

ACADEMIC PLANNER & UNITIZATION OF SYLLABUS

Department of Chemistry

Bankura Christian College

ACADEMIC YEAR: 2023-24 (Semester 2nd /4th /6th)

4th Semester (Hons) Theory (January, 2023 to June, 2023)

Name of faculty member: Dr. Mahendra Ghosh

Subject: Chemistry

Core-T8, Physical Chemistry

Unit - 1.

1. Ionic equilibria: Chemical potential of an ion in solution; Activity and activity coefficients of ions in solution; Debye-Huckel limiting law-brief qualitative description of the postulates involved, qualitative idea of the model, the equation (without derivation) for ion-ion atmosphere interaction potential. Estimation of activity coefficient for electrolytes using Debye-Huckel limiting law; Derivation of mean ionic activity coefficient from the expression of ion-atmosphere interaction potential; Applications of the equation and its limitations

Unit - 2.

2. Electromotive Force: Quantitative aspects of Faraday's laws of electrolysis, rules of oxidation/reduction of ions based on half-cell potentials, applications of electrolysis in metallurgy and industry; Chemical cells, reversible and irreversible cells with examples; Electromotive force of a cell and its measurement, Nernst equation; Standard electrode (reduction) potential and its application to different kinds of half-cells. Application of EMF measurements in determining (i) free energy, enthalpy and entropy of a cell reaction, (ii) equilibrium constants, and (iii) pH values, using hydrogen, quinone-hydroquinone, glass and SbO/Sb₂O₃ electrodes

Unit - 3.

3. Concentration cells with and without transference, liquid junction potential; determination of activity coefficients and transference numbers; Qualitative discussion of potentiometric titrations (acid-base, redox, precipitation)

4. Dipole moment and polarizability: Polarizability of atoms and molecules, dielectric constant and polarisation, molar polarisation for polar and non-polar molecules; Clausius-Mosotti equation and Debye equation (both without derivation) and their application; Determination of dipole moments

Unit - 4.

2. Qualitative treatment of hydrogen atom and hydrogen-like ions: Setting up of Schrödinger equation in spherical polar coordinates, radial part, quantization of energy (only final energy expression); Average and most probable distances of electron from nucleus; Setting up of Schrödinger equation for many-electron atoms (He, Li)

MONTH/YEAR	WEEK	PORTIONS
March 2023	2 nd	Chemical potential of an ion in solution; Activity and activity coefficients of ions in solution; Debye-Huckel limiting law-brief qualitative description of the postulates involved,
	3 rd	qualitative idea of the model, the equation (without derivation) for ion-ion atmosphere interaction potential. Estimation of activity coefficient for electrolytes using Debye-Huckel limiting law;
	4 th	Derivation of mean ionic activity coefficient from the expression of ion-atmosphere interaction potential; Applications of the equation and its limitations
	5 th	Class Test-1/ Revision of Unt-1
April 2023	1 st	Quantitative aspects of Faraday's laws of electrolysis, rules of oxidation/reduction of ions based on half-cell potentials, applications of electrolysis in metallurgy and industry;
	2 nd	Chemical cells, reversible and irreversible cells with examples; Electromotive force of a cell and its measurement, Nernst equation; Standard electrode (reduction) potential and its application to different kinds of half-cells.
	3 rd	Application of EMF measurements in determining (i) free energy, enthalpy and entropy of a cell reaction, (ii) equilibrium constants, and (iii) pH values, using hydrogen, quinone-hydroquinone, glass and SbO/Sb ₂ O ₃ electrodes
	4 th	Class Test-2
May 2023	1 st	Concentration cells with and without transference, liquid junction potential; determination of activity coefficients and transference numbers;
	2 nd	Qualitative discussion of potentiometric titrations (acid-base, redox, precipitation) Polarizability of atoms and molecules, dielectric constant and polarisation, molar polarisation for polar and non-polar molecules;
	3 rd	Clausius-Mosotti equation and Debye equation (both without derivation) and their application; Determination of dipole moments
	4 th	Revision of Unt-3
June 2023	1 st	Setting up of Schrödinger equation in spherical polar coordinates, radial part, quantization of energy (only final energy expression);
	2 nd	Average and most probable distances of electron from nucleus; Setting up of Schrödinger equation for many-electron atoms (He, Li)
	3 rd	Class Test-3