D.B.F. Dayanand College of Arts and Science, Solapur

COURSE OUTCOME

Name of Department: Chemistry

M.Sc.		
NAME OF SUBJECT: Physical Chemistry		
SEM III		
COURSE NUMBER (PAPER NUMBER) HCT-301		
TITLE OF COURSE (NAME OF PAPER): Quantum Chemistry		
COURSE CONTENT	**OBJECTIVES**	**OUTCOME**
Failure of classical mechanics. Postulates of Quantum Mechanics, Eigen function and Eigen values. Acceptability of wave functions, Normalized and orthogonal wave functions. Operators and operator algebra, Schmidt Orthogonalisation. Hermition operators. Theorems related to commutator operations, Concept of angular momentum, angular momentum operators. Ladder operators.	To know the basis of classical mechanics. To understand the origin of Quantum Mechanics To know the basic mathematical formalism of quantum mechanics To understand the concepts like operators, types of operators,	**Students will gain the understanding of** the limitations of classical mechanics at molecular length scales the differences between classical and quantum mechanics the connection of quantum mechanical operators to observables Acquire the fundamentals of quantum mechanics for atomic and molecular systems. Hermitian and unitary operators in quantum mechanical derivations. describe in detail the time evolution of quantum systems, and the Schrödinger and Heisenberg pictures. know the path integral formulation of quantum mechanics.
Practical in a box; One / two / Three dimensional Box. Degeneracy in multidimensional box. Tunneling effect, Rigid rotator, Linear harmonic oscillator,	To study the motions of a particle viz; Translational motion through particle in a box model Rotational motion through- rigid rotor model	Able to calculate the expectation value of various physical quantities and how the measurement process works in quantum mechanics. solve the Schrödinger equation for various

the formal solutions, energy levels, degeneracy, properties of wave functions and selection rules. The hydrogen and hydrogen like atoms: Schrodinger equation for hydrogen atom (in polar coordinates) and its complete solution. The radial distribution function and its significance, shapes of atomic orbitals. Application to hydrogen like atoms and molecules (e.g H^{2+}, He^{+}, Li^{2+} etc)	Vibrational motion through harmonic oscillator model To understand the concepts like atomic orbitals, shapes of atomic orbitals etc. To study the simple chemical systems like hydrogen and hydrogen like atoms: Schrodinger equation for hydrogen atom (in polar coordinates) and its complete solution.	problems, such as the rigid rotator, harmonic oscillator using algebraic methods. Solve the Schrodinger equation for simple chemical systems like hydrogen and hydrogen like atoms.
Secular equation and secular determinants, Assumptions and formalism of Hückel molecular Orbital Theory, origin of aromatic stability and calculation of delocalization energy. Brief introduction to hetero-nuclear systems. Use of symmetry based linear combination to simplify the problem of Hückel theory calculations for larger aromatic molecules (like butadiene).	To construct Secular equation and secular determinants, To know the basic assumptions and formalism of Hückel molecular Orbital Theory, To study the use of symmetry based linear combination to simplify the problem of Hückel theory calculations for larger aromatic molecules (like butadiene).	Underrstands the molecular phenomena, interpretation of spectra the connection between common approximation methods and standard chemical frameworks Huckel approximations, HMOT approach for estimation of virial coefficients, pi-electron energies, various parameters like bond order, electron density, charge density, free valence index etc.
Schrödinger wave equation and Hamiltonian for Multi-electron systems. An introduction to ab initio and semi-empirical approximate methods: Variation principle, Perturbation theory, Self–consistent field (SCF) theory, Hertree-Fock (HF) method, Basis sets, Slater and Gaussian type atomic orbitals (STO's and GTO's).	To derive the Schrödinger wave equation and Hamiltonian for Multi-electron systems. To introduce the ab initio and semi-empirical approximate methods likeVariation method, Perturbation theory, Self–consistent field (SCF) theory, Hertree-Fock (HF) method, To form the basis sets, Slater and Gaussian type atomic orbitals (STO's and GTO's).	Able to understand different aspects of the angular momentum and spin, for example, addition of angular momentum. apply the main approximation methods for stationary and time-dependent quantum mechanical problems. Advanced computational calculations for estimating electrostatic potential, charge density etc. molecular-level critical thinking skills

