<table>
<thead>
<tr>
<th>SEM</th>
<th>COURSE CODE</th>
<th>PART</th>
<th>COURSE</th>
<th>COURSE TITLE</th>
<th>HRS / WEEK</th>
<th>CREDIT</th>
<th>CIA MARKS</th>
<th>SE MARKS</th>
<th>TOTAL MARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>14U1 LT1/LA1/ LF1/ LH1/ LU1</td>
<td>I</td>
<td>Language - I</td>
<td>6</td>
<td>3</td>
<td>40</td>
<td>60</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14UCN1E1</td>
<td>II</td>
<td>English – I</td>
<td>6</td>
<td>3</td>
<td>40</td>
<td>60</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14UPH1A1</td>
<td>III</td>
<td>Allied-I Properties of Matter and Sound</td>
<td>5</td>
<td>2</td>
<td>20</td>
<td>30</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14UPH1A1P</td>
<td>III</td>
<td>Allied-I Properties of Matter – Practical</td>
<td>3</td>
<td>2</td>
<td>20</td>
<td>30</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14UCH1C1</td>
<td>III</td>
<td>Core-I Inorganic, Organic and Physical Chemistry - I</td>
<td>4</td>
<td>4</td>
<td>40</td>
<td>60</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14UCH1M1P</td>
<td>III</td>
<td>Major Based Elective - I Volumetric Analysis - Practical</td>
<td>3</td>
<td>3</td>
<td>40</td>
<td>60</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14UCN1VE</td>
<td>IV</td>
<td>Value Education</td>
<td>3</td>
<td>3</td>
<td>40</td>
<td>60</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>30</td>
<td>20</td>
<td>240</td>
<td>360</td>
<td>600</td>
</tr>
<tr>
<td>II</td>
<td>14U2 LT2 / LA2/ LF2/ LH2/ LU2</td>
<td>I</td>
<td>Language – II</td>
<td>6</td>
<td>3</td>
<td>40</td>
<td>60</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14UCN2E2</td>
<td>II</td>
<td>English – II</td>
<td>6</td>
<td>3</td>
<td>40</td>
<td>60</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14UPH2A2</td>
<td>III</td>
<td>Allied-II Modern Physics</td>
<td>4</td>
<td>2</td>
<td>20</td>
<td>30</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14UPH2A2P</td>
<td>III</td>
<td>Allied-II Optical, Thermal and Electricity – Practical</td>
<td>3</td>
<td>2</td>
<td>20</td>
<td>30</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14UCH2C2</td>
<td>III</td>
<td>Core-II Inorganic, Organic and Physical Chemistry - II</td>
<td>4</td>
<td>4</td>
<td>40</td>
<td>60</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14UCH2M2P</td>
<td>III</td>
<td>Major Based Elective –II Industrial Chemistry - Practical</td>
<td>3</td>
<td>3</td>
<td>40</td>
<td>60</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14UCH2N1</td>
<td>IV</td>
<td>Non-Major Elective-II#</td>
<td>2</td>
<td>2</td>
<td>40</td>
<td>60</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14UNCH2S1</td>
<td>IV</td>
<td>Skill Based Elective</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>30</td>
<td>21</td>
<td>280</td>
<td>420</td>
<td>700</td>
</tr>
<tr>
<td></td>
<td>14UCN3E3</td>
<td>II</td>
<td>English - III</td>
<td>6</td>
<td>3</td>
<td>40</td>
<td>60</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14UCH3A3/2</td>
<td>III</td>
<td>Allied-III Classical Algebra</td>
<td>7</td>
<td>4</td>
<td>40</td>
<td>60</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14UCH3C3</td>
<td>III</td>
<td>Core-III Inorganic, Organic and Physical Chemistry - III</td>
<td>4</td>
<td>4</td>
<td>40</td>
<td>60</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14UCH3M1P</td>
<td>III</td>
<td>Major Based Elective -III Domestic Products Preparation – Practical</td>
<td>3</td>
<td>3</td>
<td>40</td>
<td>60</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14UCH3N2</td>
<td>IV</td>
<td>Non-Major Elective-III#</td>
<td>2</td>
<td>2</td>
<td>40</td>
<td>60</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14UNCH3S1</td>
<td>IV</td>
<td>Skill Based Elective - I Soft Skills</td>
<td>2</td>
<td>2</td>
<td>40</td>
<td>60</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>30</td>
<td>21</td>
<td>280</td>
<td>420</td>
<td>700</td>
</tr>
<tr>
<td>IV</td>
<td>14U4 LT4/ LA4/ LF4/LH4/ LU4</td>
<td>I</td>
<td>Language-IV</td>
<td>6</td>
<td>3</td>
<td>40</td>
<td>60</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14UCN4E4</td>
<td>II</td>
<td>English-IV</td>
<td>6</td>
<td>3</td>
<td>40</td>
<td>60</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14UCH4A4/2</td>
<td>III</td>
<td>Allied-IV Calculus and Trigonometry</td>
<td>8</td>
<td>4</td>
<td>40</td>
<td>60</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14UCH4C4</td>
<td>III</td>
<td>Core-IV Inorganic, Organic and Physical Chemistry – IV</td>
<td>4</td>
<td>4</td>
<td>40</td>
<td>60</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14UCH4C5P</td>
<td>III</td>
<td>Core-V Inorganic Qualitative analysis-Practical</td>
<td>4</td>
<td>4</td>
<td>40</td>
<td>60</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14UCH4S2</td>
<td>IV</td>
<td>Skill Based Elective - II Separation and Purification Techniques</td>
<td>2</td>
<td>2</td>
<td>40</td>
<td>60</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14UNCH4E4A</td>
<td>V</td>
<td>Extension Activities NCC, NSS, etc</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14UNCH4EC1</td>
<td>Extra Credit- I Computer Applications in Chemistry</td>
<td>-</td>
<td>4*</td>
<td>-</td>
<td>100*</td>
<td>100*</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>14UNCH4EC2</td>
<td>Extra Credit- II Photochemistry and Radiation Chemistry</td>
<td>-</td>
<td>4*</td>
<td>-</td>
<td>100*</td>
<td>100*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>30</td>
<td>22</td>
<td>280</td>
<td>420</td>
<td>700</td>
</tr>
<tr>
<td>V</td>
<td>14UCH5C6P</td>
<td>III</td>
<td>Core-VI Gravimetric Estimation and Physical Constants Determination - Practical</td>
<td>5</td>
<td>4</td>
<td>40</td>
<td>60</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14UCH5C7</td>
<td>III</td>
<td>Core-VII Transition Elements and Nuclear Chemistry</td>
<td>4</td>
<td>4</td>
<td>40</td>
<td>60</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14UCH5C8</td>
<td>III</td>
<td>Core-VIII Organic Reactions, Heterocyclic and Stereo Chemistry</td>
<td>4</td>
<td>4</td>
<td>40</td>
<td>60</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14UCH5C9</td>
<td>III</td>
<td>Core- IX Thermodynamics and Solutions</td>
<td>4</td>
<td>4</td>
<td>40</td>
<td>60</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14UCH5C10</td>
<td>III</td>
<td>Core- X Analytical Chemistry</td>
<td>4</td>
<td>4</td>
<td>40</td>
<td>60</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14UCH5C11</td>
<td>III</td>
<td>Core- XI Applied Chemistry</td>
<td>4</td>
<td>4</td>
<td>40</td>
<td>60</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14UCH5M4P</td>
<td>III</td>
<td>Major Based Elective-IV Physical Chemistry Electrical - Practical</td>
<td>3</td>
<td>3</td>
<td>40</td>
<td>60</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14UCH5S3</td>
<td>IV</td>
<td>Skill based elective-III Medicinal Chemistry</td>
<td>2</td>
<td>2</td>
<td>40</td>
<td>60</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14UCH5EC3</td>
<td>Extra Credit- III Chemistry for Competitive Examinations-I</td>
<td>-</td>
<td>4*</td>
<td>-</td>
<td>100*</td>
<td>100*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>30</td>
<td>29</td>
<td>320</td>
<td>480</td>
<td>800</td>
</tr>
<tr>
<td>VI</td>
<td>14UCH6CT2</td>
<td>III</td>
<td>Core-XII Co-ordination Chemistry and Applications</td>
<td>5</td>
<td>4</td>
<td>40</td>
<td>60</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14UCH6C13</td>
<td>III</td>
<td>Core-XIII Molecular Spectroscopy and Electrochemistry</td>
<td>5</td>
<td>4</td>
<td>40</td>
<td>60</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14UCH6C14P</td>
<td>III</td>
<td>Core-XIV Organic Analysis and Preparation-Practical</td>
<td>5</td>
<td>4</td>
<td>40</td>
<td>60</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14UCH6C15P</td>
<td>III</td>
<td>Core- XV Physical Chemistry Non - Electrical - Practical</td>
<td>4</td>
<td>4</td>
<td>40</td>
<td>60</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14UCH6C16</td>
<td>III</td>
<td>Core- XVI Organic Compounds and Molecular Rearrangements</td>
<td>4</td>
<td>4</td>
<td>40</td>
<td>60</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14UCH6C17</td>
<td>III</td>
<td>Core- XVII Soil, Dairy and Leather Chemistry</td>
<td>4</td>
<td>4</td>
<td>40</td>
<td>60</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14UCH6S4</td>
<td>IV</td>
<td>Skill Based Elective-IV Chemistry of Biomolecules</td>
<td>2</td>
<td>2</td>
<td>40</td>
<td>60</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14UNCH6GS</td>
<td>V</td>
<td>Gender Studies Gender Studies</td>
<td>1</td>
<td>1</td>
<td>40</td>
<td>60</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td></td>
<td>14UCH6EC4</td>
<td>Extra Credit- IV Chemistry for Competitive Examinations-II</td>
<td>-</td>
<td>4*</td>
<td>-</td>
<td>100*</td>
<td>100*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>30</td>
<td>27</td>
<td>320</td>
<td>480</td>
<td>800</td>
</tr>
<tr>
<td>GRAND TOTAL</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>180</td>
<td>140</td>
<td>1680</td>
<td>2520</td>
<td>4200</td>
</tr>
</tbody>
</table>
# Non Major Elective Courses offered to the other Departments:

<table>
<thead>
<tr>
<th>SEM</th>
<th>COURSE TITLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>II</td>
<td>Food and Nutrition Chemistry</td>
</tr>
<tr>
<td>III</td>
<td>Chemistry in Everyday life</td>
</tr>
</tbody>
</table>

