PARVATHANENI BRAHMAYYA
SIDDHARTHA COLLEGE OF ARTS & SCIENCE
Autonomous
Siddhartha Nagar, Vijayawada–520010
Re-accredited at 'A+' by the NAAC

Course Code				**23CHMAL233**			
Title of the Course				**PHYSICAL CHEMISTRY - I**			
Offered to: (Programme/s)				B.Sc. Hons Chemistry			
L	**0**	**T**	**4**	**P**	**0**	**C**	**3**
Year of Introduction:	**2024-25**			**Semester:**			**3**
Course Category:	Major			**Course Relates to:**	**GLOBAL**		
Year of Revision:	**2024**			**Percentage:**	**NA**		
Type of the Course:				Employability			
Crosscutting Issues of the Course :				Professional Ethics			
Pre-requisites, if any				**23CHMAL121, 23CHMAL122**			

Course Description: Solutions are a key topic in physical chemistry, involving the study of homogeneous mixtures where one substance (the solute) is uniformly distributed in another substance Colligative properties are characteristics of solutions that depend on the number of solute particles in a given quantity of solvent, rather than the type of solute particles. These properties are useful in understanding how solutions behave and are influenced by the presence of solutes. Photochemistry is the branch of chemistry that studies the chemical effects of light. It explores how light interacts with matter, leading to chemical changes. This field is crucial for understanding various natural processes and has practical applications in areas such as materials science, environmental science, and medicine. Electrochemistry is the branch of chemistry that deals with the relationship between electrical energy and chemical changes. It explores how chemical reactions can produce electrical energy and how electrical energy can drive chemical reactions. This field is crucial for many technologies, including batteries, fuel cells, and electroplating.

Course Aims and Objectives:

S.NO	COURSE OBJECTIVES
1	Understand the ideal and non ideal behavior of solutions Colligative Properties of solutions
2	Explain the importance of emf and its applications, Potentiometric titrations. Fuelcells
3	Determine the molecular mass of non-volatile solutes, Abnormal colligative properties
4	Apply the principles of electrical conductivity conductometric titrations
5	Discuss the basic concepts of Photochemistry and Laws of photochemistry

Course Outcomes

At the end of the course, the student will be able to…

CO NO	COURSE OUTCOME	BTL	PO	PSO
CO1	Remember the importance of colligative properties in dilute solutions	K1	PO2	PSO2
CO2	Remember the ideal and non ideal behavior of solutions	K1	PO2	PSO2
CO3	Understand Basic concept of Electrochemistry and its applications	K2	PO7	PSO1
CO4	Understand basic principle of Kinetics and increase critical reading about laws of Photo Chemistry	K2	PO2	PSO1
CO5	Apply different types of electrodes in Electrochemistry for determination of EMF of a cell	K3	PO7	PSO3

For BTL: K1: Remember; K2: Understand; K3: Apply; K4: Analyze; K5: Evaluate; K6: Create

CO-PO MATRIX										
CO NO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1		2							2	
CO2		2							1	
CO3							2	1		
CO4		1						2		
CO5							1			1

Use the codes 3,2,1 for High, Moderate and Low correlation Between CO-PO-PSO respectively

Syllabus:

Unit I Solutions (9 h)

Classification - Miscible, Partially miscible and Immiscible - Raoult's Law - Azeotropes- HCl-H_2O system and ethanol-water system. Partially miscible liquids-phenol- water system. Critical solution temperature (CST), Effect of impurity on consulate temperature. Immiscible liquids and steam distillation. Nernst distribution law. Calculation of the partition coefficient. Applications of distribution law.

Unit II Colligative Properties (9 h)

Relative lowering of Vapour Pressure, Elevation in boing point depression in freezing point and Osmotic pressure. Determination of molecular mass of non-volatile solute by Ostwald- Walker method, Cottrell's method, Rast method and Barkeley-Hartley method.

Abnormal colligative properties. Van't Hoff factor.

Unit III – Photochemistry (9h)

Difference between thermal and photochemical processes, Laws of photochemistry-

Grothus- Draper's law and Stark-Einstein's law of photochemical equivalence, Quantum yield- Photochemical reaction mechanism- hydrogen- chlorine and hydrogen- bromine reaction. Qualitative description of fluorescence, phosphorescence, Jablonski diagram, chemiluminescence - Photosensitized reactions- energy transfer processes (simple example), quenching, Photo stationary state.

