, The anharmonic
vibration or oscillator , Morse potential , Vibrational energy of diatomic molecule
following the Morse potential, energy level diagram, vibrational transitions page no.

460-471 Vibrational –Rotational spectra of diatomic molecule Application of Vibrational rotational spectra page no. 480-484

Raman Spectrum in detail page no. 488-500

6 A Text Book of Physical Chemistry K. L. Kapoor Vol -5 Macillan India Ltd. 3rd edition

Adsorption Multilayer Adsorption, the BET adsorption isotherms, derivation of BET equation, determination of surface area and area of cross section of molecules by BET equation. Derivation of Langmuir equation from BET equation. Explanation of different adsorption isotherms, Change in enthalpy ,entropy and free energy of adsorption, Adsorption at the surface of liquid : Gibbs adsorption isotherms (derivation). Thermodynamic treatment of adsorption, Surface –Active substances, orientations of surfactants on the surface of solution , surface inactive substances, surface pressure page no. 11-22 , 24-26 , 30-32 ,34-38

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

Activity and activity coefficient, determination of activity coefficient by (i) solubility (solubility product principle) (ii) EMF method (cell without transference), page no. 623-626