Course Code	Course Name	Credits
26CH012	PHYSICAL CHEMISTRY-II	04

Course Objectives

- To understand key concepts in thermodynamics, electrochemistry, and photochemistry.
- To apply principles of electrical conductance, electrolytic dissociation, and electromotive force.
- To analyze electrochemical and photochemical processes using relevant laws and methods.

Learning Outcomes

Upon successful completion of this course it is intended that a student will be able to:

- Understand electrolysis and electrical conductance, theory of electrolytic dissociation, electromotive force and photochemistry.
- Explain the concepts thermodynamics and solve problems based on these topics.
- Summarize the concepts of thermodynamics, electrolysis and electrical conductance, theory of electrolytic dissociation, electromotive force and photochemistry.
- Describe the theories and their shortcomings in the above topics after critically evaluating the complexities involved in them.
- Apply knowledge acquired to the solution of problems, and design experimental work in the laboratory.

Unit 1 - Thermodynamics -II (12 Hrs.)

Spontaneous processes; entropy; third law of thermodynamics; numerical definition of entropy; units of entropy; standard entropy; standard entropy of formation; Carnot cycle; derivation of entropy from Carnot cycle; physical significance of entropy; entropy change for an ideal gas; entropy change accompanying phase transitions; Gibbs–Helmholtz equations; Clausius–Clapeyron equation; applications of the Clausius–Clapeyron equation; free energy and work functions; van't Hoff isotherm; fugacity and activity.

Unit 2 – Electrolysis and Electrical Conductance (12 Hrs.)

Mechanism of electrolysis; electrical units; Faraday's laws of electrolysis; Faraday's first law; Faraday's second law; importance of the first and second laws of electrolysis; conductance of electrolytes; specific conductance; equivalent conductance; strong electrolytes; weak electrolytes; measurement of electrolytic conductance; determination of cell constant.

Unit 3 - Theory of Electrolytic Dissociation (12 Hrs.)

Arrhenius theory of ionization; migration of ions; relative speed of ions; transport number; determination of transport number; Hittorf's method; moving boundary method; Kohlrausch's law; applications of Kohlrausch's law; conductometric titrations; differences between conductometric and volumetric titrations.

Unit 4 – Electromotive Force (12 Hrs.)

Half reactions; electrochemical cells; cell potential or emf; calculation of emf of a cell; measurement of emf of a cell; relation between emf and free energy; determination of emf of a half-cell; Nernst equation; calculation of half-cell potential; calculation of cell potential; calculation of equilibrium constant for the cell reaction; calomel electrode; dipping calomel electrode; glass electrode; quinhydrone electrode; determination of pH of a solution using hydrogen electrode, SCE, glass electrode, and quinhydrone electrode; potentiometric titrations; acid–base titrations; oxidation–reduction titrations; precipitation titrations; overvoltage or overpotential; emf of concentration cell

Unit 5 - Photochemistry (12 Hrs.)

Photochemical reactions; difference between photochemical and thermochemical reactions; thermopile; photoelectric cell; chemical actinometer; laws of photochemistry; Grotthuss–Draper law; Stark–Einstein law of photochemical equivalence; quantum yield (quantum efficiency); calculation of quantum yield; photosensitized reactions; photophysical processes; fluorescence; phosphorescence; chemiluminescence.

Reference Books:

1. B.R.Puri, L.R.Sharma & M.S. Pathania, Principles of Physical Chemistry, 47th Ed.,2016. Vishal Publishing Co.
2. P. L. Soni and O. P. Dharmaha,, Text book of Physical chemistryl, S. Chand and Sons, New Delhi.
3. Ira N. Levine, Pearson, Quantum Chemistry, 7th Ed., 2014 London, UK.
4. B.S Arun Bahl and G.D. Tuli, Essential of Physical Chemistry (S. Chand Publications)
5. Peter Atkins, Julio de Paula, and James Keeler, Atkins' Physical Chemistry, 11th Ed., 2017. Oxford University Press, UK.

Websites and eLearning Sources:

1. https://nptel.ac.in/courses/104106129
2. https://www.sciencedirect.com/topics/chemistry/photochemistry
3. https://www.youtube.com/results?search_query=Electromotive+Force+bsc

COs and Bloom's Taxonomy Mapping – 26CH012		
Course Outcomes	**On completing U.G. program the students will be able to**	**BTL**
CO1	Recall entropy, free energy, Carnot cycle, and their applications in thermodynamics.	K1, K2
CO2	Explain electrolysis, its laws, and apply conductance concepts in electrolyte measurements.	K3
CO3	Analyze electrolytic dissociation, ion transport, and Kohlrausch's Law in conductometry.	K4
CO4	Evaluate emf measurements, Nernst equation, electrodes, and potentiometric titrations.	K5
CO5	Design photochemical experiments using actinometers and quantum yield.	K6

BTL K1 and K2 – remembering and understanding, K3- Applying, K4 – Analyse, K5- Evaluate and K6- Create

Relationship Matrix – 26CH012													
Course Outcomes	**Programme Outcomes (POs)**						**Programme Specific Outcomes (PSOs)**						**Mean Score of Cos**
	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**	
CO1	1	3	2	1	2	1	2	3	1	2	1	1.5	1.7
CO2	2	3	2	3	2	1	2	3	1	3	1	1.5	1.6
CO3	3	2	2	2	1	2	3	1	2	3	1	1	1.9
CO4	3	2	1	2	1	2	1	2	2	2	2	2	1.83
CO5	1	2	3	1	2	1	2	1	2	1	2	3	1.75
												Total	1.6

Mean Score: 3- High, 2- Medium/Moderate, 1-Low

FULLY HUMAN
Fully Alive