Signature of HOD

M.Sc.II		
NAME OF SUBJECT: Physical Chemistry		
SEM III		
COURSE NUMBER (PAPER NUMBER) HCT-302 Electrochemistry		
COURSE CONTENT	OBJECTIVES	OUTCOMES
Electrochemistry : **Unit – I Electrolytic conductance: (15)** Debye – Huckel theory of inter – ionic attraction, ionic atmosphere, time of relaxation, relaxation and electrophoretic effects, Debye-Huckel –Onsagar equation and its validity for dilute solutions and at appreciably concentrated solutions. Debye- Falkenhagen and Wein effects. Abnormal ionic conductance of hydroxyl and hydrogen ions – Grotthuss mechanism. Activity coefficients: forms of activity coefficients and their interrelationship. Debye-Huckel limiting law and its applications to concentrated solutions. Debye-Huckel Bronsted equations. Qualitative and quantitative verification of Debye-Huckel limiting law, ion association,	To study the Debye – Huckel theory of inter – ionic attraction, ionic atmosphere, time of relaxation, Debye-Huckel limiting law and its applications to concentrated solutions. Debye-Huckel	At the end of this unit student should be able to i) understand the basic concepts and satisfied. Ii) To Solve the problems. Iii) describe electrolytic conductance, , Ion solvent interaction and electrolysis, electrode reactions, fuel cells, electroplating etc.

Bjerrum theory, problems		
Unit - II Ion solvent interactions: (15) The Born Model and expression for the free energy of ion solvent interactions. Thermodynamic parameters for the ion solvent interactions. Calculations of heats of hydration of ions and the concept of hydration number (Van Arkel, de Boer's and Bernal- Fowler method etc.).	To study the Born Model and expression for the free energy of ion solvent interactions. Thermodynamic concept of hydration number (Van Arkel, de Boer's and Bernal- Fowler method etc.).	At the end of this unit student should be able to i) understand the basic concepts and satisfied. Ii) To Solve the problems. Iii) describe Born Model and expression for the free energy of ion solvent interactions. Thermodynamic Calculations of heats of hydration of ions
Unit- III Electrolysis: (15) Decomposition potentials: calculations and determinations. Polarization: types of polarization, overvoltage, hydrogen and oxygen overvoltage, Laws of electrolysis, role of electrolysis in electrometallurgy. Electroforming: process, advantages and disadvantages, Electrotyping: technique, description, electrotyping in printing and in art.	To study the Decomposition potentials, overvoltage Electrotyping: technique, description, electrotyping in printing and in art.	At the end of this unit student should be able to i) understand the basic concepts and satisfied. Ii) To Solve the problems. Iii) describe electrolytic conductance, , Ion solvent interaction and electrolysis, electrode reactions, fuel cells, electroplating etc.
Unit – IV : Electrode reactions. (15) Tafel equations, kinetics of discharge of hydrogen ions. Diffusion overpotentials, theory of diffusion overpotential and its importance. Fuel cells: significance of fuel cells: hydrogen –	To study the Tafel equations, kinetics of discharge of hydrogen ions. Diffusion overpotentials ,Fuel cells Corrosion ,Pourbaix diagrams, Electro-osmosis, electrophoresis. Streaming and Sedimentation potentials, Zeta	At the end of this unit student should be able to i) understand the basic concepts and satisfied. Ii) To Solve the problems. Iii) describe overpotentials ,Fuel cells Pourbaix diagrams, Electro-osmosis, electrophoresis. Streaming and Sedimentation potentials, Zeta

oxygen, phosphoric acid, molten carbonate, solid polymer electrolytes, hydrocarbon – air, natural gas and carbon monoxide- air fuel cells. Corrosion: concept and importance, classification, mechanism and kinetics of corrosion, Pourbaix diagrams, methods of corrosion prevention. Electrical double layer concept, Electrokinetic and electro-capillary phenomena, electrocapillary curve. Electro-osmosis, electrophoresis. Streaming and Sedimentation potentials, Zeta potentials and its determination by electrophoresis, Influence of ions on Zeta potential		etc.
TITLE OF COURSE (NAME OF PAPER): Quantum Chemistry		