* Not considered for Grand Total and CGPA
<table>
<thead>
<tr>
<th>SEM</th>
<th>COURSE CODE</th>
<th>PART</th>
<th>COURSE</th>
<th>COURSE TITLE</th>
<th>HRS / WEEK</th>
<th>CREDIT</th>
<th>CIA MARKS</th>
<th>SE MARKS</th>
<th>TOTAL MARKS</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>14U1LT1/LA1/LF1/LH1/LU1</td>
<td>I</td>
<td>Language - I</td>
<td>Language - I</td>
<td>6</td>
<td>3</td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>I</td>
<td>14UCHN1E1</td>
<td>II</td>
<td>English – I</td>
<td>English – I</td>
<td>6</td>
<td>3</td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>I</td>
<td>14U1PHA1</td>
<td>III</td>
<td>Allied-I</td>
<td>Properties of Matter and Sound</td>
<td>5</td>
<td>2</td>
<td>20</td>
<td>30</td>
<td>50</td>
</tr>
<tr>
<td>I</td>
<td>14U1PHA1P</td>
<td>III</td>
<td>Allied-I</td>
<td>Allied Physics I – Practical</td>
<td>3</td>
<td>2</td>
<td>20</td>
<td>30</td>
<td>50</td>
</tr>
<tr>
<td>I</td>
<td>14UCH1C1</td>
<td>III</td>
<td>Core-I</td>
<td>Inorganic, Organic and Physical Chemistry-I</td>
<td>4</td>
<td>4</td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>I</td>
<td>14UCH1M1P</td>
<td>III</td>
<td>Major Based Elective –I</td>
<td>Volumetric Analysis - Practical</td>
<td>3</td>
<td>3</td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>I</td>
<td>14UCH1VE</td>
<td>IV</td>
<td>Value Education</td>
<td>Value Education</td>
<td>3</td>
<td>3</td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>II</td>
<td>14U2LT2/LA2/LF2/LH2/LU2</td>
<td>I</td>
<td>Language – II</td>
<td>Language – II</td>
<td>6</td>
<td>3</td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>II</td>
<td>14UCH2C3</td>
<td>III</td>
<td>Core-III</td>
<td>Inorganic, Organic and Physical Chemistry-III</td>
<td>4</td>
<td>4</td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>II</td>
<td>14UCH2M3P</td>
<td>III</td>
<td>Major Based Elective –III</td>
<td>Domestic Products Preparation - Practical</td>
<td>3</td>
<td>3</td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>III</td>
<td>14UCH3C3</td>
<td>III</td>
<td>Core-IV</td>
<td>Inorganic, Organic and Physical Chemistry-IV</td>
<td>4</td>
<td>4</td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>III</td>
<td>14UCH3C5P</td>
<td>III</td>
<td>Core-V</td>
<td>Analytical Chemistry</td>
<td>4</td>
<td>4</td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>III</td>
<td>14UCH4S2</td>
<td>IV</td>
<td>Skill Based Elective - II</td>
<td>Separation and Purification Techniques</td>
<td>2</td>
<td>2</td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>IV</td>
<td>14UCH5C6P</td>
<td>III</td>
<td>Core-VI</td>
<td>Co-ordination Chemistry and Applications</td>
<td>5</td>
<td>4</td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>IV</td>
<td>14UCH5C7</td>
<td>III</td>
<td>Core-VII</td>
<td>Organic Compounds and Molecular Rearrangements</td>
<td>4</td>
<td>4</td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>IV</td>
<td>14UCH5C9</td>
<td>III</td>
<td>Core-VIII</td>
<td>Co-ordination Chemistry and Applications</td>
<td>5</td>
<td>4</td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>IV</td>
<td>14UCH5C10</td>
<td>III</td>
<td>Core- IX</td>
<td>Organic Analysis and Preparation- Practical</td>
<td>5</td>
<td>4</td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>IV</td>
<td>14UCH5C11</td>
<td>III</td>
<td>Core-X</td>
<td>Co-ordination Chemistry and Applications</td>
<td>5</td>
<td>4</td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>V</td>
<td>14UCH6C12</td>
<td>III</td>
<td>Core-XII</td>
<td>Co-ordination Chemistry and Applications</td>
<td>5</td>
<td>4</td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>V</td>
<td>14UCH6C13</td>
<td>III</td>
<td>Core-XIII</td>
<td>Molecular Spectroscopy and Electrochemistry</td>
<td>5</td>
<td>4</td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>V</td>
<td>14UCH6C14P</td>
<td>III</td>
<td>Core-XIV</td>
<td>Organic Analysis and Preparation- Practical</td>
<td>5</td>
<td>4</td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>V</td>
<td>14UCH6C15P</td>
<td>III</td>
<td>Core-XV</td>
<td>Physical Chemistry Non Electrical - Practical</td>
<td>4</td>
<td>4</td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>V</td>
<td>14UCH6C16</td>
<td>III</td>
<td>Core-XVI</td>
<td>Organic Compounds and Molecular Rearrangements</td>
<td>4</td>
<td>4</td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>V</td>
<td>14UCH6C17</td>
<td>III</td>
<td>Core-XVII</td>
<td>Co-ordination Chemistry and Applications</td>
<td>5</td>
<td>4</td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>V</td>
<td>14UCH6S4</td>
<td>IV</td>
<td>Skill Based Elective-IV</td>
<td>Chemistry of Bio molecules</td>
<td>2</td>
<td>2</td>
<td>40</td>
<td>60</td>
<td>100</td>
</tr>
<tr>
<td>V</td>
<td>14UCH6EC4</td>
<td>V</td>
<td>Extra Credit- IV</td>
<td>Chemistry for Competitive Examinations-II</td>
<td>-</td>
<td>4*</td>
<td>-</td>
<td>100*</td>
<td>100*</td>
</tr>
</tbody>
</table>

# Non Major Elective Courses offered to the other Departments:

<table>
<thead>
<tr>
<th>SEM</th>
<th>COURSE TITLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>II</td>
<td>Food and Nutrition Chemistry</td>
</tr>
<tr>
<td>III</td>
<td>Chemistry in Everyday life</td>
</tr>
</tbody>
</table>

* Not considered for Grand Total and CGPA
SEMESTER-I: CORE-I
INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY-I

Course Code : 14UCH1C1 Max. Marks : 100
Hours/Week : 4 Internal Marks : 40
Credit : 4 External Marks : 60

Objectives:

- To understand the principles of quantum numbers and periodicity of elements
- To understand the theoretical aspects of inorganic qualitative and quantitative analysis
- To make the students acquire knowledge about nomenclature of simple aliphatic compounds, the nature and types of bonding.
- To learn the concept and behaviour of gases.

UNIT – I 12 Hours


*Periodic Table: Mendeleef’s modern periodic law – modern periodic table*, Classification of elements on the basis of electronic configuration.

1.2 Properties of Elements: Atomic and ionic radii – Comparison – Types of atomic radii – Covalent, metallic and van der Waals; Ionic radii – Determination by Pauling’s method – Factors influencing magnitude of ionic radii.


UNIT – II 12 Hours

2.1 Qualitative Analysis: Advantages of semi-micro analysis, General reactions of common anions – carbonate, sulphide, sulphate, nitrate, chloride, iodide, borate, phosphate, oxalate, fluoride.

General reactions of cations: Precipitants of Lead, bismuth, copper, cadmium, aluminium, iron, manganese, zinc, cobalt, *nickel, barium, calcium and magnesium.*


UNIT – III 12 Hours

3.1 Nomenclature of organic compounds – IUPAC naming of simple aliphatic compounds containing different functional groups – naming of aromatic compounds and alicyclic compounds.

3.2 Bond - Types of bonds – homolytic and heterolytic fission of bonds, bond length, bond energy- orbital overlap – sigma and pi bonds – hybridization and geometry of molecules methane, ethane, ethylene, acetylene and benzene.

3.3 Isomerism- *Structural and geometrical isomerism*
UNIT – IV

4.1 **Reactive intermediates**: Generation, structure, reactivity and stability of carbocation, carbanion, free radical and carbenes.

4.2 **Electron displacement effects**: Inductive, electromeric, mesomeric, resonance, hyperconjugation and steric effects.

UNIT – V

Gaseous State

5.1 Gas Laws-Kinetic theory of gases, Kinetic equation of gases, Derivation of various gas laws from Kinetic gas equation – Different types of molecular velocities, Maxwell’s law of distribution of molecular velocities.

5.2 Expansivity and compressibility, Boyle temperature, mean free path, Collision diameter, Collision number, Collision frequency, Heat capacity of gases, Determination of heat capacity ratio.

5.3 Real gases and ideal gases- Deviation of real gases from the ideal gases, derivation of van der Waals equation for real gases, significance of Van der Waals constants- #critical phenomenon, Calculation of critical constants#.

Self study

TEXT BOOKS:


UNIT I : Text Book 1,2
UNIT II : Text Book 1
UNIT III : Text Book 3
UNIT IV : Text Book 3
UNIT V : Text Book 4

REFERENCES:

SEMMESTER-II: CORE-II
INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY-II

Course Code : 14UCH2C2 Max. Marks : 100
Hours/Week : 4 Internal Marks : 40
Credit : 4 External Marks : 60

Objectives:
- To learn the concepts of bonding and molecular orbital theory.
- To know the shapes of molecules by VSEPR theory.
- To study the preparations and reactions of alkanes, cycloalkanes, alkenes, alkynes and dienes.
- To learn the concepts, properties and applications of liquid and liquid crystals
- To understand the basic idea of colloids

UNIT – I 12 Hours
1.2 Covalent Bond: Lewis, Valence Bond concepts – #types of overlap of orbitals (ss, pp, sp) – sigma, pi –bonds : Polarity of bonds – ion polarization – degree of ionic character; Significance of dipole moment of polar molecules – Fajan’s Rules – Applications.
1.3 Molecular Orbital Theory: Bonding and anti – bonding (LCAO method) – Order of energy levels – Relationship between bond order, stability of bond length and molecular magnetic behaviour. Molecular Orbital diagrams of homonuclear (H₂, He₂, N₂ and O₂) heteronuclear (CO, NO and HF) diatomic molecules. Comparison of valence bond theory and molecular orbital theory.

UNIT – II 12 Hours
2.1 Shapes of Covalent Molecules: Hybridization sp (BeF₂, CO₂), sp² (BF₃, NO₃ ion), sp³ (NH₄⁺, H₂O, SO₄²⁻), sp³d (PCl₃) – Salient features of hybridization – Rules – Bond Strength, energy and length. #Resonance -Canonical forms of CO₂, NO₂, CO₃²⁻ – Resonance energy, conditions. # VSEPR – Theory, Postulates, shapes and bond angles of molecules containing only bonded pairs of electrons.
2.2 Metallic Bond: Electron sea theory, valence bond theory, Band theory – Properties explained by these.
2.3 Hydrogen Bond: Nature, types, effects on physical – Chemical Properties. van der Waals attraction: Significance of Intermolecular electrostatic force.

UNIT – III 12 Hours
3.1 Alkanes – Preparation by Wurtz, Corey-House and Kolbe’s synthesis– Mechanism of free radical substitution in alkanes – chlorination and pyrolysis(cracking).
3.2 Cycloalkanes – preparation using Wurtz reaction, Dieckmann’s ring closure and reduction of aromatic hydrocarbons, substitution and ring opening reactions –Bayer strain theory.
3.3 Grignard reagent: #Preparation, synthesis of alcohols, aldehydes and ketones using Grignard reagent #.
UNIT – IV


4.2 Dienes: Types of dienes – conjugated – Non conjugated and cumulated dienes – relative stabilities of dienes and chemical reactivity – 1,2 and 1,4- additions – Diels-Alder reaction.


