

SHAHID MATANGINI HAZRA GOVT. COLLEGE FOR WOMEN

Teaching Assignment and Lesson Plan

Academic Session: 2022-23 (Odd Semester)

Department: Chemistry

1st Semester (Hons)

| Name of the Teacher | Title of the Teaching Assignment | Dividing the Assignment into Number of Units along with detailed lesson plan as per the University Syllabus | | Date of Commencement of the Assignment | Number of classes required to complete each unit | Total number of classes required to complete the assignment |
|-----------------------------------|--|--|---|--|--|---|
| Mitali Dewan, Rathin Jana | (C1T) Organic Chemistry | Bonding and Physical properties | Valence Bond Theory, Electronic Displacements | 19 th Sept,2022 | 08 | 48 |
| Sayanwita Panja | | Stereochemistry | Bonding geometries of carbon compounds and representation of molecules, Concept of chirality and symmetry | | 12 | |
| Mitali Dewan, Rathin Jana | | Bonding and Physical properties | MO Theory, Physical properties | | 08 | |
| Rathin Jana | | General Treatment of Reaction Mechanism | Mechanistic classification, Relative intermediates | | 12 | |
| Sayanwita Panja | | Stereochemistry | Relative and absolute configuration, E/Z isomerisms, Optical activity | | 08 | |
| Mitali Dewan, Sayanwita Panja, | C1P | 1. Separation, based upon solubility, by using common laboratory reagents like water (cold, hot), dil. HCl, dil. NaOH, dil. NaHCO ₃ , etc., of components of a binary solid mixture; purification of any one of the Separated components by crystallization and determination of its melting point. The composition of the mixture may be of the following types: Benzoic acid/ <i>p</i> -Toluidine; <i>p</i> -Nitrobenzoic acid/ <i>p</i> -Aminobenzoic acid; <i>p</i> -Nitrotolune/ <i>p</i> -Anisidine; etc. 2. Determination of boiling point of common organic liquid compounds e.g., ethanol, cyclohexane, | | 19 th Sept,2022 | 45 | 45 |

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| | | chloroform, ethyl methyl ketone, cyclohexanone, acetylacetone, anisole, crotonaldehyde, mesityl oxide, <i>etc.</i> [Boiling point of the chosen organic compounds should preferably be less than 160 °C] 3. Identification of a Pure Organic Compound <i>Solid compounds:</i> oxalic acid, tartaric acid, citric acid, succinic acid, resorcinol, urea, glucose, cane sugar, benzoic acid and salicylic acid <i>Liquid Compounds:</i> formic acid, acetic acid, methyl alcohol, ethyl alcohol, acetone, aniline, dimethylaniline, benzaldehyde, chloroform and nitrobenzene | | | | |
| Rathin Jana | (C2T) Physical Chemistry | Kinetic Theory and Gaseous state | Kinetic Theory of gases Maxwell's distribution of speed and energy: Real gas and virial equation | 19 th Sept,2022 | 16 | 45 |
| Sachinath Bera | | Chemical Thermodynamics | Zeroth and 1st law of Thermodynamics and Second Law | | 18 | |
| Basudev Mandal | | | Thermochemistry | | 03 | |
| | | Chemical Kinetics | | | 08 | |
| Sachinath Bera, Basudev Mandal | | 1: Determination of pH of unknown solution (buffer), by color matching method 2: Determination of heat of neutralization of a strong acid by a strong base 3: Study of kinetics of acid-catalyzed hydrolysis of methyl acetate 4: Study of kinetics of decomposition of H ₂ O ₂ 5: Determination of heat of solution of oxalic acid from solubility measurement | | | 30 | 30 |

