FACULTY OF SCIENCES

SYLLABUS

of

Chemistry

for

Bachelor of Science (Honours) Mathematics (Semester I)

(Under Credit Based Continuous Evaluation Grading System)

Session: 2023-24



The Heritage Institution KANYA MAHA VIDYALAYA JALANDHAR

(Autonomous)

KANYA MAHA VIDYALAYA JALANDHAR (AUTONOMOUS)

SCHEME AND CURRICULUM OF EXAMINATION OF FOUR YEAR DEGREE PROGRAMME

Bachelor of Science (Honours) Mathematics

Credit Based Continuous Evaluation Grading System (CBCEGS) (Session: 2023-2024)

Bachelor of Science (Honours) Mathematics										
(Semester I)										
		Course	Hours Per	Credits	Total	Marks				Examination time
Course	Course Title	Туре	Week	L-T-P	Credits					(in Hours)
Code										
			L-T-P							
						Total	Th	Р	CA	
BOMM-	Physical	С	3-0-2	3-0-1	4	100	60	20	20	3 (Theory)
1085	Chemistry									3.5(Practical)

Bachelor of Science (Honours) Mathematics (Semester–I) Session: 2023-24 Course Title: Physical Chemistry Course Course Code: BOMM-1085

Course outcomes

Students will be able to:

CO1: understand the various thermodynamic properties and laws of Thermodynamics, acquire knowledge about the various thermodynamic terms like enthalpy of formation, enthalpy of ionisation, entropy, internal energy

CO2: calculate entropy change for reversible and irreversible processes under isothermal and non-isothermal conditions and also absolute entropies of substances, understand the concept of reaction rates and determine the rate law from initial rate data, determine the order of reaction with respect to each reactant, the overall order of reaction, the rate constant with units

CO3: understand the relation between free energy change and equilibrium constants K_p , K_c and K_f : describe the Phases and Phase rule and its thermodynamic derivation and determine the transference number of ions using Hittorf and moving boundary methods

CO4: draw and explain the phase diagrams of water system, sulphur system, understand the concept of Electrochemistry and various terms related to it like resistance, conductance, specific resistance, cell constant, EMF, importance of Nernst Equation

Bachelor of Science (Honours) Mathematics (Semester–I) Session: 2023-24 Course Title: Physical Chemistry Course Code: BOMM-1085

Exam Time: 3 Hrs. Credit(L-T-P): 3-0-0

Max.Marks:60

Instructions for the Paper Setters:

Eight questions of Twelve marks each are to be set, two in each of the four Sections (A-D). Questions may be subdivided into parts (not exceeding four). Candidates are required to attempt five questions, selecting at least one question from each Section. The fifth question may be attempted from any Section.

Unit I

Chemical Thermodynamics

Laws of thermodynamics, Enthalpy of a system, heat capacity, Isothermal and adiabatic process in ideal gases, Carnot cycle, thermodynamic efficiency, Thermo-Chemistry : heat of reaction at constant volume and pressure thermo chemical equations, calculations of E from H and vice versa, Hess's law of heat summation, heat of formation, heats of combustion, heat of solution, heat of neutralization of acids and bases, dependence of H and E for a reaction

(Kirchoff's equation). II and III law of thermodynamics: Entropy, dependence of entropy on variables of a system, Entropy change in ideal gases, entropy of mixing for ideal gases, entropy change in physical transformations, entropy change in chemical reactions, absolute Entropies, residual entropy, thermodynamics of III Law.

Unit II

Equilibrium

Equilibrium and Spontaneity under constraints- General conditions. Helmholtz free energy (A) for reactions. Gibbs free energy.Chemical potential, Gibbs free energy and entropy of mixing of ideal gases. The Equilibrium constants K_p and K_c of real gases.Phase Rule, Gibbs Phase rule, derivation of phase rule, one component system, the water system, the sulfur system.

Unit III

Chemical Kinetics

Measurement of reaction rate, order, molecularity of reaction, first order reactions, second order reactions, third order reactions, Methods of determination of order, effect of temperature, activation energy.

Unit IV

Electro-Chemistry

Conductance and Ionic Equilibrium: Faraday's law of electrolysis, Kohlrausch law of independent migration of ions, transference numbers, determination of transference numbers, electrolytic conductance, variation of conductance with concentration, equivalent conductance at infinite dilution, Applications of conductance measurements, Reversible and Irreversible cells, standard cells, cell reaction and EMF. Single electrode potential and its calculation, thermodynamic and EMF, standard potential and equilibrium constants.

Books Recommended:

- 1. Physical Chemistry by Samuel H, Carl P. Putton; 4th Edition, Americ Inc. Co.
- 2. Physical Chemistry by Glassstone, 2ndEdition, The Macmillian Press Ltd.
- 3. Kinetic and Mechanism by Frost A and Pearson R.G, 3rd Edition, Wiley Eastern Pvt. Ltd.
- 4. Chemical Kinetic by K.J. Laidler, Harper and Row.
- 5. Physical Chemistry by Glberg W. Castellian Addison:3rd Revised Edition Wesley publishing Comp

Bachelor of Science (Honours) Mathematics (Semester–I) Session: 2023-24 Course Title: Physical Chemistry Practical Course Code: BOMM-1085 (P)

Course outcomes:

Students will be able to:

CO1: determine the surface tension of different liquids and solutions

CO2: determine the viscosity of different liquids and solutions

- CO3: efficiently use of calorimeter in various experiments
- CO4: determine heat of neutralization and heat of solution

Bachelor of Science (Honours) Mathematics (Semester–I) Session: 2023-24 Course Title: Physical Chemistry Practical Course Code: BOMM-1085(P)

Exam Time: 3.5 Hrs

Max. Marks: 20

Credit (L-T-P): 0-0-1

Instruction for practical examiner: Question paper is to be set on the spot jointly by the Internal and External Examiners. Two copies of the same should be submitted for the record to COE Office, KanyaMahaVidyalaya, Jalandhar.

- 1. Determine the coefficient of viscosity of the given liquid (CCl₄, glycerine solution in water).
- 2. Determine the surface tension of given liquid (CCl₄, glycerine solution in water) by drop number method.
- 3. Determine the surface tension of given liquid (CCl₄, glycerine solution in water) by drop weight method.
- 4. Determine the water equivalent of given calorimeter.
- 5. Determine the enthalpy of neutralisation of a strong acid versus strong base.
- 6. Determine the enthalpy of neutralisation of a weak acid/weak base versus strong base/strong acid and determine the enthalpy of ionisation of the weak acid/weak base.
- 7. Determine the enthalpy of dissolution of solid calcium chloride in water at room temperature.

Books Recommended:

- 1. Experiments in General Chemistry, C.N.R. Rao and U.C. Aggarwal, East-West Press.
- 2. Experiments in Physical Chemistry, R.C. Das and B. Behra, Tata McGraw Hill.
- 3. Advanced Practical Physical Chemistry, J.B. Yadav, Goel Publishing House.
- 4. Advanced Experimental Chemistry, Vol. I, Physical, J.N. Guru and R. Kapoor, S. Chand and Co.
- 5. Selected Experiments in Physical Chemistry, N.G. Mukherjee, J.N. Ghosh and Sons.
- 6. Experiments Physical Chemistry, J.C. Ghosh, BharatiBhavan.