



# ARSD College, University of Delhi

## Model Course Handout/Lesson Plan

| Course Name : B.Sc. (Hons) Chemistry |  |   |             |              |               |            |
|--------------------------------------|--|---|-------------|--------------|---------------|------------|
| Semester                             | Course Code                              | Course Title  | Lecture (L) | Tutorial (T) | Practical (P) | Credit (C) |
| IV<br>(Sec-A & B)                    | CHEMISTRY-CX<br>PHYSICAL<br>CHEMISTRY-IV | Course Title:<br>Conductance & Chemical<br>Kinetics | 0           | 0            | 4             | 2          |
| Teacher/Instructor(s)                |  | Mr. Vishnu Kumawat, Dr. Meenakshi Gupta             |             |              |               |            |
| Session                              |  | 2021-2022   |             |              |               |            |

### Course Description:

**Objectives:** This course aims to make the students understand conductance, anomaly of strong electrolytes, laws governing migration of ions in solutions and application of conductance measurement for titration methods and have understanding of kinetics of chemical reaction, catalysis and photochemical reactions.

### Learning Outcomes:

By the end of this course, students will be able to:

- Explain the chemistry of conductance and its variation with dilution, migration of ions in solutions.
- Learn the applications of conductance measurements,
- Have understanding of rate law and rate of reaction, theories of reaction rates and catalysts; both chemical and enzymatic
- Have knowledge of the laws of absorption of light energy by molecules and the subsequent photochemical reactions.

### List of Experiments:

#### Conductometry:

1. Determination of cell constant
2. Determination of conductivity, molar conductivity, degree of dissociation and dissociation constant of a weak acid.
3. Perform the following conductometric titrations: i. Strong acid vs. strong base, ii. Weak acid vs. strong base, iii. Mixture of strong acid and weak acid vs. strong base, iv. strong acid vs. weak base.

#### Chemical Kinetics:

1. To study the kinetics of Acid hydrolysis of methyl acetate with hydrochloric acid using integrated rate law method.
2. To study the kinetics of Iodide-persulphate reaction by Initial rate method.
3. To study the kinetics of iodine-persulphate reaction using integrated rate law method.

4. To study the kinetics of iodine clock reaction.
5. To study the kinetics of Saponification of ethyl acetate.
6. Comparison of the strengths of HCl and H<sub>2</sub>SO<sub>4</sub> by studying the kinetics of hydrolysis of methyl acetate.
7. To determine the degree of hydrolysis and hydrolysis constant of aniline hydrochloride in aqueous solution.
8. To relate the rate of the reaction between Calcium carbonate and Hydrochloric acid to the amount of carbon dioxide formed and study the effect of change in concentration of reactants and the temperature on rate of the reaction.

| <b>Details of the Lab Course</b> |  |                      |
|----------------------------------|--|----------------------|
| <b>Session</b>                   | <b>Name of Experiment</b>  | <b>Contact Hours</b> |
| 1                                | Issue of Apparatus   | 4                    |
| 2                                | <b>Conductometry:</b> Determination of cell constant   | 4                    |
| 3                                | <b>Conductometry:</b> Determination of conductivity, molar conductivity, degree of dissociation and dissociation constant of a weak acid.  | 4                    |
| 4                                | <b>Conductometry:</b> To perform conductometric titrations: (i) Strong acid vs. strong base,   | 4                    |
| 5                                | <b>Conductometry:</b> To perform conductometric titrations : (ii) Weak acid vs. strong base,   | 4                    |
| 6                                | <b>Conductometry:</b> To perform conductometric titrations: (iii) Mixture of strong acid and weak acid vs. strong base, (iv)strong acid vs. weak base.   | 4                    |
| 7                                | <b>Chemical Kinetics:</b> To study the kinetics of Acid hydrolysis of methyl acetate with hydrochloric acid using integrated rate law method.  | 4                    |
| 8                                | <b>Chemical Kinetics:</b> To study the kinetics of Iodide-persulphate reaction by Initial rate method.   | 4                    |
| 9                                | <b>Chemical Kinetics:</b> To study the kinetics of iodine-persulphate reaction using integrated rate law method.   | 4                    |
| 10                               | <b>Chemical Kinetics:</b> To study the kinetics of iodine clock reaction.  | 4                    |
| 11                               | <b>Chemical Kinetics:</b> To study the kinetics of Saponification of ethyl acetate.  | 4                    |
| 12.                              | <b>Chemical Kinetics:</b> Comparison of the strengths of HCl and H <sub>2</sub> SO <sub>4</sub> by studying the kinetics of hydrolysis of methyl acetate.  | 4                    |
| 13                               | <b>Chemical Kinetics:</b> To determine the degree of hydrolysis and hydrolysis constant of aniline hydrochloride in aqueous solution.  | 4                    |
| 14.                              | <b>Chemical Kinetics:</b> To relate the rate of the reaction between Calcium carbonate and Hydrochloric acid to the amount of carbon dioxide formed and study the effect of change in concentration of reactants and the temperature on rate of the reaction | 4                    |
| 15                               | Mock test  | 4                    |
|                                  | <b>Total</b>   | <b>60</b>            |
| <b>Suggested Books:</b>          |  |                      |

| Sl. No. | Name of Authors/Books/Publishers  | Year of Publication/Reprint |
|---------|---|-----------------------------|
| 1.      | Khosla, B.D.; Garg, V.C.; Gulati, A., Senior Practical Physical Chemistry, R. Chand & Co, New Delhi.                    | 2015                        |
| 2.      | Kapoor, K.L., A Textbook of Physical Chemistry, Vol.7, 1st Edition, McGraw Hill Education.                              | 2019                        |
| 3.      | Garland, C. W.; Nibler, J. W.; Shoemaker, D. P., Experiments in Physical Chemistry, 8th Edition, McGraw-Hill, New York. | 2003                        |

**Evaluation Scheme:**

| No. | Component                | Duration | Marks |
|-----|--------------------------|----------|-------|
| 1.  | Internal Assessment      |          | 20    |
|     | • Quiz/Viva              |          |       |
|     | • Observation & Record   |          |       |
|     | • Attendance             |          |       |
|     | • Model Exam             |          |       |
| 2.  | End Semester Examination | 5 hrs    | 30    |

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