1st SEM (Generic Elective)

| Name of the Teacher | Title of the Teaching Assignment | | Dividing the Assignment into Number of Units along with detailed lesson plan as per the University Syllabus | | Date of Commencement of the Assignment | Number of classes required to complete each unit | Total number of classes required to complete the assignment |
|---------------------|----------------------------------|--------------------------------------|--|----|--|--|---|
| Sachinath Bera | GE1 T | Section A: Inorganic Chemistry | Atomic Structure | | 19 th Sept,2022 | 08 | 23 |
| | | | Chemical Periodicity | | | 05 | |
| Acids and Bases | | | | 06 | | | |
| Redox Reactions | | | | 04 | | | |
| Basudev Mandal | | Organic Chemistry | Fundamentals of Organic Chemistry | | | 03 | 21 |
| | | | Stereochemistry | | | 06 | |
| | | | Nucleophilic Substitution and Elimination Reactions | | | 04 | |
| | Aliphatic Hydrocarbons | | Alkanes, alkenes, alkynes | | | 06 | |
| | | | Reactions | | | 02 | |
| Mitali Dewan | GE1P | Section A: Inorganic Chemistry | 1. Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture. 2. Estimation of oxalic acid by titrating it with KMnO ₄ . 3. Estimation of water of crystallization in Mohr's salt by titrating with KMnO ₄ . 4. Estimation of Fe (II) ions by titrating it with K ₂ Cr ₂ O ₇ using internal indicator. 5. Estimation of Cu (II) ions iodometrically using Na ₂ S ₂ O ₃ . | | 19 th Sept,2022 | 30 | 30 |
| Sachinath Bera | | | | | | | |

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| Mitali Dewan | | Section B: Organic Chemistry | <p>Qualitative Analysis of Single Solid Organic Compound(s)</p> <p>Experiment A: Detection of special elements (N, Cl, and S) in organic compounds.</p> <p>Experiment B: Solubility and Classification (solvents: H₂O, dil. HCl, dil. NaOH)</p> <p>Experiment C: Detection of functional groups: Aromatic-NO₂, Aromatic -NH₂, -COOH, carbonyl (no distinction of -CHO and >C=O needed), -OH (phenolic) in solid organic compounds.</p> | | 24 | 24 |
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1st Semester (Gen)

| Name of the Teacher | Title of the Teaching Assignment | | Dividing the Assignment into Number of Units along with detailed lesson plan as per the University Syllabus | | Date of Commencement of the Assignment | Number of classes required to complete each unit | Total number of classes required to complete the assignment |
|---------------------|----------------------------------|--------------------------------|---|-----------------------------------|--|--|---|
| Sachinath Bera | CIT (DSC-1A) | Section A: Inorganic Chemistry | Atomic Structure | | 19 th Sept,2022 | 06 | 22 |
| Basudev Mandal | | | Chemical Bonding and Molecular Structure | MO Approach | | 04 | |
| | | | | Ionic Bonding Covalent bonding | | 12 | |
| Mitali Dewan | | Section B: Organic Chemistry | Fundamentals of Organic Chemistry | | | 03 | 15 |
| | | | Stereochemistry | | | 06 | |
| | | | Alkanes, alkenes, alkynes | | | 06 | |
| Basudev Mandal | DSC-1AP | Section A: Inorganic Chemistry | 1. Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture. 2. Estimation of oxalic acid by titrating with KMnO ₄ . 3. Estimation of water of crystallization in Mohr's salt by titrating with KMnO ₄ . 4. Estimation of Fe (II) ions by titrating it with K ₂ Cr ₂ O ₇ using internal indicator. 5. Estimation of Cu (II) ions iodometrically using Na ₂ S ₂ O ₃ . | | 19 th Sept,2022 | 30 | 30 |
| Mitali Dewan | | Section B: Organic Chemistry | 1. Detection of extra elements (N, S, Cl, Br, I) in organic compounds 2. Separation of mixtures by Chromatography: Measure the R _f value in each case (combination of two compounds) (a) Identify and Separate the components of a given mixture of 2 amino acids (glycine, aspartic acid, glutamic acid, tyrosine) by paper chromatography (b) Identify and Separate the sugars present in the given mixture by paper chromatography. | | | 30 | 30 |