Unit IV Electrochemistry-I (9 h)

Conductance, Specific conductance, equivalent conductance and molar conductance - effect of dilution. Cell constant. Strong and weak electrolytes, Kohlrausch's law and its applications,

Definition of transport number, determination of transport number by Hittorf's method. Debye-Huckel - Onsagar's equation for strong electrolytes (derivation excluded), Application of conductivity measurements- conductometric titrations.

Unit V Electrochemistry-II (9 h)

Electrochemical Cells- Single electrode potential, Types of electrodes with examples: Metal- metal ion, Gas electrode, Inert electrode, Redox electrode, Metal-metal insoluble salt- salt anion. Determination of EMF of a cell, Nernst equation, Applications of EMF measurements

-Potentiometric titrations. Fuelcells – Basic concepts, examples and applications.

List of Reference books:

1) Principles of physical chemistry by Prutton and Marron

2) Solid State Chemistry and its applications by Anthony R. West

3) Text book of physical chemistry by K L Kapoor

4) Text book of physical chemistry by S Glasstone

5) Advanced physical chemistry by Bahl and Tuli

6) Advanced physical chemistry by Gurudeep Raj

7) Principles of physical chemistry by Puri, Sharma and Pathania.

References-weblinks

1. https://www.chem.purdue.edu/gchelp/solutions/whatis.html
2. https://chem.libretexts.org/Bookshelves/Physical_and_Theoretical_Chemistry_Textbook_Maps/Supplemental_Modules_(Physical_and_Theoretical_Chemistry)/Physical_Properties_of_Matter/Solutions_and_Mixtures/Colligative_Properties#:~:text=Colligative%20properties%20are%20the%20physical,on%20the%20type%20of%20solvent.
3. https://www2.chemistry.msu.edu/faculty/reusch/virttxtjml/photchem.htm
4. https://chem.libretexts.org/Bookshelves/Analytical_Chemistry/Supplemental_Modules_(Analytical_Chemistry)/Electrochemistry
5. https://chem.libretexts.org/Courses/University_of_California_Davis/UCD_Chem_002C/UCD_Chem_2C_(Larsen)/Text/02%3A_Electrochemistry

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SEMESTER -END QUESTION PAPER

Course Code & Title of the Course:	**23CHMAL233 PHYSICAL CHEMISTRY - I**
Offered to:	**BSC –Hons CHEMISTRY**
Category: MAJOR	**SEMESTER: 3**
Max. Marks	**70**
Max.Time	**3 Hrs**

Section A: Short Answer Questions (20 Marks)

Answer All questions. Each question carries 4 Marks.

Q1 (a) Discuss the Azeotropes with an examples K2

OR

(b) Discuss the Nernst distribution law K2

Q2 (a) Define Relative lowering of Vapour Pressure, Elevation in boing point K1

OR

(b) State Van't Hoff factor for Abnormal colligative properties K1

Q3 (a) Explain Quantum yield- Photochemical reaction K2

OR

(b)Explain differences beween fluorescence and phosphorescence K2

Q4 (a) State Kohlrausch's law and its any two applications K2

OR

(b) State Debye-Huckel - Onsagar's equation for strong electrolytes K2

Q5 (a) State Nernst equation K2

OR

(b) Give the constrction of fuel bcells and write any two of its application K2

Section B: Long Answer Questions (50 Marks)

Answer All questions. Each question carries 10 Marks.

Q6 (a) Explain Raoult's Law and discuss HCl-H_2O system and ethanol-water system. K2

OR

(b) Critical solution temperature (CST) Effect of impurity on CST K2

Q7 (a) Define osmatic pressure and give experimental determination of osmatic pressure by Barkeley-Hartley method. K1

OR

(b) Give experimental determination of lowering of Vapour Pressure by Ostwald- Walker method K1

Q8 (a) Explain Grothus- Draper's law and Stark-Einstein's law of photochemical equivalence .
K2 OR
(b)Explain Jablonski diagram, Chemiluminescence K2

Q9 (a) Define of transport number and Describe the determination of transport number by Hittorf's method. K3

OR

(b)Explain different types of conductometric titrations with an example each. K3

Q10 (a) Describe Single electrode potential, Types of electrodes with examples K2

OR

(b) Define EMF? Determination of EMF of a cell, and give any four Applications of EMF measurements K2