

**Govt. T. R. S. (Autonomous) College Rewa (M.P.)**

**Department of Chemistry**

**Syllabus for B.Sc. Chemistry**

**(CBCS & NEP 2020)**

**Session 2022-23**

| <b>Part A - Introduction</b>  |                                       |   |                            |
|---|---------------------------------------|---|----------------------------|
| <b>Program: UG<br/>(Diploma)</b>  | <b>Class: B.Sc. Chemistry</b>         | <b>Semester: I</b>  | <b>Session: 2022-23</b>    |
| <b>Subject: Chemistry</b>   |                                       |   |                            |
| <b>1</b>  | <b>Course code</b>                    | <b>CHGT-01A</b>   |                            |
| <b>2</b>  | <b>Course title</b>                   | <b>CHEMICAL EQUILIBRIUM &amp; PHASE EQUILIBRIA</b>  |                            |
| <b>3</b>  | <b>Course type</b>                    | <b>Generic Elective (GE)</b>  |                            |
| <b>4</b>  | <b>Pre-requisite<br/>(if any)</b>     | <b>This course is Open for all</b>  |                            |
| <b>5</b>  | <b>Course Objective</b>               | The aim this course is to develop Familiarization with various states of matter, Physical properties of each state of matter and laws related to describe the states as well as Calculation of lattice parameters within students.  |                            |
| <b>6</b>  | <b>Course Learning Outcomes (CLO)</b> | <b>By the end of this paper Students will be able to</b> <ul style="list-style-type: none"><li>• Electrolytes and electrolytic dissociation, salt hydrolysis and acid-base equilibria.</li><li>• Understanding Kinetic model of gas and its properties.</li><li>• Maxwell distribution, mean-free path, kinetic energies.</li><li>• Behavior of real gases, its deviation from ideal behavior, equation of state, isotherm, and</li><li>• law of corresponding states.</li><li>• Liquid state and its physical properties related to temperature and pressure variation.</li><li>• Properties of liquid as solvent for various household and commercial use.</li><li>• Solids, lattice parameters – its calculation, application of symmetry, solid characteristics</li><li>• of simple salts.</li><li>• Ionic equilibria – electrolyte, ionization, dissociation.</li><li>• Salt hydrolysis (acid-base hydrolysis) and its application in chemistry.</li></ul> |                            |
| <b>7</b>  | <b>Credit Value</b>                   | <b>4</b>  |                            |
| <b>8</b>  | <b>Total Marks</b>                    | <b>Max. Marks (40+60): CCE+ESE</b>  | <b>Min. Passing Marks:</b> |
| <b>Part B – Content of the course</b>   |                                       |   |                            |
| <b>Total No. of Lectures-Tutorials-Practical (4 hours per week):</b><br><b>L-T-P: 30-0-00</b> |                                       |   |                            |
| <b>Unit</b>   | <b>Topic</b>                          |   | <b>No. of Lectures</b>     |
| <b>1</b>  | <b>Phase Equilibria</b>               |   | <b>10</b>                  |

|          |  |           |
|----------|--|-----------|
|          | Phases, components and degrees of freedom of a system, criteria of phase equilibrium. Gibbs Phase Rule and its thermodynamic derivation. Derivation of Clausius – Clapeyron equation and its importance in phase equilibria. Phase diagrams of one-component systems (water and sulphur) and two component systems involving eutectics, congruent and incongruent melting points (lead-silver, FeCl <sub>3</sub> -H <sub>2</sub> O and Na-K only).                                     |           |
| <b>2</b> | <b>Chemical Equilibrium:</b><br>Free energy change in a chemical reaction. Thermodynamic derivation of the law of chemical equilibrium. Distinction between $\Delta G$ and $\Delta G_o$ , Le Chatelier's principle. Relationships between $K_p$ , $K_c$ and $K_x$ for reactions involving ideal gases.   | <b>8</b>  |
| <b>3</b> | <b>Ionic Equilibria:</b><br>Strong, moderate and weak electrolytes, degree of ionization, factors affecting degree of ionization, ionization constant and ionic product of water. Ionization of weak acids and bases, pH scale, common ion effect. Salt hydrolysis–calculation of hydrolysis constant, degree of hydrolysis and pH for different salts. Buffer solutions. Solubility and solubility product of sparingly soluble salts – applications of solubility product principle. | <b>12</b> |

### Part C – Learning Resources

#### Text Books, Reference Books, Other resources

#### Suggested Reading:

1. Modern Technology of Paints, Varnishes & Lacquers (2nd Edition) Author: **NIIR Board** Published: **2007** Publisher: **Asia Pacific Business Press Incnc.**
2. Surface Phenomena and Latexes in Waterborne Coatings and Printing Technology” by Mahendra K Sharma.
3. Practical Book of Paint and Varnish Technology by Aparesh Barman Power publisher .com
4. Paint and Surface Coatings: Lambourne R and T A Strivens Practice Woodhead Publishing Series in Metals and Surface Engineering
5. Applications of Synthetic Resin Latices: Latices in Surface Coatings – Emulsion Paints: 2” by H Warso
6. Complete Hand Book on Paints, Varnish, Resins, Copolymers and Coatings with Manufacturing Process, Formulations and Technology Paperback – 1 January 2017 By EIRI Author
7. Paint and Coatings: Applications and Corrosion Resistance (Corrosion Technology)” by Philip A Schweitzer P E.
8. Barrow, G.M. Physical Chemistry Tata McGraw-Hill (2007). 0
9. Castellan, G.W. Physical Chemistry 4th Ed. Narosa (2004).
10. Kotz, J.C., Treichel, P.M. & Townsend, J.R. General Chemistry, Cengage Learning India Pvt. Ltd.: New Delhi (2009).
11. Mahan, B.H. University Chemistry, 3rd Ed. Narosa (1998).
12. Petrucci, R.H. General Chemistry, 5th Ed., Macmillan Publishing Co.: New York (1985).