3rd Semester (Hons)

| Name of the Teacher | Title of the Teaching Assignment | Dividing the Assignment into Number of Units along with detailed lesson plan as per the University Syllabus | | Date of Commencement of the Assignment | Number of classes required to complete each unit | Total number of classes required to complete the assignment |
|-----------------------------------|----------------------------------|--|--|--|--|---|
| Rathin Jana | (C5T) Physical Chemistry | Transport process | | 9 th Sept,2022 | 12 | 45 |
| Mitali Dewan | | Application of Thermodynamics-I | Partial properties and Chemical potential, Chemical potential and other properties of ideal substances- pure and mixtures | | 10 | |
| Sayanwita Panja | | | Chemical Equilibrium | | 08 | |
| Basudev Mandal | | Foundation of quantum mechanics | | | 15 | |
| Mitali Dewan, Rathin Jana | C5P | 1: Study of viscosity of unknown liquid (glycerol, sugar) with respect to water 2: Determination of partition coefficient for the distribution of I ₂ between water and CCl ₄ 3: Determination of K _{eq} for KI + I ₂ = KI ₃ , using partition coefficient between water and CCl ₄ 4: Conductometric titration of an acid (strong, weak/monobasic, dibasic) against base strong 5: Study of saponification reaction conductometrically 6: Verification of Ostwald's dilution law and determination of K _a of weak acid | | 9 th Sept,2022 | 36 | 36 |
| Basudev Mandal | (C6T) Inorganic Chemistry | Chemical Bonding-I | | 9 th Sept,2022 | 20 | 46 |
| Sachinath Bera | | Chemical Bonding-II | | | 20 | |
| | | Radioactivity | | | 06 | |
| Basudev Mandal, Sachinath Bera | C6P | Iodo-/ Iodimetric Titrations 1. Estimation of Cu(II) | | 9 th Sept,2022 | 36 | 36 |

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| | | 2. Estimation of Vitamin C 3. Estimation of available chlorine in bleaching powder. Estimation of metal content in samples 1. Estimation of Cu in brass. 2. Estimation of Cr and Mn in Steel. 3. Estimation of Fe in cement | | | | |
| Sayanwita Panja | (C7T) Organic Chemistry | Chemistry of alkenes and alkynes | Addition to alkenes and alkynes | 9 th Sept,2022 | 10 | 42 |
| Sayanwita Panja | | Organometallics | Grignard Reagents | | 04 | |
| Rathin Jana | | Aromatic Substitution | Electrophilic and nucleophilic substitution | | 08 | |
| Mitali Dewan | | Carbonyl and Related compound | | | 20 | |
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| Rathin Jana, Mitali Dewan | C7P | Qualitative Analysis of Single Solid Organic Compounds a) Detection of special elements (N, S, Cl, Br) by Lassaigne's test b) Solubility and classification (solvents: H ₂ O, 5% HCl, 5% NaOH and 5% NaHCO ₃) c) Detection of the following functional groups by systematic chemical tests: aromatic amino (-NH ₂), aromatic nitro (-NO ₂), amido (-CONH ₂ , including imide), phenolic -OH, carboxylic acid (-COOH), carbonyl (-CHO and >C=O). d) Melting point of the given compound e) Preparation, purification and melting point determination of a crystalline derivative of the given compound f) Identification of the compound through literature survey. | | 9 th Sept,2022 | 45 | 45 |
| Sachinath Bera | Skill Enhancement Course | Analytical Clinical Biochemistry | Carbohydrates, Proteins, Enzymes, Lipids, hormones, DNA & RNA, Biochemistry of disease | 9 th Sept,2022 | 30 | 30 |

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| | SEC 1T | | | | |
| Sachinath Bera | SEC 1P | Identification and estimation of the following: 1. Carbohydrates – qualitative and quantitative. 2. Lipids – qualitative. 3. Determination of the iodine number of oil. 4. Determination of the saponification number of oil. 5. Proteins – qualitative. 6. Determination of protein by the Biuret reaction. | 9 th Sept,2022 | 24 | 24 |

