बिरसा मुंडा ट्रायबल युनिवर्सिटी
Birsa Munda Tribal University

राजपिपला, जि॰ नर्मदा Rajpipla, Dist. Narmda
Established by Tribal Development Department, Govt. of Gujarat

School of Science
B.Sc. (Chemistry) Programme
Subject Code & Name: - BS04MJCHE3 Physical Chemistry-II

Teaching and Evaluation Scheme:

Teaching Scheme				Examination Scheme			
Credits				Component Weightage (%)			
				CCE		SEE	
L	T	P	Total	TH	PWE	TH	PWE
3	-	1	4	35	15	35	15

Programme Name	B.Sc.
Semester	IV
Course Code	BS04MJCHE3
Course Title	Physical Chemistry-II
Course Content Type (Th./Pr.)	Theory & Practical
Course Credit	3 + 1
Sessions+ Lab. Per Week	3 +2
Total Teaching/Lab. Hours	45 Theory Hours + 30 Practical Hours
* 2 Laboratory = 1 Session	

1. Student should grasp the principle that energy cannot be created or destroyed, only transformed from one form to another.
2. They should understand how heat transfer and work done by or on a system affect the system's internal energy.
3. Students should be able to use the first law to calculate changes in internal energy, work done and heat transfer in various scenarios.
4. Students should be able to apply the first law to solve problems involving energy transformations in thermodynamic systems
5. Understanding and applying Hess's law to calculate enthalpy changes for reactions is a key skill
6. Understand that equilibrium is the state in a reversible reaction where the rate of the forward reaction equals the rate of the reverse reaction
7. Use the law of mass action to write expressions for Kc and Kp.

Prerequisites (if any)

Learning Outcomes

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On the Completion of this course, students will able to:

1. Understanding the first law of thermodynamics and its relationship to the law of conversation of energy.

2. Explain how energy is transferred or transformed within a system.

3. Recognize the importance of the first law in understanding thermodynamic processes.

4. Understand how the first law applies to both closed and open systems.

5. Predict how changes in concentration, pressure, temperature, or volume affect the position of equilibrium.

6. Explore how equilibrium is important in buffer systems, blood pH, and ocean acidification.

Detailed Contents

| UNIT	TOPIC/SUB-TOPIC	TEACHING HOURS
I	**The First law of Thermodynamics- I** Terminology of thermodynamics, Thermodynamics equilibrium, Extensive and intensive properties, Thermodynamics processes, Nature of work and heat, The first law of thermodynamics, internal energy, state functions, exact and inexact differentials, The Euler reciprocal relation, The cyclic rule, Enthalpy, Heat capacity, Relation between C_p and C_v, Expansion of an ideal gas and changes in thermodynamic properties: Isothermal expansion, Adiabatic expansion, Numerical	15
II	**The First law of Thermodynamics-II** Final temperatures in reversible and irreversible, adiabatic expansions, Comparison of isothermal and adiabatic expansions, Reversible isothermal expansion of a real gas, The Joule-Thomson coefficient in an ideal gas, Joule-Thomson coefficient in a real gas, Joule-Thomson coefficient and inversion temperature, Zeroth law of thermodynamics, Absolute temperature scale, Numerical	15

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III	**Chemical Equilibrium** Introduction of Chemical Equilibrium, Equilibrium State, Law of Mass Action, Law of Equilibrium and Equilibrium Constant, Le-Chaterlier Principle and its applications, Kp and Kc Relationship, Characteristics of Equilibrium Constant (K), Activation Energy, Standard Free Energy and Degree of Dissociation, Hydrolysis Constant, Sparingly Soluble Salts, Buffer Solution and its Classification, Handerson-Hasselbach Equation, Numerical.	15

Text Book(s)

Reference Books

1. Essentials of Physical Chemistry, B. S. Bahl, G. D. Tuli and Arun Bahl, S. Chand & Co.
2. Physical Chemistry, 7th edition P. C. Rakshit
3. Elements of Physical Chemistry, B. R. Puri, L. R. Sharma and Madan Pathania, Vishal Publishing Co. Jalandhar.
4. Physical Chemistry, Gordon M. Barrow
5. A Textbook of physical chemistry, O.P.Tadon, 1st edition
6. Advanced Physical chemistry Vol-1, Gutru & Gutru, 3rd edition
7. Advanced Physical chemistry Vol-2, Gutru & Gutru, 3rd edition
8. Physical Chemistry, W.J. Moore, 6/E, 1996, Mac-Graw Hill Publication
9. Essentials of Physical Chemistry, Bahl & Tuli, 22/E, S. Chand Publication, New Delhi.
10. Advanced Physical Chemistry by Gurdeep Raj, 19/E, Goel Publishing House Meerut.

Web Resources

Required Software(s) (if any)

Practical(s) (if any)   **30 Marks**

1. l Determine the dissociation constant of the acid of the acid mixture of CH_3COONa and CH_3COOH by using pH meter.
2. Determine the specific refraction and molar refraction of the given liquid A, B and mixture C (A+B) and calculate the percentage composition of A and B in the mixture C by Abbe's Refractometer
3. Determine the molar refraction $CH3COOC_2H_5$, $CH3COOC_3H_7$ and $CH3COOC_4H_9$ and show the constancy of reaction equivalent of $-CH_2$ group by Abbe's Refractometer.
4. To determine the viscosity of a different mixture of liquid A and B and determine the percentage composition of unknown mixture by graphical method.
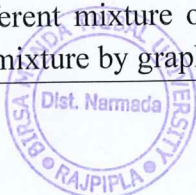
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L:: Lecture, **T::** Tutorial , **P::**Practical

CCE:: Continuous and Comprehensive Evaluation

(CCE Theory includes Mid Semester Examination, Assignment, MCQ quizzes, Seminar, Reflective notes, class participation, case analysis and presentation, slip tests (announced/ surprised), attendance etc. or any combination of these)

PWE:: Practical Work Examination

(PWE includes Laboratory practical work, project work, viva simulation exercise work etc.)

SEE:: Semester End Evaluation