D.B.F. Dayanand College of Arts and Science, Solapur

COURSE OUTCOME

Name of Department: Chemistry

M.Sc.II		
NAME OF SUBJECT: Physical Chemistry		
SEM III		
COURSE NUMBER (PAPER NUMBER) PCH –303		
TITLE OF COURSE (NAME OF PAPER): Molecular structure-I		
COURSE CONTENT	**OBJECTIVES**	**OUTCOME**
Introduction of Molecular spectro scopy and Rotational Spectra Characterization of electromagnetic radiation. The quantification of energy, Regions of Spectrum, transition probability, the width and intensity of spectral transitions. Classification of molecules according to their moment of inertia. Rotational spectra of rigid and non-rigid diatomic molecules. Selection rules. The intensities of spectral lines. The effect of isotopic substitution. Polyatomic molecules. The Stark effect. Calculations of rotational constant B for real spectrum eg CO, HCl, NO etc. Instrumentation, source, waveguide and	**To Review of the knowledge of spectrroctry,** Characterization of electromagnetic radiation. The quantification of energy, Regions of Spectrum, transition probability, the width and intensity of spectral transitions. Classification of molecules according to their moment of inertia. Rotational spectra of rigid and non-rigid diatomic molecules. Selection rules. The intensities of spectral lines. The effect of isotopic substitution. Polyatomic molecules. The Stark effect. Calculations of rotational constant B for real spectrum eg CO, HCl, NO etc. Instrumentation, source, waveguide and detectors	**Students should review of the knowledge of spectrroctry**, Characterization of electromagnetic radiation. The quantification of energy, Regions of Spectrum, transition probability, the width and intensity of spectral transitions. Classification of molecules according to their moment of inertia. Rotational spectra of rigid and non-rigid diatomic molecules. Selection rules. The intensities of spectral lines. The effect of isotopic substitution. Polyatomic molecules. The Stark effect. Calculations of rotational constant B for real spectrum eg CO, HCl, NO etc. Instrumentation, source, waveguide and detectors

detectors		
Infra-Red Spectroscopy and Raman Spectroscopy: Diatomic molecules: molecules as harmonic oscillator Morse potential energy function, vibrational spectrum, fundamental vibrational frequencies. Force constant, zero point energy, isotope effect. The anharmonic oscillator, the diatomic vibrating rotator, the interaction of rotation and vibration, selection rule. Analysis of one real spectrum. Polyatomic molecules: Fundamental vibrations and their symmetry. Overtone and combition frequencies. The influence of rotations and molecular spin on the spectra of plyatomic molecules. Analysis by infrared techniques. Raman Spectroscopy: Reyleighscattering. Raman scattering, classical and quantum theories of Raman effect. Rotational Raman spectra. For linear and symmetric top molecules. Vibrtional Raman spectra, rotational fine structure. Polarization of light and the Raman effect. Structure determination from Raman and Infrared spectroscopy. Selection rules. Mutual exclusion effect**.**	. Diatomic molecules: as harmonic oscillator vibrational spectrum, fundamental vibrational frequencies.	To study the spectroscopic methods like, Infra-Red Spectroscopy and Raman Spectroscopy The study of modes of vibrations in Diatomic and poly atomic molecules