UNIT-V

Liquids and Colloids:

5.1 Liquids-Physical properties of liquids- Vapour pressure, measurement of vapour pressure by isotenisoscopic method, heat of vaporization, Trouton’s rule - Surface tension, measurement of surface tension by Capillary-Rise Method, variation of surface tension with temperature and pressure. *Viscosity – determination of viscosity by Hoppler viscometer, variation of viscosity with temperature and pressure*.

5.2 Liquid crystals – definition, classification, theory of liquid crystals, molecular viscosity – parachor, atomic parachor, structural parachor and application of parachor in deciding structures.

5.3. Colloids – Definition, differences between true solution, colloidal solution and suspension, phases of colloidal solution-Electrical properties – Electrophoresis and Electro osmosis (definition and uses only) - protection of colloids – Gold number, Theories of protection – stabilities of Sols.

Self study

TEXT BOOKS:


UNIT I: Text Book 1
UNIT II: Text Book 1
UNIT III: Text Book 2
UNIT IV: Text Book 2
UNIT V: Text Book 3

REFERENCES:

SEMESTER-II: NON MAJOR ELECTIVE-I
FOOD AND NUTRITION CHEMISTRY

Course Code : 14UCH2N1       Max. Marks : 100
Hours/Week : 2        Internal Marks : 40
Credit  : 2         External Marks : 60

Objectives:

- To learn basic knowledge in Food Chemistry.
- To know the nutritional values of food.
- To get awareness on the food spoilage, adulteration and sanitation.

UNIT – I 6 hours
1.1 Food: Definition – classification based on nutritional values, nutritive values of cereals, nuts as oil seeds and milk as milk products.
1.2 Carbohydrates: sources, biological functions, deficiency disease and RDA.
1.3 Protein: sources, biological functions, deficiency diseases and RDA.
1.4 Fat: sources, biological functions, deficiency and RDA.

UNIT – II 6 hours
2.1 Minerals: Dietary sources, functions, Effects of deficiency and requirements of calcium, phosphorous, iron, fluorine, iodine, sodium and potassium.
2.2 Vitamins: Classification, fat and water soluble vitamin, their food sources, effects of deficiency and RDA.

UNIT – III 6 hours

UNIT – IV 6 hours
4.1 Food spoilage: – Food Spoilage – Causes of food spoilage – Fermentation, rancidity, autolysis and putrefaction – food poisoning.
4.2 Food Preservation: principle and importance-method of freezing, canning, pickling, salting, smoking, bottling, sterilization, refrigeration, dehydration, heating, radiation and preservative agents.

UNIT – V 6 hours
5.1 Food adulteration: Definition, classification – Common adulteration in food and their ill effects – Packing hazards-food additives.

TEXT BOOKS:


UNIT I : Text Book 1,3
UNIT II : Text Book 1,2,3
UNIT III : Text Book 1,3
UNIT IV : Text Book 1,3
UNIT V : Text Book 1,2,3

REFERENCES:
SEMESTER-III: CORE-III
INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY-III

Course Code : 14UCH3C3
Hours/Week : 4
Credit : 4
Max. Marks : 100
Internal Marks : 40
External Marks : 60

Objectives:
- To understand the chemistry of halogen, oxygen and nitrogen family
- To understand about the preparations and reactions of alcohols and alkyl halides
- To learn the basic concepts of solids and their structure
- To know the behavior of adsorption on solids
- To study the structure of molecules based on physical properties.

UNIT – I  12 hours

1.1. **Halogen Family**: Comparative study of halogens and their compounds – Oxides and Oxyacids of halogens; Basic Properties of Iodine; Chemistry of Astatine.Interhalogen compounds: Preparation, properties and structures (ClF_3, IF_5, IF_7) Polyhalides stoichiometry, properties, structures (ICl_2, IF_4).

2.1 **Oxygen Family**: Comparative study of elements – Oxides and their classification (based on oxygen content and based on their chemical behaviour) – Ozone – manufacture, properties, uses. Sulphur – Properties – Allotropic modifications – Compounds of sulphur – Oxides and Oxyacids of sulphur – Properties – Structures

UNIT – II  12 hours

2.1 **Peracids of Sulphur and Thionic acids**: Preparation and properties – Sodium thiosulphate – properties and uses.

2.2 **Nitrogen family**: Comparative study of nitrogen family elements, their compounds, Oxides and oxyacids of Nitrogen – preparation, properties.

UNIT – III  12 hours


3.2 **Alkyl halides**: Alkyl halide, vicinal dihalides - Preparation from alkenes, gem dihalides - Preparation from alkyne, properties – hydrolysis and dehalogenation. Aliphatic Nucleophilic substitution reactions - mechanism of SN_1, SN_2 and SN_1 reactions. Elimination reactions - mechanisms of E1 and E2 reactions – Saytzeff’s and Hofmann rules.
UNIT – IV 12 hours

**Solid state and Adsorption**

4.1 Solid state – Classification - crystalline and amorphous solids, isotropic and anisotropic solids. Space lattice, unit cell, seven crystal systems, crystal structure of NaCl and CsCl.


4.2 X-ray diffraction - Derivation of Bragg’s equation – Determination of crystal structure by Laue’s powder method.

4.3 Adsorption on solids – Chemisorption and physisorption, Postulates and mathematical form of Freundlich, Langmuir and BET adsorption isotherms.

UNIT – V 12 hours

5.1 **Electrical Properties of Matter:** Polar and non-polar molecules, dipole moment, Stark effect, polarization of molecules in an electric field - electronic polarization, atomic polarization and orientation polarization- Clausius-Mosotti equation (no derivation ) and Debye equation (no derivation) - Methods to determine dipole moment - Temperature method and dilute solution method - applications of dipole moment- determining the percentage of ionic character of bonds- shapes of simple molecules (H₂O, CO₂ and NH₃).

5.2 **Magnetic Properties of Matter:** Magnetic flux, Magnetic susceptibility, Types of magnetism- dia, para, ferro and antiferro magnetism. Determination of magnetic susceptibility by Guoy balance method. Application to solving of simple structural problems.

# Self study

**TEXT BOOKS:**


**REFERENCES:**

SEMESTER-III: NON MAJOR ELECTIVE-II
CHEMISTRY IN EVERY DAY LIFE

Course Code : 14UCH3N2       Max. Marks : 100
Hours/Week : 2                Internal Marks : 40
Credit : 2                    External Marks : 60

Objectives:
- To acquire knowledge on chemistry applied in day to day activities
- To get knowledge about the preparation and uses of several commodities in daily life
- To understand the importance of fuels

UNIT-I
Essential oils, Perfumes and Flavours:
1.2 Perfumes: Formulations, Requirements of a good perfume, composition of perfumes, classification of perfumery materials – animals - synthetic - formulations #Manufacturing and Packaging processes of Perfumes#.
1.3 Flavours: Definition of flavours – classification, chemical composition, common characteristics, formulation, #uses and hazards #.

UNIT-II
Cosmetics:
2.1 Face cream, sun screen lotion, shaving cream-composition-formulation - uses and their hazard.
2.2 Sprayer, hand lotion, nail lacquers, nail bleaches, hair oil, hair dyes - Composition-formulation-uses and their hazards.

UNIT-III
Dyes:
3.1 Definition, classification of dyes based on applications – preparation and uses of alizarin, indigo, methyl orange, phenolphthalein and malachite green.

UNIT-IV
Polymers:
4.1 Definition-classification of polymer–addition and condensation – Preparation and uses of PVC, PTFE, polystyrene, #terylene and nylon 6,6 #.
4.2 Plastics - thermo plastic, thermosetting plastics examples- differences –properties-uses.

UNIT-V
Fuels for Home and Fire Protection:
5.1 Fuels: Definition, classification-solid, liquid and gaseous fuels, requirements of a good fuel-Composition and uses of LPG, gobar gas and water gas.
5.2 Fire Protection: Causes of fire accidents in homes, firefighting in homes – methods of extinguishing fire, chemical fire extinguishers - merits and demerits. #Automatic fire detection cum control, causes and fire fighting #.

# Self Study
TEXT BOOKS:

UNIT I : Text Book 1,2
UNIT II : Text Book 1,2
UNIT III : Text Book 1,2
UNIT IV : Text Book 1,2
UNIT V : Text Book 1,2,3

REFERENCES:
SEMESTER- IV: CORE-IV

INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY-IV

Course Code : 14UCH4C4       Max. Marks : 100
Hours/Week : 4        Internal Marks : 40
Credit : 4         External Marks : 60

Objectives:

- To understand the chemistry of carbon and boron family.
- To study about the preparations and reactions of carbonyls and ethers.
- To understand the aromaticity and mechanism of electrophilic substitution reactions.
- To know the importance of acids, bases and their salts
- To study the kinetics and catalysis of chemical reactions

UNIT – I                                                                                 12 hours

1.1. **Carbon family:** Comparative study of carbon family and their compounds – hydrides, halides and oxides. Preparation and properties of carbonic acid, phosgene, carbon disulphide, cyanogens, HCN, HCNS and pseudo halogens.

1.2. **Boron Family:** Comparative study of boron family. Preparation, properties, structure and uses of H3BO3, Borax, diborane and borazole.

1.3. *Compounds of Aluminium: Alumina, precious gems and alums.*

UNIT – II                                                                                 12 hours

2.1 **Carbonyl Compounds:** General methods of preparation of aliphatic carbonyl compounds (acetone, acetaldehyde) – by oxidation of alcohols, properties – nucleophilic addition reactions, acidity of alpha hydrogen and addition of Grignard reagents. Aromatic carbonyl compounds (Benzaldehyde) - preparation by Rosenmund reduction and Gattermann Koch synthesis, benzophenone and acetophenone – preparation by Fridel-Crafts Acylation, properties – reduction reactions.

2.2 **Ethers:** Simple and mixed ethers – isomerism – preparation by Williamson’s ether synthesis, properties - reactions involving alkyl, ethereal oxygen and C-O bonds*. Anisole – Preparation from benzene diazonium chloride – Thio ether preparation by Williamson’s ether synthesis and mustard gas preparation from ethylene and uses.

UNIT – III                                                                                 12 hours

3.1 **Aromaticity:** Huckel’s rule and its application to aromaticity of benzenoid compounds.

3.2 **Aromatic Electrophilic substitution reactions:** General mechanism of electrophilic reactions – Halogenation, nitration and sulphonation. Fridel-Craft’s alkylation and acylation reactions. Orientation effects of various substituents – ortho / para ratio.