3rd Semester (General Elective)

| Name of the Teacher | Title of the Teaching Assignment | | Dividing the Assignment into Number of Units along with detailed lesson plan as per the University Syllabus | Date of Commencement of the Assignment | Number of classes required to complete each unit | Total number of classes required to complete the assignment | |
|---------------------|----------------------------------|-------------------------------|---|--|--|---|----|
| Sayanwita Panja | GE T3 | Section A: Physical Chemistry | Chemical Energetics | 1 st Oct,2022 | 12 | 22 | |
| | | | Chemical Equilibrium | | 05 | | |
| | | | Ionic Equilibrium | | 05 | | |
| Sayanwita Panja | | GE T3 | Section-B: Organic Chemistry | Aromatic Hydrocarbon | | 04 | 24 |
| | | | | Organometallic Compounds | | 02 | |
| | | | | Aryl Halides | | 03 | |
| | Alcohols, phenol, ether | | | 08 | | | |
| Sayanwita Panja | GE3P | | Section A: Physical Chemistry | 1.Determination of enthalpy of neutralization of hydrochloric acid with sodium Hydroxide 2. Measurement of pH of different solutions like aerated drinks, fruit juices, shampoos and soaps using pH-meter and compare it with the indicator method 3. Preparation of buffer solutions and find the pH of an unknown buffer solution by colour matching method (i) Sodium acetate-acetic acid (ii) NH ₄ Cl-NH ₄ OH c) Study of solubility of benzoic acid in water | | 30 | 30 |
| | | | | Section B: Organic Chemistry | | Identification of a pure organic compound <i>Solid compounds:</i> oxalic acid, tartaric acid, succinic acid, resorcinol, urea, glucose, benzoic acid and salicylic acid. <i>Liquid Compounds:</i> methyl alcohol, ethyl alcohol, acetone, aniline, dimethylaniline, benzaldehyde, chloroform and nitrobenzene | |

3rd Semester (DSC)

| Name of the Teacher | Title of the Teaching Assignment | | Dividing the Assignment into Number of Units along with detailed lesson plan as per the University Syllabus | | Date of Commencement of the Assignment | Number of classes required to complete each unit | Total number of classes required to complete the assignment |
|-------------------------------|----------------------------------|-------------------------------------|---|--|--|--|---|
| Basudev Mandal | Core-7- (DSC-1C) | Section A: Physical Chemistry | Solutions | | 1 st Oct,2022 | 06 | 22 |
| | | | Phase Equilibrium | | | 04 | |
| | | | Conductance | | | 04 | |
| | | | Electrochemistry | | | 08 | |
| Rathin Jana | | Organic Chemistry | Carboxylic acids and their derivatives | | | 06 | 24 |
| | | | Amines and Diazonium Salts | | | 05 | |
| | | | Amino Acids, Peptides and Proteins | | | 08 | |
| | | | Carbohydrates | | | 05 | |
| Basudev Mandal Rathin Jana | DSC-1CP | Section A: Physical Chemistry | 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. Conductance I. Determination of cell constant II. Determination of equivalent conductance, degree of dissociation and dissociation constant of a weak acid. III. conductometric titrations: i. Strong acid vs. strong base ii. Weak acid vs. strong base Potentiometric titrations: | | | 45 | 45 |

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| | | | <p>i. Strong acid vs. strong base ii. Weak acid vs. strong base iii. Potassium dichromate vs. Mohr's salt</p> | | | |
| Rathin Jana | | Section B: Organic Chemistry | <p>I. Systematic Qualitative Organic Analysis of Organic Compounds possessing monofunctional groups (-COOH, phenolic, aldehydic, ketonic, amide, nitro, amines) and preparation of one derivative. II) 1. Separation of amino acids by paper chromatography 2. Determination of the concentration of glycine solution by formylation method. 3. Titration curve of glycine 4. Differentiation between a reducing and a nonreducing sugar.</p> | | 30 | 30 |
| Rathin Jana | Skill Enhancement Course SEC 1T | Basic Analytical Chemistry | <p>Introduction, Analysis of soil, Analysis of water, Analysis of food products, Chromatography, Ion-exchange, Analysis of cosmetics</p> | | 24 | 24 |
| Basudev Mandal Sachinath Bera | SEC 1P | | <p>1. Determination of pH of soil samples. 2. Estimation of Calcium and Magnesium ions as Calcium carbonate by complexometric titration. 3. Determination of pH, acidity and alkalinity of a water sample. 4. Determination of dissolved oxygen (DO) of a water sample. 5. Paper chromatographic Separation of mixture of metal ion (Fe^{3+} and Al^{3+}). 6. Determination of ion exchange capacity of anion/cation exchange resin (using batch procedure if use of column is not feasible).</p> | | 36 | 36 |