D.B.F.Dayanand College of Arts and Science,Solapur

COURSE OUTCOME

Name of the Department : Chemistry

B.Sc. I/II/III/M.Sc. I/II : M.Sc. II		
NAME OF THE SUBJECT : Physical Chemistry		
SEM : III		
COURSE NUMBER (PAPER NUMBER) : PCH 304		
TITLE OF THE COURSE (TITLE OF THE PAPER) : Solid State and Nuclear Chemistry		
COURSE CONTENT	**OBJECTIVES**	**OUTCOME**
Unit II : Solid State Reactions General principle, types of reactions: Additive, structure sensitive, decomposition and phase transition reactions, material transport in solid state reactions,Kirkendall effect, kinetics of solid state reactions, factors affecting the reactivity of solid state reactions.	To make students know difference between mode of reactions in solid and liquid state,to get knowledge about factors affecting the solid state reactions.	Students will learn the way reactions take place in solids.

D.B.F. Dayanand College of Arts and Science, Solapur

COURSE OUTCOME

Name of Department: Chemistry

M.Sc.II		
NAME OF SUBJECT: Physical Chemistry		
SEM IV		
COURSE NUMBER (PAPER NUMBER) HCT-401		
TITLE OF COURSE (NAME OF PAPER): Statistical Mechanics and Thermodynamics		
COURSE CONTENT	**OBJECTIVES**	**OUTCOME**
Exact and inexact differential expressions in two variables. Total differentials. Techniques of partial differentiations. Transformation of variables. Maxima and mimima. Integrating Factors, Paff differential equations, Caratheodory's theory. Legendre transformations. Derivation of thermodynamic identities. The second law of thermodynamics, classical formulations, mathematical consequences of second law. Entropy changes, Clausius inequality. Free energy concept. General condition of equilibrium.	To know the Exact, inexact, total and Paff differential expressions in two variables. To transform the variables. To understand the Maxima and mimima. To know about Legendre transformations. Derivation of thermodynamic identities. To study the second law of thermodynamics, classical formulations, mathematical consequences of second law. Entropy changes, Clausius inequality. To understand the Free energy concept. General condition of equilibrium.	Understands the Exact, inexact, total and Paff differential expressions in two variables. Able to transform the variables. Understand the Maxima and mimima. Does the Legendre transformations. Able to derive the thermodynamic identities. Able to interpret the second law of thermodynamics, classical formulations, mathematical consequences of second law. Entropy changes, Clausius inequality. Understands the Free energy concept. General condition of equilibrium.
Configuration and weights, the most probable configuration. Statistical Equilibrium. Postulates of equal probabilities. Ensembles. Ensemble average and time average of property. The classical Boltzmann Distribution	To know about the Configuration and weights, the most probable configuration. Statistical Equilibrium. To study the Postulates of equal probabilities. Ensembles. Ensemble average and time average of property.	Understands the Configuration and weights, the most probable configuration. Statistical Equilibrium. Knew the Postulates of equal probabilities. Ensembles. Ensemble average and time average of property.