UNIT – IV                                                                                 12 hours

4.2 **Hydrolysis of salts** – Definition, salts of strong acids-strong base - salt of weak acids-strong bases, salt of weak base - strong acid, salt of weak acid - weak base, hydrolysis constant($K_h$), relation between $K_h$, $K_a$ and $K_w$, #Degree of hydrolysis - salt of weak acid-strong base, salt of weak base - strong acid, salt of weak acid - weak base#.

**UNIT – V 12 hours**

**Chemical Kinetics and Catalysis**

5.1 Chemical Kinetics-Energy of activation and its significance, influence of temperature, Arrhenius Rate Equation and its significance. Theories of reaction rates – simple collision theory, Absolute Reaction Rate Theory (ARRT) to simple uni-molecular and bimolecular processes - Comparison of collision & ARRT.

5.2 Catalysis- basic idea of catalyst- types- homogeneous and heterogeneous catalysis – theories of acid-base catalysis, enzyme catalysis- mechanism and kinetics (Michaelis-Menten equation). #synthetic and industrial importance of catalyst#.

#________________# Self study

**TEXT BOOKS:**


UNIT I : Text Book 1,2
UNIT II : Text Book 2,3
UNIT III : Text Book 2,3
UNIT IV : Text Book 4,5
UNIT V : Text Book 4,5

**REFERENCES:**

SEMESTER- IV: SKILLBASED ELECTIVE-II
SEPARATION AND PURIFICATION TECHNIQUES

Course Code : 14UCH4S2       Max. Marks : 100
Hours/Week : 2        Internal Marks : 40
Credit : 2         External Marks : 60

Objectives:

- To help students to develop knowledge of safety in laboratory.
- To learn the basic separation and purification methods.

UNIT – I                                               6 hours
Distillation: Desiccant – types – drying power and choice of desiccants – Distillation - Principles and techniques of fractional distillation, steam distillation and azeotropic distillation.

UNIT–II                                               6 hours

UNIT – III                                               6 hours
Paper Chromatography: Principle, types, techniques and applications.

UNIT – IV                                               6 hours
Thin layer Chromatography: Principle, types, techniques and applications.
HPLC: Principle, types, techniques and applications.

UNIT – IV                                               6 hours
Column Chromatography: Principle, types, techniques and applications.
Ion exchange Chromatography: Principle, types, techniques and applications.

# Self study

TEXT BOOKS:

UNIT I    : Text Book 1,2
UNIT II   : Text Book 1,2
UNIT III  : Text Book 1,2
UNIT IV   : Text Book 1,2
UNIT V    : Text Book 1,2

REFERENCES:
Objectives:

- To enable the students to learn computer basics and operating system
- To know the fundamentals of networks and C programming
- At the end of this course the students will be in a position to get an idea of solve chemistry formulae in C programming.

UNIT-I


UNIT-II


UNIT-III


UNIT-IV

UNIT – V
Applications of C-Programming:
- Basic Structure of C-Programming
- Conversion of temperature from Kelvin to Celsius
- Determination of molecular weight by Rast-Macro method
- Calculation of rate constant using first order rate equation
- Calculation of root mean square, average and most probable velocities of molecules
- Calculation of Bohr radius
- pH determination using Henderson equation
- Determination of half life and average life of a radioactive nucleus
- Determination of van der Waals constants
- Determination of lattice energy of a Crystal using Born-Lande equation

TEXT BOOKS:

UNIT I : Text Book 1
UNIT II : Text Book 1
UNIT III : Text Book 1,
UNIT IV : Text Book 1,2
UNIT V : Text Book 2

REFERENCES:
Objective:

- To understand the fundamentals of photochemistry and radiation chemistry

UNIT – I

UNIT – II

UNIT – III
Kinetics of some important photochemical reactions – Dissociation of HI, Formation of HCl, formation of HBr, photolysis of acetaldehyde, Dimerisation of anthracene (Derivations required).

UNIT – IV

UNIT – V

TEXT BOOKS:

UNIT I : Text Book 1
UNIT II : Text Book 1,2
UNIT III : Text Book 1,2
UNIT IV : Text Book 1,2
UNIT V : Text Book 1,2
REFERENCES:
SEMESTER-V:  CORE-VII
TRANSITION ELEMENTS AND NUCLEAR CHEMISTRY

Course Code : 14UCH5C7       Max. Marks : 100
Hours/Week : 4       Internal Marks : 40
Credit : 4       External Marks : 60

Objectives:
- To understand chemistry of zero group elements, alkali and alkaline earth metals
- To study the chemistry of transition and inner transition metals
- To know about the fundamental concepts and applications of nuclear chemistry

UNIT – I  12 hours
1.1. Zero group elements: Position in the periodic table. Separation of Noble gases (Dewar’s method) and from liquid air. General properties, uses. Compounds of Xenon – Fluorides – Preparation, properties. Structures of XeF₂, XeF₄, XeF₆, XeOF₄, Clathrates, Structures.
1.2. Alkali and alkaline earth metals: Comparative study of metals and their compounds (oxides, hydroxides, carbonates, sulphates). Glauber’s salt, Chile saltpeter, Sodamide, Sodium azide.

UNIT – II  12 hours
2.2. Preparation, properties and uses of TiO₂, V₂O₅, Cr₂O₃, WO₃, FeO, Fe₂O₃ and Cu₂O.
2.3. Preparation, properties and uses of ZnCl₂, CdS and HgCl₂.

UNIT – III  12 hours

UNIT – IV  12 hours
Nuclear Chemistry:
4.1 Composition of nucleus – nuclear stability-n/p ratio, half life period and average life period. Mass defect, binding energy and magic numbers.
4.3 Definition of isotopes, isobars, isotones and isomers - Whole number rule and packing fraction. Applications of radio isotopes- rock dating and carbon dating.
UNIT – V  
12 hours

5.1 Radioactivity: Definition, Properties of α, β and γ rays: Detection and measurement – Wilson cloud chamber and G.M.Counter. decay constant,
5.2 Modes of decay – Group displacement law. Radioactive series.
5.3 Nuclear Fission – Atom bomb and nuclear reactor. Nuclear Fusion – Hydrogen bomb and stellar energy.

Self Study

TEXT BOOKS:


UNIT I : Text Book 1,3
UNIT II : Text Book 1,3
UNIT III : Text Book 1,3
UNIT IV : Text Book 2,3
UNIT V  : Text Book 2,3

REFERENCES:

Objectives:

- To understand the concepts of stereochemistry, conformational analysis and their applications in the determination of reaction mechanism.
- To know modern synthetic methods and synthetic strategies. This helps in planning the synthesis of any types of organic compounds.
- To study about the reactions of heterocyclic compounds and polynuclear hydrocarbons.

UNIT – I 12 hours

Stereochemistry – I
1.2 Optical isomerism activity of lactic acid and tartaric acid - enantiomers and diastereomers, racemic mixture – resolution – chemical and biochemical resolutions. Racemization, Asymmetric synthesis and Walden inversion.
1.3 Optical activity of compounds containing no asymmetric carbons – Biphenyls, allenes and spiranes.

UNIT – II 12 hours

Stereochemistry - II
2.1 R & S Notations – Cahn, Ingold and Prelog rule – Erythro and Threo representations. Fischer, Sawhorse and Newmann projection formulae of compounds containing two asymmetric carbon atoms.
2.2 Geometrical Isomerism:- Cis-trans, syn–anti and E–Z notations – Geometrical isomerisms of Maleic and Fumaric acids and unsymmetrical ketoximes – Methods of determination of the configuration of geometrical isomers.
2.3 Conformation Analysis - Definition – conformation and configuration – conformation of ethane and n-butane molecules and their stability. Conformations of cyclohexanes – energy profile diagrams.

UNIT – III 12 hours

Reagents and Naming Reactions:
3.1 Reagents: Lithium aluminium hydride, Sodium boro hydride, Raney nickel, Sodium cyano borohydride, chromyl chloride, HIO4, SeO2, Wilkinson’s catalyst, Zeigler – Natta catalyst, Fenton’s reagent and Pb(OAc)4.
3.2 **Naming reactions**: Aldol, Benzoin, Cannizaro, Crossed Cannizaro, Mannich, Michael addition, Oppenauer oxidation, MPV, Perkin, Rosenmund and Wolf Kishner reactions with mechanisms.

**UNIT – IV**

**Heterocyclic Compounds:**

4.1 Nomenclature for mono cyclic compounds - Preparation of Furan from furfural, pyrrole from furan and thiophene from butene. Properties -electrophilic substitution reactions - Halogenation, nitration and sulphonation. Comparative basic characters of pyrrole and piperidine with alkyl amines.

4.2 Synthesis of Quinoline, Isoquinoline and Indole with special reference to Skraup, Fischer indole synthesis and Fischer Napieralski synthesis. Structural elucidation of Quinoline and Isoquinoline.

**UNIT – V**

5.1 **Polynuclear hydrocarbons**: Naphthalene, anthracene and phenanthrene – preparation by Haworth synthesis, properties - oxidation, reduction, sulphonation, nitration, halogenation and uses.

5.2 **Petroleum**: Thermal and catalytic process of cracking, Synthetic petrol-Fischer Tropsch’s Process - Bergius process – flash point, fire point, smoke point – knocking - octane number and cetane number - antiknocking reagents – Power alcohol.

# _________ # Self Study

**TEXT BOOKS:**


UNIT I : Text Book 1
UNIT II : Text Book 1
UNIT III : Text Book 2
UNIT IV : Text Book 3
UNIT V : Text Book 4

**REFERENCES:**


Objectives:
- To understand the concepts of thermodynamics and thermo chemistry.
- To make the student to understand the phase rule and its applications to one and two component systems.
- To study the concepts and uses of colligative properties.

UNIT – I 12 hours

First Law of Thermodynamics and Thermo Chemistry
1.1. Terms used in thermodynamics – Various systems and process. Intensive and extensive properties, internal energy, work and heat, state function, path function, exact and inexact differentials, first law of thermodynamics- definition, heat capacity – $C_p$ and $C_v$. Joule-Thomson effect, Joule Thomson co-efficient and inversion temperature, zeroth law of thermodynamics.
1.2. Application of First law – Calculation of $q$, $W$, $\Delta U$ and $\Delta H$ for isothermal and adiabatic reversible & irreversible expansion of an ideal gas.
1.3. Thermo chemistry: Change of internal energy and enthalpy in a chemical reaction, Enthalpy of reaction at constant volume and at constant pressure, Enthalpy of combustion, formation, neutralization, dissociation, solution, hydration, dilution, precipitation. Kirchoff equation and Hess’s law and their applications.

UNIT – II 12 hours

Second Law of Thermodynamics
2.1. Need for the law, spontaneous process, Carnot’s cycle, efficiency of Carnot’s engine, thermodynamic scale of temperature, entropy - Concept of entropy, entropy as a state function, entropy change in isothermal expansion of ideal gas, entropy change in reversible and irreversible processes.
2.2. Entropy change accompanying change of phase, entropy of mixture of ideal gases, Physical significance of entropy. Other state functions – Free energy, work functions, variation of $G$ with $T$ and $P$, Maxwell’s relations, Gibb’s– Helmholtz equation.