5th Semester (Hons)

| Name of the Teacher | Title of the Teaching Assignment | Dividing the Assignment into Number of Units along with detailed lesson plan as per the University Syllabus | | Date of Commencement of the Assignment | Number of classes required to complete each unit | Total number of classes required |
|-----------------------------------|----------------------------------|---|--|--|--|----------------------------------|
| Basudev Mandal | (C11T) Inorganic chemistry | Coordination chemistry-II | | 16 th August,2022 | 24 | 54 |
| Sachinath Bera | | Chemistry of d- and f- block elements | | | 30 | |
| Sachinath Bera, Basudev Mandal | C11P | Chromatography of metal ions Paper chromatographic Separation of following metal ions: 1. Ni (II) and Co (II) 2. Fe (III) and Al (III) Gravimetry 1. Estimation of Ni(II) using Dimethylglyoxime (DMG). 2. Estimation of copper as CuSCN. 3. Estimation of Al(III) by precipitating with oxine and weighing as Al(oxine) ₃ (aluminium oxinate). 4. Estimation of chloride. Spectrophotometry 1. Measurement of 10Dq by spectrophotometric method. 2. Determination of λ_{\max} of [Mn(acac) ₃] and [Fe(acac) ₃]. | | | 48 | 48 |
| Sayanwita Panja, Rathin Jana | (C12T) Organic Chemistry | Carbocycles and Heterocycles | | 16 th August,2022 | 08 | 45 |
| Mitali Dewan | | Cyclic Stereochemistry | | | 14 | |
| Sayanwita Panja | | Pericyclic reactions | | | 10 | |
| Mitali Dewan | | Carbohydrates | | | 08 | |
| Rathin Jana | | Biomolecules | | | 05 | |
| Sayanwita Panja, Rathin Jana | C12P | A. Chromatographic Separations 1. TLC Separation of a mixture containing 2/3 amino acids 2. TLC Separation of a mixture of dyes (fluorescein and methylene blue) 3. Column chromatographic Separation of mixture of dyes 4. Paper chromatographic Separation of a mixture containing 2/3 | | | 60 | 60 |

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| | | <p>amino acids</p> <p>5. Paper chromatographic Separation of a mixture containing 2/3 sugars</p> <p>B. Spectroscopic Analysis of Organic Compounds</p> <p>1. Assignment of labelled peaks in the ^1H NMR spectra of the known organic compounds explaining the relative δ-values and splitting pattern.</p> <p>2. Assignment of labelled peaks in the IR spectrum of the same compound explaining the relative frequencies of the absorptions (C-H, O-H, N-H, C-O, C-N, C-X, C=C, C=O, N=O, $\text{C}\equiv\text{C}$, $\text{C}\equiv\text{N}$ stretching frequencies; including bending vibrations.</p> <p>3. The students must record full spectral analysis of compounds (i) 4-Bromoacetanilide (ii) 2-Bromo-4'-methylacetophenone (iii) Vanillin (iv) 2'-Methoxyacetophenone (v) 4-Aminobenzoic acid (vi) Salicylamide (vii) 2'-Hydroxyacetophenone (viii) 1,3-Dinitrobenzene (ix) <i>trans</i>-Cinnamic acid (x) <i>trans</i>-4-Nitrocinnamaldehyde (xi) Diethyl fumarate (xii) 4-Nitrobenzaldehyde (xiii) 4'-Methylacetanilide (xiv) 2-Hydroxybenzaldehyde (xv) 4-Nitroaniline</p> | | | |
| Sayanwita Panja | DSE -1: Advanced Physical Chemistry | Crystal Structure | | 18 | 45 |
| Sachinath Bera | | Statistical Thermodynamics | | 12 | |
| Mitali Dewan | | Special selected topics | | 15 | |
| Mitali Dewan, Sachinath Bera | DSE1P | <p>Computer programs based on numerical methods for 1: Roots of equations: (e.g. volume of van der Waals gas and comparison with ideal gas, pH of a weak acid)</p> <p>2: Numerical differentiation (e.g., change in pressure for small change in volume of a van der Waals gas, potentiometric titrations)</p> <p>3: Numerical integration (e.g. entropy/ enthalpy change from heat capacity data), probability distributions (gas kinetic theory) and mean values</p> <p>4: Matrix operations (Application of Gauss-Siedel method in colourimetry)</p> | | 60 | 60 |