law. Principle of the equi-partition of energy, Quantum Statistics : Bose-Einstein, Fermi-Dirac and Maxwell–Boltzmann statistics, comparison of three statistics, Fermi- Dirac systems. Thermodynamics of electromagnetic radiations using BE statistics, Calculation of thermodynamic properties for boson and fermion gases using quantum statistics. Fermi energy. Electron gas in metals.	To derive the classical Boltzmann Distribution law. To know the Principle of the equi-partition of energy, To study Quantum Statistics : Bose-Einstein, Fermi-Dirac and Maxwell–Boltzmann statistics, comparison of three statistics, Fermi-Dirac systems. Thermodynamics of electromagnetic radiations using BE statistics, Calculation of thermodynamic properties for boson and fermion gases using quantum statistics. Fermi energy. Electron gas in metals.	Able to derive the classical Boltzmann Distribution law. Understands the Principle of the equi-partition of energy, Able to solve the Quantum Statistics : Bose-Einstein, Fermi-Dirac and Maxwell–Boltzmann statistics, comparison of three statistics, Fermi-Dirac systems. Thermodynamics of electromagnetic radiations using BE statistics, Calculation of thermodynamic properties for boson and fermion gases using quantum statistics. Fermi energy. Electron gas in metals.
Expressions for transnational, rotational, vibrational and electronic partition functions, relation between the partition function and thermodynamic properties. Free energy functions, ortho- and para-hydrogen, use of spectroscopic and structural data to calculate thermodynamics functions. Molecular and statistical interpretation of entropy, third law of thermodynamics and equilibrium constant. Heat capacity of solids, Einstein and Debye specific heat theories. Characteristic temperatures.	To derive the Expressions for transnational, rotational, vibrational and electronic partition functions, To relate the partition function and thermodynamic properties. Free energy functions, To study ortho- and para- hydrogen, use of spectroscopic and structural data to calculate thermodynamics functions. Molecular and statistical interpretation of entropy, third law of thermodynamics and equilibrium constant. To study Heat capacity of solids, Einstein and Debye specific heat theories. Characteristic temperatures.	Able to derive the Expressions for transnational, rotational, vibrational and electronic partition functions, Establish the relationship between partition function and thermodynamic properties. Free energy functions, Able to know ortho- and para- hydrogen, use of spectroscopic and structural data to calculate thermodynamics functions. Molecular and statistical interpretation of entropy, third law of thermodynamics and equilibrium constant. Understands the Heat capacity of solids, Einstein and Debye specific heat theories. Characteristic temperatures.
Conservation of mass in closed and open systems. Conservation of energy in closed and open systems. Law of increasing entropy. Non- adiabatic process and clausius inequality, steady	To know about Conservation of mass in closed and open systems. Conservation of energy in closed and open systems. Law of increasing entropy. To study Non- adiabatic process and clausius	Understands the Conservation of mass in closed and open systems. Conservation of energy in closed and open systems. Law of increasing entropy. Able to know Non- adiabatic process and clausius

state. Thermodynamic equations of motion. Entropy production in closed and open systems. Entropy production due to heat flow. Chemical potentials. Generalized fluxes, forces and their transformation. Phenomenological equations and coefficients, concepts of reciprocity relations and Onsager theorem of microscopic reversibility. Diffusion, electromotive force and other reactions involving cross relations e.g. thermoelectric and electrokinetic effects. Saxen’s relations. Oscillatory reactions.	inequality, steady state. Thermodynamic equations of motion. Entropy production in closed and open systems. Entropy production due to heat flow. Chemical potentials. Generalized fluxes, forces and their transformation. To understand the Phenomenological equations and coefficients, concepts of reciprocity relations and Onsager theorem of microscopic reversibility. Diffusion, electromotive force and other reactions involving cross relations e.g. thermoelectric and electrokinetic effects. Saxen’s relations. Oscillatory reactions.	inequality, steady state. Thermodynamic equations of motion. Entropy production in closed and open systems. Entropy production due to heat flow. Chemical potentials. Generalized fluxes, forces and their transformation. Understands the Phenomenological equations and coefficients, concepts of reciprocity relations and Onsager theorem of microscopic reversibility. Diffusion, electromotive force and other reactions involving cross relations e.g. thermoelectric and electrokinetic effects. Saxen’s relations. Oscillatory reactions.

Signature of HOD

Sem- IV

Course number – Hard core HCT-402

TITLE OF THE COURSE: CHEMICAL KINETICS.