UNIT – III 12 hours

Third Law of Thermodynamics and Phase Rule
3.2. Phase Rule - Definition of the terms – Phase, components, degrees of freedom, derivation of Gibb’s phase rule, one component system – H$_2$O, CO$_2$, and Sulphur systems, two component system – Simple eutectic system - Pb-Ag, freezing mixture, compound formation with congruent melting points - FeCl$_3$-H$_2$O system, compound formation with incongruent melting points - Na$_2$SO$_4$-H$_2$O system.
UNIT – IV                        12 hours

Solutions of Non-Electrolytes


4.2. Vapour pressure of non-ideal solution - deviations from Raoult’s law, vapour pressure composition and boiling point - composition curves, azeotropic mixtures (HCl–H₂O and ethanol–water system).

4.3. Solubility of partially miscible liquids pairs – system with upper CST - Phenol–Water, aniline–hexane, system with lower CST – Triethylamine-water and system with upper and lower CSTs - Nicotine-water, effects of impurities on CST, completely immiscible liquid pairs –Nernst distribution law and its application to solvent extraction.

UNIT – V

Properties of Dilute Solutions

5.1. Colligative properties – Definition, lowering of vapour pressure, relative lowering of vapour pressure, determination of molecular weight from lowering of vapour pressure, measurement of lowering of vapour pressure, osmosis and osmotic pressure – definitions, expression for calculating osmotic pressure, determination of molecular weight from osmotic pressure, relation between osmotic pressure and lowering of vapour pressure, experimental determination of osmotic pressure.

5.2. Elevation of boiling point – Definition, derivation of ebullioscopic constant, determination of molecular weight from elevation of boiling point, elevation of boiling point determination, depression of freezing point – definition, derivation of cryoscopic constant, determination of molecular weight from depression of freezing point, experimental determination, abnormal colligative property – Association, dissociation and Van’t Hoff factor, degree of dissociation.

TEXT BOOKS:


UNIT I : Text Book 1,2
UNIT II : Text Book 1,2
UNIT III : Text Book 1,2
UNIT IV : Text Book 1,3
UNIT V : Text Book 1,3

REFERENCES:

SEMESTER-V: CORE-X
ANALYTICAL CHEMISTRY

Course Code : 14UCH5C10
Max. Marks : 100

Hours/Week : 4
Internal Marks : 40

Credit : 4
External Marks : 60

Objectives:
- To develop the habit of accurate manipulation and an attitude of critical thinking.
- To learn the basic analytical methods and have a sound knowledge of chemistry involved in an analysis.

UNIT – I
Laboratory Hygiene and Safety: Storage and handling of chemicals, handling of ethers, Toxic and poisonous chemicals, general precautions for avoiding accidents, first aid techniques – acid and alkali on eye, acid and alkali burn – Bromine burns - cut by glasses – Heat burns – Inhalation of toxic vapours – Poisoning – Treatment for specific poisons – acids, alkalis, acetone, arsenic and copper compounds, cyanides - universal antidote.

UNIT – II

UNIT – III
Thermal Analysis
Thermo gravimetric Analysis (TGA): Principle – Instrumentation – Techniques - Factors affecting TGA – applications (CuSO_4.5H_2O and Ca(C_2O_4)_2.H_2O).

UNIT – IV
Analytical Electrochemistry: Redox potential measurement and applications – Interpretation of chemical behavior – Electrolytic separation.

UNIT – V
Electrogravimetry: Theory – Instrumentation - applications - Spontaneous (Internal) electrolysis – Coulometric analysis, coulometric titration – Applications –Potentiostatic coulometry.

Self Study
TEXT BOOKS:
   UNIT I : Text Book 2
   UNIT II : Text Book 2
   UNIT III : Text Book 2
   UNIT IV : Text Book 2
   UNIT V : Text Book 1,2

REFERENCES:
SEMESTER-V: CORE-XI
APPLIED CHEMISTRY

Course Code : 14UCH5C11
Max. Marks :100
Hours/Week : 4
Internal Marks : 40
Credit : 4
External Marks : 60

Objectives:
- To impart knowledge on Glass, Refractories, Paints and Varnishes and Pigments.
- To have knowledge on applied the chemistry in daily life.

UNIT – I
12 hours

UNIT – II
12 hours

UNIT – III
12 hours
3.2 Dyes: Dyes - colour and constitution – classification of dyes – based on application and chemical structure – nitro and nitroso dyes - triphenyl methylene dyes - malachite green, crystal violet, Azo dyes - Aniline yellow, methyl orange – phthaleins – Phenolphthalein, fluorescein – preparation properties and uses.
UNIT – IV

4.1 **Portland Cement:** Introduction – types of cements – High alumina cement, Pozzolona cement Portland cement- manufacture and quantitative requirements, #Setting of Cement and uses#.


UNIT – V


5.2 **Batteries:** Fundamentals of Batteries – Classification of Batteries – Sizes of Batteries – Primary Batteries – Le’clanche dry cell – Magnesium dry cell – Secondary batteries – Lead-acid battery – Alkaline Storage Batteries. #Fuel cells (hydrogen – oxygen)#.

#__________________________# Self study

**TEXT BOOKS:**

UNIT I : Text Book 1
UNIT II : Text Book 1
UNIT III : Text Book 1, 2, 3
UNIT IV : Text Book 1
UNIT V : Text Book 1

**REFERENCES:**
Objectives:

- To impart the knowledge in the basic concept of drugs.
- To create the awareness about the diseases and their causes.

UNIT –I

1.1. Drugs: source of drugs - important terminologies - molecular pharmacology, pharmacodynamics, pharmacophore, metabolites, virus, antimetabolites, bacteria, fungi - actinomycetes.

1.2. Indian medicinal plants and trees – Adathoda, tulsi, thoothuvalai, neem, mango, and kizhanelli.

1.3. Causes and symptoms of common diseases: Tuberculosis, asthma, jaundice, leprosy, typhoid, malaria, cholera and filaria.

UNIT – II


2.2 Sulpha drugs: Definition and drug action of sulpha drugs. Preparation and uses of sulphadiazine, sulphapyridine, sulpha thiazole and sulpha furazole.


UNIT – III


UNIT – IV 6 hours
4.1. **Blood:** Composition of blood, blood graphics – Rh factor, Blood clotting, Mechanism.
4.2. **Haematological agents:** Coagulants and anticoagulants, definition-examples.
4.3 #Qualitative test for urea, bile, ketone, Protein in urine sample and urea, glucose in blood sample#.

UNIT-V 6 hours
5.1. **Psychopharmacology, antipsychotic drugs, anti anxiety drugs, anti depressant drugs, sedatives and hypnotics** – definition – examples.
5.2. **Diabetes and Hypoglycemic Drugs:** Types-causes- symptoms – control methods insulin - oral hypoglycemic agents - sulphonyl urea – adverse effects.
5.3. **Anticonvulsant agents:** Definition, types, barbiturates, hydantoins, succinimides – acetyl urea derivatives -uses.

# Self study

**TEXT BOOKS:**

UNIT I : Text Book 1,2,3
UNIT II : Text Book 1,2,3
UNIT III : Text Book 1,2,3
UNIT IV : Text Book 1,2,3
UNIT V : Text Book 1,2,3

**REFERENCES:**
Objectives:

- To impart the knowledge for the preparation of competitive examinations
- To understand reasoning skills in the concept of chemistry for competitive examination

UNIT – I

Periodic classifications of elements, atomic and ionic radii - ionization potential – electron affinity – electro negativity – Oxidation states and oxidation number – common oxidizing and reducing agents – ionic equations – inert gases - isolation and chemistry – principles of inorganic chemical analysis.

UNIT – II


UNIT – III


UNIT – IV

UNIT – V


TEXT BOOKS:

UNIT I : Text Book 1,
UNIT II : Text Book 2
UNIT III : Text Book 3
UNIT IV : Text Book 2,3
UNIT V : Text Book 4

REFERENCES:
SEMESTER-VI: CORE-XII
CO-ORDINATION CHEMISTRY AND APPLICATIONS

Course Code : 14UCH6C12  Max. Marks : 100
Hours/Week : 5  Internal Marks : 40
Credit : 4  External Marks : 60

Objectives:
- To study nomenclature, properties and applications of coordination compounds
- To understand the nature of coordinate bonds.
- To know the concepts of acids and bases.
- To study the chemistry of inorganic polymers, polyacids and carbonyl compounds.

UNIT – I  15 hours
1.1. Coordination Chemistry:
- Coordinate valence (electron pair donation) – characteristics of coordination compounds.
- Ligands: Classification – uni dentate to hexadentate. Symmetrical, unsymmetrical ligands, ambidentate ligands.
1.2. IUPAC Nomenclature:
- Naming of ligands (all types) – bridging and ambidentate ligands.
- Naming of mono-nuclear and bi-nuclear complexes.
1.3. Isomerism:
- Structural (all types), Stereoisomerism – geometrical and optical isomerism in 4 and 6 coordination compounds.

UNIT – II  15 hours
2.1. Detection and structure determination of complexes in solution.
2.2. Theories of coordination:
- Werner’s, Sidgwick (EAN concept) and Valence bond theory for the octahedral, tetrahedral and square planar complexes. Application of VBT for properties of complexes – Limitations of VBT. Crystal field theory – Important features, splitting of d-orbitals in Oh, Td and square planar complexes. CFSE – factors influencing Dq values. Application of CFT – magnetic properties – Limitations of CFT.

UNIT – III  15 hours
3.1. Chelation:
3.2. Stability of complexes:
- Stability and instability constants, labile and inert complexes. thermodynamic and kinetic stability.
3.3. Application of complexes in analysis:
- Detection of K⁺ ions, separation of Copper and Cadmium ions. Estimation of Ni²⁺ and Al³⁺ ions through chelation. Structure of EDTA and its complexes.
3.4. Application in Bio-fields:
- Structure and functions of Haemoglobin and Chlorophyll.
UNIT – IV 15 hours
4.2. **Organic acids**: Acetic acid, Oxalic acids – inductive effect. Aromatic acid – resonance effect – General theory of solvent – Cady and Elsey concept
4.3. Preparation, properties and structure of metal carbonyls (mono, bi) Ni, Fe, Co.

UNIT – V 15 hours
5.1. **Silicates**: Definition – Classification – Ortho, Pyro, Chain structures, sheet silicates, three – dimensional silicates – Composition, structure and uses.
5.2. **Silicones**: Preparation – Silicone Oils – Silicone rubbers - important uses.
5.3. **Polyacids**: Isopolyacids – Preparation, Structure of Cr, W and V poly acids.
5.4. **Boron-Nitrogen Polymers**: Boron nitride - Layer structure, preparation, hardness.