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| | | 5: Simple exercises using molecular visualization software | | | | |
| Sachinath Bera | DSE-2: Analytical Methods in Chemistry | Qualitative and quantitative aspects of analysis | | 16 th August,2022 | 06 | 50 |
| | | UV-Visible Spectrometry | | | 02 | |
| | | Atomic Absorption and Emission Spectrometry | | | 05 | |
| | | Thermal methods of analysis | | | 02 | |
| | | Electro-analytical methods | | | 08 | |
| Basudev Mandal | | Infrared Spectrometry | | | 03 | |
| Sayanwita Panja | | Separation techniques | Solvent extraction Chromatography Stereoisomeric Separation and analysis | | 25 | |
| Basudev Mandal, Rathin Jana | DSE2P | I. Separation Techniques Chromatography: (a) Separation and identification of the monosaccharides present in the given mixture (glucose & fructose) by paper chromatography. Reporting the R _f values. (b) Separate a mixture of Sudan yellow and Sudan Red by TLC technique and identify them on the basis of their R _f values. II. Solvent Extractions: To Separate a mixture of Ni ²⁺ & Fe ²⁺ by complexation with DMG and extracting the Ni ²⁺ -DMG complex in chloroform, and determine its concentration by spectrophotometry. Analysis of soil: (i) Determination of pH of soil. (ii) Estimation of calcium, magnesium, phosphate Ion exchange: Determination of exchange capacity of cation exchange resins and anion exchange resins. III. Spectrophotometry 1. Determination of pK _a values of indicator using spectrophotometry. 2. Determination of chemical oxygen demand (COD). 3. Determination of Biological oxygen demand (BOD). | | | 36 | 36 |

5th Semester (DSE)

| Name of the Teacher | Title of the Teaching Assignment | | Dividing the Assignment into Number of Units along with detailed lesson plan as per the University Syllabus | Date of Commencement of the Assignment | Number of classes required to complete each unit | Total number of classes required to complete the assignment |
|--------------------------------|----------------------------------|-----------------------------------|--|--|--|---|
| Mitali Dewan | DSE 1A/2A/3A | Polymer Chemistry | Introduction and history of polymeric materials, Functionality and its importance, Kinetics of Polymerization, Crystallization and crystallinity, Nature and structure of polymers, Determination of molecular weight of polymers, Glass transition temperature (T _g) and determination of T _g , Polymer Solution, Properties of Polymer | 16 th August,2022 | 45 | 45 |
| Mitali Dewan Sachinath Bera | DSE1AP | | <ol style="list-style-type: none"> 1. Free radical solution polymerization of styrene (St) / Methyl Methacrylate (MMA) / Methyl Acrylate (MA) / Acrylic acid (AA). 2. Preparation of nylon 66/6 3.Redox polymerization of acrylamide 4. Precipitation polymerization of acrylonitrile 5. Preparation of urea-formaldehyde resin 6. Preparations of novalac resin/ resold resin. 7. IR studies of polymers | | 42 | 42 |
| Sayanwita Panja | Skill Enhancement Course SEC 3T | Chemistry of Cosmetics & Perfumes | A general study including preparation and uses of the following: Hair dye, hair spray, shampoo, suntan lotions, face powder, lipsticks, talcum powder, nail enamel, creams (cold, vanishing and shaving creams), antiperspirants and artificial flavours. Essential oils and their importance in cosmetic industries with reference to Eugenol, Geraniol, sandalwood oil, eucalyptus, rose oil, 2- phenyl ethyl alcohol, | 16 th August,2022 | 30 | 30 |

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| | | | Jasmone, Civetone, Muscone. | | | |
| Sayanwita Panja | SEC 3P | | <ol style="list-style-type: none"> 1. Preparation of talcum powder. 2. Preparation of shampoo. 3. Preparation of enamels. 4. Preparation of hair remover. 5. Preparation of face cream. 6. Preparation of nail polish and nail polish remover. | | 30 | 30 |