#### Suggested equivalent online:

Barrow, G.M. Physical Chemistry Tata McGraw-Hill (2007). • Castellan, G.W. Physical Chemistry 4th Ed. Narosa (2004).

• Kotz, J.C., Treichel, P.M. & Townsend, J.R. General Chemistry Cengage Learning India Pvt. Ltd., New Delhi (2009). • Mahan, B.H. University Chemistry 3rd Ed. Narosa (1998). • Petrucci, R.H. General Chemistry 5th Ed. Macmillan Publishing Co.: New York (1985).

### **Part D – Assessment & Evaluation**

Suggested Continuous Evaluation Method

Any remark / suggestion:

This course can be opted as an elective by the students of the following subjects:

**Open for All**

Continuous & Comprehensive Evaluation shall be based on allotted Assignment and Class Test

### **Keywords:**

$\Delta G$  and  $\Delta G_0$ , Clausius – Clapeyron equation, Le Chatelier's principle, Salt hydrolysis.

Govt. T. R. S. (Autonomous) College Rewa (M.P.)

Department of Chemistry

Syllabus for B.Sc. Chemistry

(CBCS & NEP 2020)

Session 2022-23

| <b>Part A - Introduction</b>  |  |   |                            |
|---|--|---|----------------------------|
| <b>Program: UG<br/>(Diploma)</b>  | <b>Class: B.Sc. (Hons) Chemistry</b>   | <b>Semester: IV</b>   | <b>Session: 2022-23</b>    |
| <b>Subject: Chemistry (Honours)</b>   |  |   |                            |
| <b>1</b>  | <b>Course code</b>   | <b>CHGP-01 A (Practical)</b>  |                            |
| <b>2</b>  | <b>Course title</b>  | <b>CHEMICAL EQUILIBRIUM &amp; PHASE EQUILIBRIA</b>  |                            |
| <b>3</b>  | <b>Course type</b>   | <b>Generic Elective (GE)</b>  |                            |
| <b>4</b>  | <b>Pre-requisite (if any)</b>  | <b>This course is Open for all</b>  |                            |
| <b>5</b>  | <b>Course Objective</b>  | <b>The objective of this course to make students aware about the role of chemistry in surroundings.</b>   |                            |
| <b>6</b>  | <b>Course Learning Outcomes (CLO)</b>  | <b>By the end of this paper Students will be able to:</b><br>Determination of lattice parameters of given salt.<br>2. Study of X-Ray diffraction pattern and finding out reference from JCPDI file.<br>3. Numerical related to salt hydrolysis, ionic equilibria. |                            |
| <b>7</b>  | <b>Credit Value</b>  | <b>2</b>  |                            |
| <b>8</b>  | <b>Total Marks</b>   | <b>Max. Marks (60+40):</b>  | <b>Min. Passing Marks:</b> |
| <b>Part B – Content of the course</b>   |  |   |                            |
| <b>Total No. of Lectures-Tutorials-Practical (4 hours per week):</b><br><b>L-T-P: 00-0-15</b> |  |   |                            |
| <b>Unit</b>   | <b>Topic</b>   |   | <b>No. of Lectures</b>     |
| <b>1</b>  | <b>1. Ionic equilibria:</b><br><br><i>pH measurements</i><br><br>Measurement of pH of different solutions like aerated drinks, fruit juices, shampoos and soaps (use dilute solutions of soaps and shampoos to prevent damage to the glass electrode) using pH-meter.<br><br>a) Preparation of buffer solutions:<br><br>(i) Sodium acetate-acetic acid |   | <b>15</b>                  |

(ii) Ammonium chloride-ammonium hydroxide Measurement of the pH of buffer solutions and comparison of the values with theoretical values.

## 2. Phase equilibria

a) Construction of the phase diagram of a binary system (simple eutectic) using cooling curves.

b) Determination of the critical solution temperature and composition of the phenol water system and study of the effect of impurities on it.

c) Study of the variation of mutual solubility temperature with concentration for the phenol water system and determination of the critical solubility temperature.

### Part C – Learning Resources

#### Text Books, Reference Books, Other resources

#### Suggested Reading:

- Vogel, A.I., Tatchell, A.R., Furnis, B.S., Hannaford, A.J. & Smith, P.W.G., Textbook of Practical Organic Chemistry, Prentice-Hall, 5th edition, 1996.
- Mann, F.G. & Saunders, B.C. Practical Organic Chemistry Orient-Longman, 1960.
- Khosla, B. D.; Garg, V. C. & Gulati, A. Senior Practical Physical Chemistry, R. Chand & Co.: New Delhi (2011).

#### Suggested equivalent online:

### Part D – Assessment & Evaluation

Suggested Continuous Evaluation Method

Any remark / suggestion:

This course can be opted as an elective by the students of the following subjects:

**Open for All**

Continuous & Comprehensive Evaluation shall be based on allotted Assignment and Class Test

#### Keywords:

buffer solutions, Sodium acetate-acetic acid, shampoos.