# Self study

TEXT BOOKS:

UNIT I : Text Book 1,2
UNIT II : Text Book 2
UNIT III : Text Book 2
UNIT IV : Text Book 2
UNIT V : Text Book 1

REFERENCES:
SEMESTER–VI: CORE– XIII

MOLECULAR SPECTROSCOPY AND ELECTROCHEMISTRY

Course Code : 14UCH6C13      Max. Marks : 100
Hours/Week : 5        Internal Marks : 40
Credit : 4         External Marks : 60

Objectives:
- To study the fundamentals of various spectroscopy
- To understand the concept and applications of electrolytic conductance and electrochemical cells.

UNIT – I 15 hours

Atomic structure, Quantum theory and Spectroscopy

1.1. de-Broglie theory of matter, experimental proof, Heisenberg’s uncertainty principle, derivation of Schrodinger wave Equation, significance of $\Psi$ and $\Psi^2$.

1.2. Electromagnetic radiations – Definition, regions of electromagnetic radiations, quantization of energies in molecules - Translational, rotational, vibration, and electronic energies, molecular spectra - origin of molecular spectra - Interaction of electro-magnetic radiations with molecules.

1.3 UV visible spectroscopy – Theory of electronic spectroscopy, Frank – Condon Principle, types of electronic transitions – # Dissociation and Predissociation spectra#.

UNIT – II 15 hours

Absorption Molecular Spectroscopy

2.1. Microwave spectroscopy - Molecular rotation, theory of microwave spectroscopy, selection rule, effect of isotopic substitution and calculation of moment of inertia and bond length of diatomic molecules.

2.2. Infrared spectroscopy - Molecular vibration – Modes of vibration of diatomic, tri-atomic linear(CO$_2$) and non linear (H$_2$O) molecules - Stretching and bending vibrations, selection rules, expression for vibration frequency, Hook’s law - calculation of force constant.

2.3. Raman spectroscopy – Raman Effect, Rayleigh and Raman scattering – Stokes and anti-stokes lines - # Modes of vibrations and change in polarisability of H$_2$O and CO$_2$, mutual exclusion principle#, comparison between Raman and IR spectroscopy.

UNIT – III 15 hours

Resonance and Mass Spectra

3.1. NMR spectroscopy - Magnetic and non–magnetic nuclei, principle of nuclear magnetic resonance - shielding mechanism, chemical shift, factors affecting chemical shifts (electro negativity and anisotropic effect) - number of signals – proton counting - Spin-spin coupling, coupling constant, NMR spectrum of ethyl alcohol.

3.2. ESR spectroscopy - theory of ESR spectra, hyperfine splitting, ESR spectra of hydrogen and methyl radicals – comparison of NMR and ESR.

3.3. Mass spectroscopy- Basic principle, molecular ion peak, base peak, isotopic and meta stable peaks, and nitrogen rule and # mass spectra of toluene and branched alkanes#.
UNIT – IV                                               15 hours

Electrolytic Conductance and Transference

4.1. Ionic mobility – Definition, experimental proof for migration of ions, transport number –
definition, Hittorf’s rule, experimental determination - Hittorf’s method, moving boundary
method, effect of concentration on transport number.

4.2. Transport of ions in solution – Debye-Huckel-Onsager (DHO) theory – assumption and
mathematical form - validity of DHO equation, drawbacks of DHO equation, and Extension
of Debye-Huckel-Onsager theory to strong electrolytes- Conductometric titrations- Acids
and Bases.

4.3. Activity of ions in solutions – Mean ionic activity and activity coefficient, ionic strength,
Debye-Huckel limiting law of activity coefficient. (No Derivation)

UNIT – V                  15 hours

Electromotive Force of Galvanic Cells

5.1. Galvanic cell – Definition, chemical cell, concentration cell, reversible cell and
irreversible cell, types of reversible electrodes – Metal-metal ion electrodes, amalgam
electrodes, gas electrodes, metal-insoluble metal salt electrode and oxidation - reduction
electrode, single electrode potential.

5.2. E.M.F. of galvanic cell and cell reaction – Cell e.m.f., sign conventions of cell e.m.f. and
cell reaction, Nernst equation for cell e.m.f., reference electrode – primary and secondary
reference electrode, standard electrode potential and its determination, electro chemical
series, standard cell,

5.3. Thermodynamics of galvanic cells – Relation between E.M.F. and \( \Delta G \), \( \Delta H \), \( \Delta S \) and
equilibrium constant(K), concentration cells – Electrode concentration cells – Amalgam and
gas concentration cells, electrolyte concentration cells - Concentration cells without
transference and its e.m.f., concentration cells with transference and its e.m.f., liquid
junction potential#.

# ____________ # Self study

TEXT BOOKS:
1. C. N. Banwell and E. M. Mccash, “Fundamentals of Molecular Spectroscopy”, Tata McGraw-
2. B.R. Puri, L.R. Sharma and M.S. Pathania, Principles of Physical Chemistry, Vishal Publications,
Jalandhar. 2005,

UNIT I : Text Book 1,2
UNIT II : Text Book 1,2
UNIT III : Text Book 1,2
UNIT IV : Text Book 2
UNIT V : Text Book 2

REFERENCES:
5. R.L. Madan and G.D. Tuli, “Simplified Course in Physical Chemistry”, 5th revised and enlarged edition,
Course Code : 14UCH6C16          Max. Marks : 100
Hours/Week : 4                  Internal Marks : 40
Credit : 4                      External Marks : 60

Objectives

- To learn the various types of reactions, rearrangements and their mechanisms.
- To study about the reactions of carboxylic acids.
- To learn the characteristics and reactions of natural products

UNIT – I

12 hours

Dihydric phenols: Preparations – Catechol and resorcinol using sodium hydroxide reagent and quinol from aniline.

1.2 Reactions of phenols – Esterification, nitration, sulphonation, halogenation, acylation and coupling reactions.

1.3 Naphthols: Preparation of α and β-naphthols from sodium naphthalene sulphonate, properties - electrophilic substitution reactions and uses of naphthols.

UNIT – II

Nitro Compounds and Amines:

2.1 Preparation of nitrobenzene from benzene – reduction of nitrobenzene in neutral, acidic and alkaline media - TNT.

2.2 Amines: Relative basic characters of aliphatic and aromatic amines – ring substitution in aromatic amines – separation of amines by Hinsburg and Hofmann methods, diazotization reaction.

2.3 Phenylene diamines (o, p & m) – #Preparation - sulphanilic acid, sulphanilamide, saccharin, chloramine -T and uses#.

UNIT – III

Mono, Dicarboxylic acids and Esters:

3.1 Acetic acid – preparation from quick vinegar process, properties - chlorination and uses. Acidity of carboxylic acids, acidity constants and comparison of acid strengths of substituted benzoic acids.

3.2 Dicarboxylic acids – preparations - oxalic acid from sucrose, malonic acid from chloro acetic acid and succinic acid from maleic acid, properties - oxalic acid (action with glycerol, H₂SO₄, KMnO₄ and action of heating), malonic acid (action with P₂O₅ and aldehyde), succinic acid (action with NH₃ and action of heating).
3.3 **Esters** – Preparations – malonic ester from potassium cyano acetate, aceto acetic ester from ethyl acetate. Properties - malonic ester and aceto acetic ester (formation of salts, hydrolysis and alkylation). Keto-enol tautomerism of aceto acetic esters, # synthetic applications of malonic and aceto acetic esters #.

**UNIT – IV**

**Molecular rearrangements**

4.1 Pinacole-Pinacolone, Beckmann, Benzidine, Hofmann and Benzilic acid rearrangements with mechanisms.

4.2 Claisen, Dienone-phenol, Fries, Favorskii and Wolff rearrangements with mechanisms.

**UNIT – V**

**Terpenoids:** Classification, Isoprene rule, special isoprene rule, gem - dialkyl rule, Structural elucidation and uses of citral, α-terpineol and menthol.

**Alkaloids:** Classification – General methods of isolation, Hofmann exhaustive methylation, Structural elucidation of coniine, nicotine and piperine.

# Self study

**TEXT BOOKS:**


UNIT I : Text Book 1,2
UNIT II : Text Book 2
UNIT III : Text Book 4
UNIT IV : Text Book 4
UNIT V : Text Book 3

**REFERENCES:**

SEMESTER-VI: CORE-XVII
SOIL, DAIRY AND LEATHER CHEMISTRY

Course Code : 14UCH6C17
Max. Marks : 100
Hours/Week : 4
Internal Marks : 40
Credit : 4
External Marks : 60

Objective:

- To impart knowledge on dairy, leather, soil, fertilizers and water.
- To understand the applications of chemistry in industrial processes.

UNIT – I
12 hours
Soil Chemistry: Introduction - soil classification, physical and chemical properties of soil, soil water, soil air, soil temperature, soil minerals, soil colloids, soil reaction and buffering - soil pH, soil acidity, soil salinity and alkalinity, soil fertility and soil formation.

UNIT – II
12 hours

UNIT – III
12 hours

UNIT – IV
12 hours

UNIT – V
12 hours

# Self study

TEXT BOOKS:


UNIT I : Text Book 2
UNIT II : Text Book 2
UNIT III : Text Book 1
UNIT IV : Text Book 1
UNIT V : Text Book 3

REFERENCES:
Objective:
- To enable the student to develop a sound knowledge of fundamental concepts in biochemistry.

UNIT-I 6 hours
Amino Acids and Proteins:
Classification of amino acids: Definition of Essential and non–essential amino acids. Preparation and properties of glycine and alanine. Zwitter ions, isoelectric points, polypeptides, End group analysis by Sanger’s method.
Proteins – classification based on physical and chemical properties and on physiological functions-
Primary, secondary and tertiary structures of proteins-
Denaturation of proteins.

UNIT-II 6 hours

UNIT-III 6 hours
Carbohydrates: Classification, structural elucidation of glucose and fructose, Reactions of glucose and fructose - osazone formation - mutarotaion and its mechanism -Inter conversion of aldoses and ketoses.
Disaccharides – structure, properties and uses of maltose and sucrose.
Polysaccharides – structure, properties and uses of starch and cellulose.

UNIT-IV 6 hours
Vitamins: Classification- water soluble – fat soluble vitamins – Deficiency diseases- RDA – Estimation of vitamin B₁ and vitamin C.

UNIT-V 6 hours
Insulin – the sex hormones.

Self study
TEXT BOOKS:

UNIT I  : Text Book 1
UNIT II : Text Book 1,2,3
UNIT III : Text Book 1,2,3
UNIT IV : Text Book 1,2,3
UNIT V  : Text Book 1,2,3

REFERENCES:
2. J. L. Jain, Biochemistry, Sultan Chand and Co. 1999
SEMESTER-VI: EXTRA CREDIT-IV
CHEMISTRY FOR COMPETITIVE EXAMINATIONS – II

Course Code : 14UCH6EC4      Max. Marks : 100*
Hours/Week : --        Internal Marks : --
Credit : 4*        External Marks : 100*

Objectives:

- To impart the knowledge for the preparation of competitive examination
- To understand the analytical skills concept in chemistry for competitive examination

UNIT-I

Analytical Chemistry: Classification of analytical Methods – classical and instrumental errors and evaluation: Definition of terms in mean and median – Types of errors, propagation of errors, accuracy and precision, least squares analysis, average standard deviation.