COURSE CONTENT	OBJECTIVES	OUTCOMES
Unit – I : Theories of reaction rates: (15) Equilibrium and rate of reaction, Partition functions and activated complex, Transition state theory (Thermodynamic and partition function approach), Reaction between polyatomic molecules, calculation of activation parameters of a reaction. Collision theory, energy factor, orientation factor, rate of reaction, Lindemann's mechanism of unimolecular reaction, weakness of the collision theory.	Theories of reaction rates, chemical kinetics, chain reactions, homogeneous catalysis	At the end of this unit student should be able to i) Explain Theories of reaction rates, chain reactions, ii) understand the basic concepts and satisfied. Ii) To Solve the problems.
Unit – II : Chemical kinetics: (15) Kinetics of complex reactions: Opposing reactions, derivation of rate law for first order opposed by first order, second order opposed by first order, sequential reactions: expression for the rate law, maximum concentration of intermediate, time for maximum concentration of intermediate. Kinetics of parallel reactions and their rate law, ratio of products and examples, Numerical problems.	To study Kinetics of complex reactions: In detail opposing reactions, parallel reactions, Numerical problems.	At the end of this unit student should be able to i) Explain kinetics of complex reactions, ii) understand the basic concepts and satisfied. Ii) To Solve the problems.
Unit-III: Chain reactions: (15) Chain reactions. General aspects of chain reactions, chain	Chain reactions potential energy surfaces (semi-	At the end of this unit student should be able to i) Explain chain reactions,

length, reaction between H2-Br2, H2-Cl2, H2-I2 and their comparison, thermal decomposition of acetaldehyde, Kinetics of branching chain reactions & explosion limits. Potential energy surfaces: construction of multidimensional potential energy surfaces (semi-empirical treatment), saddle point, reaction co-ordinate, example of tunneling effect, reaction H+H2	empirical treatment), saddle point, reaction co-ordinate, example of tunneling effect, reaction H+H2	ii) understand the basic concepts and satisfied. Ii) To Solve the problems.
Unit – III: Homogeneous catalysis: (15) Kinetics of homogeneous catalysis, general catalytic mechanism, equilibrium and steady- state treatment, activation energies for catalyzed reactions. General acid-base catalysis, mechanisms of acid-base catalysis (Arrhenius and van't Hoff intermediates), catalytic activity and acid base sterngth,Acidity functions, autocatalysis and oscillatory reactions. Mechanism of enzyme catalyzed reactions and rate law for single substrate, Lineweaver-Burk plot, effect of pH and temperature.	Kinetics of homogeneous catalysis Acidity functions, autocatalysis and oscillatory reactions. Mechanism of enzyme catalyzed reactions and rate law for single substrate, Lineweaver-Burk plot, effect of pH	At the end of this unit student should be able to i) Explain kinetics of homogeneous catalysis ii) understand the basic concepts of autocatalysis and oscillatory reactions. Mechanism of enzyme catalyzed reactions and rate law for single substrate, Lineweaver-Burk plot, effect of pH and satisfied. Ii) To Solve the problems.

Head of Department

D.B.F. Dayanand College of Arts and Science, Solapur
COURSE OUTCOME
Name of Department: Chemistry

M.Sc.II		
NAME OF SUBJECT: Physical Chemistry		
SEM IV		
COURSE NUMBER (PAPER NUMBER) 403		
TITLE OF COURSE (NAME OF PAPER): Molecular structure-II		
COURSE CONTENT	**OBJECTIVES**	**OUTCOME**
Electrical Properties of Molecules Electric dipole moment of molecule, polarization of a dielectric, polarizability of molecules, Clausius-Mossotti equation. Debye equation, Limitation of the Debye theory, determination of dipole moment from dielectric measurements in pure liquids and in solutions. Dipole moment and ionic character, Bond moment, Group moment, vector addition of moments, bond angles, the energies due to dipole-dipole, dipole-induced dipole and induced dipole-induced dipole interaction. Lennard-Jones potential.	**To Review of the knowledge of** Electric dipole moment of molecule, polarization of a dielectric, polarizability of molecules, Clausius-Mossotti equation. Debye equation, Limitation of the Debye theory, determination of dipole moment from dielectric measurements in pure liquids and in solutions. Dipole moment and ionic character, Bond moment, Group moment, vector addition of moments, bond angles, the energies due to dipole-dipole, dipole-induced dipole and induced dipole-induced dipole interaction. Lennard-Jones potential.	**Students should understand**. Electric dipole moment of molecule, polarization of a dielectric, polarizability of molecules, Clausius-Mossotti equation. Debye equation, Limitation of the Debye theory, determination of dipole moment from dielectric measurements in pure liquids and in solutions. Dipole moment and ionic character, Bond moment, Group moment, vector addition of moments, bond angles, the energies due to dipole-dipole, dipole-induced dipole and i interaction. Lennard-Jones
The Magnetic properties of Molecules: Diamagnetism and paramagnetism. Volume and mass susceptibilities. Lengevins classical theory of diamagnetism and	**To Review of the knowledge of** Diamagnetism and paramagnetism. Volume and mass susceptibilities. Lengevins classical theory of diamagnetism and paramangenetism. Atomic and ionic susceptibility. Pascal constants,	**Students should understand** Diamagnetism and paramagnetism. Volume and mass susceptibilities. Lengevins classical theory of diamagnetism and paramangenetism. Atomic and ionic susceptibility. Pascal constants,