UNIT-II


UNIT-III

Spectroscopy:- Rotational spectra of diatomic molecules - Isotopic substitution and retatialional constants - vibrations spectra of linear symmetric, linear asymmetric and bent tri atomic molecules - electronic spectra - selection rules - nuclear magnetic resonance - chemical shifts - spin - spin coupling - election spin resonance and hyperfine splitting theoretical principles of mass spectroscopy. Applications of UV, IR, NMR, ESR and mass spectroscopy for structural elucidation of organic compounds, inorganic complexes and free radicals.

UNIT-IV


UNIT-V

Colloids – general nature of colloidal solutions and their classifications – general methods of preparation and properties of colloids – coagulation protective action and gold number – absorption


TEXT BOOKS:


UNIT I : Text Book 1
UNIT II : Text Book 2
UNIT III : Text Book 3
UNIT IV : Text Book 3
UNIT V : Text Book 3

REFERENCES:

SEMESTER-I : ALLIED -I
INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY - I

Course Code : 14UCH1A1:1      Max. Marks : 50
Hours/Week : 5                   Internal Marks : 20
Credit : 2         External Marks : 30

Objectives:

- To understand the concept of periodic properties and molecular orbital theory.
- To know the chemistry of biomolecules.
- To study the concept of stereochemistry electrochemistry and photochemistry.
- To learn the principles of separation techniques.

Unit – I                               15 hours

1.1 Periodic properties- Ionization potential, electron affinity and electro negativity-variation in the periodic table
1.2 Molecular Orbital Theory: Some important basic concepts of molecular orbital theory - LCAO. Bonding, anti-bonding orbital and bond order – application of MO theory to H₂, He₂, O₂ and F₂ molecules
1.3 Industrial Chemistry:
Soap and detergents – An elementary idea of soap and detergent. Cleansing action of soap and detergents.

Unit – II                               15 hours

2.1 Carbohydrates:
Classification – Glucose and fructose – Preparation and properties – Sucrose – Manufacture and properties – Starch and cellulose – Properties and uses.
2.2 Amino Acids and Proteins:
Amino acids – Classification, preparation and properties. Peptides (Elementary treatment) – Proteins – Classification based on physical properties and biological functions.
2.3 Nucleic acid: DNA and RNA – functions - Structure of DNA and RNA.

Unit – III                               15 hours

3.1 Synthetic polymers – Teflon, Alkyl and Epoxy resins, Polyesters – definitions and uses Types of polymerization – Thermosetting and thermoplastics.
3.2 Heterocyclic compounds – Furan, thiophene, and pyridine – Preparation and properties.
3.3 Stereoisomerism: Optical isomerism – lactic and tartaric acid – Racemic mixture and resolution – Geometrical isomerism – maleic and fumaric acid.
Unit – IV

4.1 Chromatography – principles of column, paper and thin layer chromatography.

4.2 Photochemistry: Photochemical reaction – Lambert’s law, Beer’s law – Absorption, Extinction Coefficient – The law of Photochemical equivalence, Quantum efficiency, #Some of Photochemical and their quantum yield#.

4.3 Phase Rule: Phase, Component, Degree of freedom, Phase Rule – Definition. One component system – Water system.

Unit – V

5.1 Electrochemistry: Specific and equivalent conductance – their determination – Effect of dilution on conductivities – An elementary idea about ionic theory – Ostwald’s Dilution Law, Kohlrausch Law, Conductometric titrations.

5.2 pH and Buffer: Importance of pH and buffers in the living systems, pH determination by colorimetric and electrometric methods.

5.3 Corrosion: Types of corrosion, #Prevention#.

# Self study #

Text books


UNIT I : Text Book 1,2
UNIT II : Text Book 3
UNIT III : Text Book 3
UNIT IV : Text Book 4
UNIT V : Text Book 4

References:

SEMESTER-II: ALLIED -II
INORGANIC, ORGANIC AND PHYSICAL CHEMISTRY – II

Course Code : 14UCH2A2:1 Max. Marks : 50
Hours/Week : 4 Internal Marks : 20
Credit :2 External Marks : 30

Objectives:

- To understand the types of chemical bonding and the importance of coordination compound.
- To have knowledge of types for organic reaction and chemotherapy.
- To study the importance of energetics and colloids.
- To know the concept of chemical equilibrium and catalysis.

Unit – I 12 hours

1.1. Coordination Chemistry:

1.2. Metallic Bond:
Electron gas, Pauling and Band Theories. Semiconductors - Intrinsic, n and p-type.

1.3. Compounds of Sulphur: Peracids of sulphur and sodium thiosulphate#.

Unit – II 12 hours


2.2. Aromaticity – Conditions – Huckel’s rule - aromaticity of benzene.

2.3. Substitution reactions- Nitration, halogenation, sulfonation and alkynation of benzene#.

Unit – III 12 hours

3.1 Halogen containing compounds: Preparation and uses of Dichloromethane, Chloroform, Carbon tetrachloride, DDT, and BHC.

3.2. Chemotherapy: Struture and uses of Sulpha drugs – Sulpha pyridine,
Sulpha thiazole and sulpha diazine –Antibiotics - Struture and uses of penicillin –G and Chloromycetin#.

3.3. Name reactions: Benzoin, Perkin, Cannizaro, Claisen, Haloform, Carbylamine reactions – Biuret reaction.

Unit – IV 12 hours

4.1 Solid State:
Typical crystal lattice – Unit cell. Elements of symmetry. Bragg’s equation, Weiss indices, Miller indices, Simple, Body centered and face centered cubes.
4.2 **Energetics:**
Second Law of thermodynamics - Carnot’s Theorem – Carnot Cycle.

4.3 **Colloids:**

**Unit – V**

5.1 **Chemical Equilibrium:**
Criteria of homogeneous and heterogeneous equilibria.
Decomposition of HI and PCl₅.

5.2 **Chemical Kinetics:**
Order, Rate, Molecularity of the reaction and rate constant, Determination of order of the reaction – Activation energy, Effect of temperature on reaction rate.

5.3 **Catalysis:**

#__________# Self study

**Text books:**

UNIT I : Text Book 1
UNIT II : Text Book 2
UNIT III : Text Book 4
UNIT IV : Text Book 3
UNIT V : Text Book 3

**References:**
SEMESTER-I: ALLIED - I
INORGANIC AND ORGANIC CHEMISTRY
(For B.Sc., Botany/ Zoology)

Course Code : 14UCH1A1:2                   Max. Marks : 50
Hours/Week  : 5                              Internal Marks : 20
Credit      : 2                              External Marks : 30

Objectives:
- To understand the types of chemical bond, hybridization and chemical reactions
- To study about the type of fertilizer and their importance
- To understand theoretical aspects of quantitative and qualitative analysis

UNIT – I 15 hours
Chemical Bonding: Ionic bond, lattice energy. Covalent bond, Polarity of covalent bond. Lewis Concept of orbital overlap. VSEPR theory and geometry of molecules. Valence bond theory and hybridization. BeF$_2$, BF$_3$, CH$_4$, C$_2$H$_4$, and C$_2$H$_2$ (sp, sp$^2$, and sp$^3$ only).

UNIT – II 15 hours
Co-ordination Compounds: Coordination Compounds – Introduction, ligands and coordination number. IUPAC formulation and nomenclature of mono-nuclear coordination compounds – theories of coordination – Werner’s theory. Importance of coordination compounds in qualitative analysis, extraction of metals and biological systems.

UNIT – III 15 hours

UNIT – IV 15 hours
Electron displacement effect: Inductive, electrometric, resonance and hyper conjugation effect – Electrophiles, nucleophiles, carbocations, carbanions and free radical – formation and their stability
Organic reactions: Common type of organic reaction – Substitution, addition, Elimination, Polymerization, Condensation reaction (Elementary idea only).

UNIT – V 15 hours
Qualitative analysis – Detection of nitrogen, sulphur, phosphorus and halogens. Identification and properties of functional groups (aldehyde, ketone, mono and dicarboxylic acid, amine, phenol)

Self study
TEXT BOOKS:

UNIT I : Text Book 1
UNIT II : Text Book 1
UNIT III : Text Book 1
UNIT IV : Text Book 2
UNIT V : Text Book 2,3

Reference:
SEMESTER-II : ALLIED - II
BIO-ORGANIC CHEMISTRY
(For B.Sc., Botany/ Zoology)

Course Code : 14UCH2A2:2  Max. Marks : 50
Hours/Week : 4            Internal Marks : 20
Credit : 2                External Marks : 30

Objectives:
- To understand the types polymers
- To study about the purification technique of Chromatography
- To understand the application of natural product

UNIT – I                                                              12 hours
**Bio Polymers:** Definition, Classifications of polymers, General methods of Polymerization
- Addition and condensation, Bio medical applications of polymers – Polymers used in surgery –
  Polyurethane, Teflon, Polyethylene, Polyvinylchloride (structure and applications only)
**Polymers used in medicine:** Polypeptide antibiotics – Bacitracin - A, Polymyxin – B, Nystatin
  (sources and application), Synthetic polypeptides – Insulin, Oxytocin, Vasopressin (basic concept
  only).

UNIT – II                                                              12 hours
**Industrial organic Compounds:** preparation and uses of – Fermentation, Condition for
fermentation of alcohols – absolute alcohol – acetone – preparation and uses. Vinegar – lactic acid,
citric acid.
**Chemical in Medicine and Health care:** Analgesics, antibiotics, antiseptic, disinfectants,
antihistamines and antacids (structure and uses only)
**Chemical in food:** Preservatives, artificial sweetening agents, #antioxidants and edible colours#.

UNIT – III                                                           12 hours
**Separation and purification technique:** Filtration, crystallization, sublimation, distillation,
differential extraction.
**Chromatography** – Coloum, Thin layer chromatography and #paper chromatography# –
Definition, principle, types and applications.

UNIT – IV                                                              12 hours
**Carbohydrate:** Classification, monosaccharide- structure and simple chemical reactions of
  glucose, Disaccharides : reducing and non-reducing sugars – sucrose, maltose and lactose, structure
  of sucrose (chemical reaction not required),Polysaccharides: #Elementary idea of structures of
  starch and cellulose#.
**Proteins:** amino acids : peptide bond, polypeptides, primary structure of proteins, simple idea of
secondary and tertiary structure of proteins. Denaturation of proteins and enzymes.
UNIT – V  

Nucleic acids: Types of nucleic acids, primary building blocks of nucleic acids (Chemical composition – DNA and RNA) primary structure of DNA and its double helix. Replication, transcription and protein synthesis, Genetic code.

Lipids: Classification, structural, functions in biosystems.

Hormones: Classification, structural features and functions in biosystems.