paramangenetism. Atomic and ionic susceptibility. Pascal constants, Curie- Weiss law. Van Vleck general equation of magnetic susceptibility. Determination of magnetic susceptibility, Gouy method. Ferro and ferri magnetism, application to coordination complexes and complex ions of transition metals.	Curie- Weiss law. Van Vleck general equation of magnetic susceptibility. Determination of magnetic susceptibility, Gouy method. Ferro and ferri magnetism, application to coordination complexes and complex ions of transition metals.	Curie- Weiss law. Van Vleck general equation of magnetic susceptibility. Determination of magnetic susceptibility, Gouy method. Ferro and ferri magnetism, application to coordination complexes and complex ions of transition metals.
Nuclear Magnetic Resonance Spectroscopy: The nature of spinning particles, interaction between spin and magnetic field. Population of energy levels and signal to noise ratio, the Larmour precession, relaction times, the meaning of resonance, selection rules and the resonance condition. NMR experiment and instrumentation, significance of shielding constants and chemical shift, chemical analysis by NMR. Simple and complex splitting patterns. Fourier Transformer and FT NMR. Exchange phenomena, 13C NMR spectroscopy, double resonance and Nuclear-Overhauser effect.	The nature of spinning particles, interaction between spin and magnetic field. Population of energy levels and signal to noise ratio, the Larmour precession, relaction times, the meaning of resonance, selection rules and the resonance condition.	To understand principle of NMR Spectroscopy and splitting pattern, exchange phenomenon, 13C NMR and NOE etc.

D.B.F.Dayanand College of Arts and Science,Solapur

COURSE OUTCOME

Name of the Department : Chemistry

M.Sc. II		
NAME OF THE SUBJECT : Physical Chemistry		
SEM : IV		
COURSE NUMBER (PAPER NUMBER) : PCH 404		
TITLE OF THE COURSE (TITLE OF THE PAPER) : Surface Chemistry		
COURSE CONTENT	**OBJECTIVES**	**OUTCOME**
Unit II : Liquid-Gas interfaces Types of interfaces, Surface and interfacial tension, Young and Laplace equation for vapor pressure at curved , plane and spherical interfaces , Kelvin equation for Vapor Pressure inside and outside the liquid droplet, methods of determination of surface tension.	To make students know about surface tension between liquid-gas interfaces and methods of determination.	Students will learn surface tension between liquid-gas interfaces.
Unit III: Liquid-Liquid interfaces: Surface spreading, spreading coefficient, cohesion and adhesion energy, surface energy and spreading coefficient, Langmuir–Adam surface pressure balance, formation of insoluble monomolecular films, Langmuir-Blodget films, physical states of film,π-A	To make students know about surface tension between liquid-liquid interfaces and methods of determination. To also get knowledge about emulsion and nano-particles.	

isotherm and its comparison with P-V isotherm, derivation $\pi A = kT$ equation, gaseous, liquid expanded and condensed films. Emulsion, identification of emulsion, types of emulsion, emulsion stability, emulsifier, theories of emulsification, preparation of nanoparticles by using reprecipitation and emulsion method.		