# Self study

TEXT BOOKS:

UNIT I : Text Book 1,2
UNIT II : Text Book 4
UNIT III : Text Book 2,3
UNIT IV : Text Book 4
UNIT V : Text Book 4

REFERENCES:
Objectives:

- To know the basic principles of volumetric analysis
- To understand the concepts of indicators and equivalent weight

Titrmetric Quantitative Analysis

1. Estimation of HCl by NaOH using a standard oxalic acid solution.
2. Estimation of Na₂CO₃ by HCl using a standard Na₂CO₃ solution.
3. Estimation of oxalic acid by KMnO₄ using a standard oxalic acid solution.
4. Estimation of Iron(II)sulphate by KMnO₄ using a standard Mohr’s salt solution.
5. Estimation of Fe(III) by K₂Cr₂O₇ using a standard Mohr’s salt solution (internal and external indicators).
6. Estimation of copper(II) sulphate by Na₂S₂O₄.
7. Estimation of Mg(II) by EDTA.
8. Estimation of Ca(II) by EDTA.

Scheme of valuation

Procedure writing - 10 marks

Results

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2%</td>
<td>50</td>
</tr>
<tr>
<td>2-3%</td>
<td>40</td>
</tr>
<tr>
<td>3-4%</td>
<td>30</td>
</tr>
<tr>
<td>&gt;4%</td>
<td>20</td>
</tr>
</tbody>
</table>

Reference:

Objectives:

- To compare the experimental and standard values of certain commercial substances
- To check the purity of some samples.

1. Estimation of total hardness of water using EDTA
2. Determination of iodine value of an oil by Hanus method.
3. Determination of saponification value of an oil
4. Estimation of ascorbic acid (Vitamin – C)
5. Determination of percentage purity of washing soda
6. Estimation of available chlorine in bleaching powder
7. Determination of percentage of calcium in lime stone
8. Determination of acid value of an edible oil

Scheme of valuation

Procedure writing - 10 marks

Results

<table>
<thead>
<tr>
<th>Range</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-2%</td>
<td>50 marks</td>
</tr>
<tr>
<td>2-3%</td>
<td>40 marks</td>
</tr>
<tr>
<td>3-4%</td>
<td>30 marks</td>
</tr>
<tr>
<td>&gt;4%</td>
<td>20 marks</td>
</tr>
</tbody>
</table>

Reference:


* * * * *
Objectives:

- To develop self employment skills
- To become entrepreneur

1. Preparation of detergent washing powder
2. Preparation of utensils cleaning powder
3. Preparation of normal shampoo
4. Preparation of poly vinyl alcohol adhesive
5. Preparation of room freshener
6. Preparation of liquid blue
7. Preparation of pain relieving balm
8. Preparation of jasmine perfume liquid
9. Preparation of tooth powder
10. Preparation of face powder
11. Preparation of white phenol
12. Preparation of automobile decarboniser
13. Preparation of tooth paste
14. Preparation of talcum powder

Scheme of valuation

Procedure writing - 10 marks

Results - 50 marks

Reference:


* * * * *
Objective:
- To understand the basic concepts of qualitative analysis
- To study the applications of solubility product, common ion effect in group separation
- To distinguish interfering and non-interfering radicals

Semi micro Inorganic Qualitative analysis

Analysis of a mixture containing **two cations** and **two anions** of which one will be an **interfering ion**. Semi micro methods using the conventional scheme with hydrogen sulphide may be adopted.

**Cations to be analysed:** lead, copper, bismuth, cadmium, tin, iron, zinc, manganese, cobalt, nickel, barium, calcium, strontium, magnesium and ammonium.

**Anions to be analysed:** carbonate, sulphide, sulphate, nitrate, chloride, bromide, **fluoride, borate, oxalate** and phosphate.

**Scheme of valuation**

Procedure: 10 marks

4 radicals correct with suitable tests: 50 marks
3 radicals correct with suitable tests: 40 marks
2 radicals correct with suitable tests: 30 marks
1 radical correct with suitable tests: 15 marks

Spotting: 5 marks

Reference:

Objectives:

- To learn the complex preparation
- To study the reagent for separation of metal ions
- To know the stoichiometry of the complexes
- To study physical constants of solids and liquid organic compounds

Gravimetric Estimation:

**Sintered Crucible**

1. Ni as nickel dimethyl glyoxime
2. Zn as zinc oxinate.
3. Pb as lead chromate.
4. Ba as barium chromate.
5. Ca as calcium oxalate monohydrate (110°C temperature should be maintained)

**Silica Crucible**

1. Ca as calcium sulphate.
2. Pb as lead sulphate.
3. SO₄ as barium sulphate

Determination of physical constants

Determination of boiling / melting point by semi micro method.

Melting Points:


Boiling Points:


Scheme of valuation

Procedure writing : 10 marks

Gravimetric estimation: 40 Marks;  Physical constant: 10 marks

Results

<table>
<thead>
<tr>
<th>Range</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1%</td>
<td>40</td>
</tr>
<tr>
<td>1-2%</td>
<td>30</td>
</tr>
<tr>
<td>2-3%</td>
<td>20</td>
</tr>
<tr>
<td>3-4%</td>
<td>10</td>
</tr>
</tbody>
</table>

Reference:


* * * * *
SEMESTER- V: MAJOR BASED ELECTIVE - IV

PHYSICAL CHEMISTRY ELECTRICAL - PRACTICAL

Course Code : 14UCH5M4P       Max. Marks : 100
Hours/Week : 3                   Internal Marks : 40
Credit : 3                        External Marks : 60

Objectives:

- To understand the conductometric and potentiometric principles
- To know different types of chemical reaction
- To study electrode potential of single electrodes, EMF

1. Determination of equivalent conductance of a strong electrolyte.
2. Determination of strength of strong acid (HCl) by conductometry using NaOH.
3. Determination of strength of a weak base by conductometry.
4. Determination of strength of K₂SO₄ by conductometry.
5. Determination of strength of a strong acid by potentiometry.
6. Determination of strength of weak acid by potentiometry.
8. Determination of strength of Fe(II) ion by potentiometry.

Scheme of valuation

Procedure with formula : 10
Practical : 50

<1% - 50 marks
1-2% - 40 marks
2-3% - 30 marks
3-4% - 20 marks
>4% - 10 marks

Reference:


*****
Objectives:

- To learn the techniques of organic qualitative analysis
- To learn the methods of organic preparations
- To study physical constants of organic compounds

Organic Qualitative Analysis and Organic Preparation:

Organic Analysis

Analysis of Simple Organic compounds

(a) characterization of functional groups

(b) confirmation by preparation of solid derivatives / characteristic colour reactions.

Note: Mono-functional compounds are given for analysis. In case of bi-functional compounds, students are required to report any one of the functional groups.

Organic Preparation

Preparation of organic compounds involving the following chemical conversions

1. Oxidation (Benzoic acid from benzaldehyde)
2. Hydrolysis (Benzoic acid from ethyl benzoate)
3. Nitration (m-Dinitrobenzene from nitrobenzene)
4. Bromination (p-Bromoacetaldehyde from acetaldehyde, Tri-bromoaniline from aniline)
5. Diazotization (Methylorange from aniline)

Scheme of valuation

<table>
<thead>
<tr>
<th>Category</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Procedure</td>
<td>10</td>
</tr>
<tr>
<td>Organic analysis</td>
<td>40</td>
</tr>
<tr>
<td>Organic preparation</td>
<td>10</td>
</tr>
<tr>
<td>Special elements present/absent</td>
<td>5 marks</td>
</tr>
<tr>
<td>Aromatic/aliphatic</td>
<td>5 marks</td>
</tr>
<tr>
<td>Saturated/unsaturated</td>
<td>5 marks</td>
</tr>
<tr>
<td>Functional group present</td>
<td>15 marks</td>
</tr>
<tr>
<td>Derivative</td>
<td>10 marks</td>
</tr>
</tbody>
</table>

Reference:

Objectives:

- To study colligative properties of organic compounds
- To understand the concept of chemical equilibrium
- To study phase rule and its applications

List of Experiments:

2. Effect of impurity (NaCl) on Critical solution Temperature of Phenol –Water system.
3. Determination of Transition Temperature of a salt hydrate.
4. Determination of molecular weight by Rast’s macro method.
5. Determination of Kf by Rast’s macro method.
6. Phase diagram(Simple eutectic system)
7. Determination of rate constant of acid catalyst hydrolysis of an ester
8. Determination of Partition co-efficient of iodine between water and carbon tetrachloride

Scheme of valuation

Procedure with formula: 10 Marks

Practicals: 50 Marks

<table>
<thead>
<tr>
<th>Percentage</th>
<th>Marks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 10%</td>
<td>50</td>
</tr>
<tr>
<td>10-15%</td>
<td>35</td>
</tr>
<tr>
<td>15-20%</td>
<td>25</td>
</tr>
<tr>
<td>&gt;20%</td>
<td>15</td>
</tr>
</tbody>
</table>

Reference:


SEMESTER- I: ALLIED–I
ALLIED CHEMISTRY PRACTICAL - I
VOLUMETRIC ANALYSIS

Course Code : 14UCH1A1P       Max. Marks : 50
Hours/Week : 3        Internal Marks : 20
Credit : 2        External Marks : 30

Objectives:

❖ To know the basic principles of volumetric analysis
❖ To understand the concepts of indicators and equivalent weight

1. Estimation of Sodium Hydroxide
   \((\text{Na}_2\text{CO}_3 \times \text{HCl} \times \text{NaOH})\)

2. Estimation of Hydrochloric Acid
   \((\text{H}_2\text{C}_2\text{O}_4 \times \text{NaOH} \times \text{HCl})\)

3. Estimation of Oxalic Acid
   \((\text{FeSO}_4 \times \text{KMnO}_4 \times \text{H}_2\text{C}_2\text{O}_4)\)

4. Estimation of Ferrous Sulphate
   \((\text{H}_2\text{C}_2\text{O}_4 \times \text{KMnO}_4 \times \text{FeSO}_4)\)

5. Estimation of KMnO₄
   \((\text{K}_2\text{Cr}_2\text{O}_7 \times \text{FAS} \times \text{KMnO}_4)\)

6. Estimation of Zn by EDTA
   \((\text{MgSO}_4 \times \text{EDTA} \times \text{ZnSO}_4)\)

7. Estimation of Mg by EDTA

8. Estimation of Cu by iodometry
   \((\text{K}_2\text{Cr}_2\text{O}_7 \times \text{thio} \times \text{CuSO}_4)\)

9. Estimation of Iodine
   \((\text{K}_2\text{Cr}_2\text{O}_7 \times \text{thio} \times \text{I}_2)\)

Reference:


*****
Objectives:

- To learn the techniques of organic qualitative analysis
- To learn the Nitrogen containing compounds.

A study of reactions of the following organic compounds:

1. Carbohydrate
2. Amide
3. Aldehyde
4. Ketone
5. Monocarboxylic acid
6. Dicarboxylic acid
7. Amine
8. Monohydric phenol
9. Ester
10. Nitro

The students may be trained to perform the specific reactions like test for element (Nitrogen only), aliphatic or aromatic, saturated or unsaturated and functional group present and record their observation.

Reference: