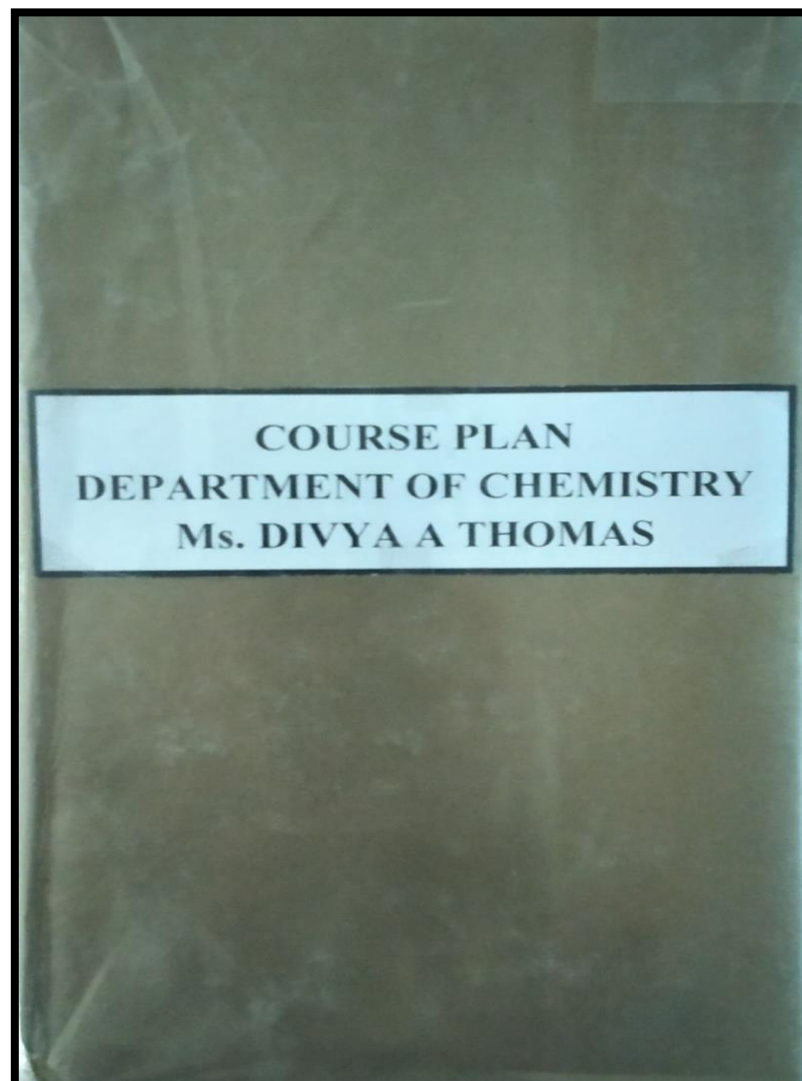




SOPHIA GIRLS' COLLEGE(AUTONOMOUS), AJMER



COURSE_PLAN_2020-21_MS_DIVYA_THOMAS



COURSE PLAN
U.G. & P.G. Programs
2020-21
ODD SEMESTER



SOPHIA GIRLS' COLLEGE, (AUTONOMOUS) AJMER
B. Sc. I (SEMESTER I)

INORGANIC CHEMISTRY (PAPER I) (CHE-101)

Max. Marks: 75 (50 Ext; 25 Int)

Min. Marks: 30(20 Ext; 10 Int)

Credit: 03

COURSE PLAN

SEM I Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
SEM I DEC - FEB	UNIT III Nuclear Chemistry Introduction, fundamental particles of nucleus, concept of nuclides and its representation, types of nuclides- isotopes, isobars, isotones and nuclear isomers, stability of nucleus (n/p ratio).	Nuclear Reactions, Isotopes, Isobars, Isotones	Animated Videos, PPT	Discuss the concept of nuclear chemistry and radioactivity	<u>Knowledge Based</u> -Define Meson. -What is n/p ratio. <u>Understanding Based</u> -Explain the stability of nucleus. -Explain Mass Defect and binding energy	Knowledge--60 Understanding-30 Higher Order-10
	Radiochemistry Introduction to radioactivity, Natural and Artificial radioactivity, Radioactive Disintegration, disintegration series, Radioactive Displacement Law, rate of radioactive decay, Half-life and Average life,	Half Life, Radioactivity, Age of wood	E -content, PPT, Animated videos		<u>Higher Order Thinking Skills Based</u> -Elaborate the packing fraction. -Elaborate various type of Nucleoids.	



	applications of radioactivity, binding energy and its calculation, mass defect and its calculation, Nuclear reactions: Bethe's Notation for nuclear reactions, Spallation, Nuclear fission and Nuclear fusion					
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B. Sc. I (SEMESTER I)

ORGANIC CHEMISTRY (PAPER II) (CHE-102)

SEM I Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
SEM I DEC - FEB	Alkenes Methods of preparation, mechanism of dehydration of alcohols and dehydrohalogenation of alkyl halides, regioselectivity in alcohol dehydration- Saytzeff rule, Hoffmann elimination, physical properties and relative stabilities of alkenes. Chemical reactions of alkenes-mechanisms involved in hydrogenation, electrophilic and free radical additions, halogenation, hydrohalogenation, Markownikoff's rule, hydroboration-oxidation, oxymercuration-reduction, epoxidation, ozonolysis, hydration, hydroxylation and oxidation with KMnO_4 . Substitution at the allylic and vinylic positions of alkenes.	Structure and reactivity in context to regioselectivity in different alkenes.	Group Discussion, PPT, Audio-Visuals	Summarize the chemical behaviour of alkenes, dienes and alkynes.	<p><i>Knowledge Based</i></p> <p>-Define Hydroboration</p> <p>-What is Kucherov's reaction.</p> <p><i>Understanding Based</i></p> <p>-Explain why ethyne is less reactive towards electrophilic addition than ethene.</p> <p>- Discuss the structure and stability of 1,3-butadiene.</p> <p><i>Higher Order Thinking Skills Based</i></p> <p>-Why isoprene is more stable than 1,3-</p>	Knowledge--60 Understanding-30 Higher Order-10



Alkynes Methods of preparation, chemical reactions of alkynes- hydrogenation, halogenation, hydrohalogenation, hydration, hydroboration and hydroxylation, ozonolysis of alkynes, acidity of alkynes, mechanism of electrophilic and nucleophilic addition reactions, metal-ammonia reductions and oxidation.	Electrophilic addition and reactions of alkynes	Diagrams, Models, Demonstration, Flow Charts		butadiene . -How will you synthesis 1-hexanol from acetylene.	
Diens- Nomenclature and classification of dienes: isolated, conjugated and cumulated dienes. Structure of allenes and butadiene method of formation, polymerization. Chemical reactions- 1,2 and 1,4 additions, Diels-Alder reaction.	Structure of dienes and thermodynamic and kinetic control of reactions	PPT, Demonstration, Flipped Classroom 			


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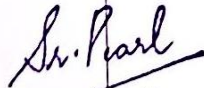


B.Sc. III (SEMESTER V)

ORGANIC CHEMISTRY (PAPER II) (CHE-502)

COURSE PLAN

SEM/ Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
SEM- V Nov- Jan	UNIT III Organic Synthesis via Enolates Acidity of α -hydrogens, alkylation of diethyl malonate and ethyl acetoacetate, Synthesis of ethyl acetoacetate : the Claisen condensation, Keto-enol tautomerism of ethyl acetoacetate, Alkylation of 1, 3-dithianes, Alkylation and acylation of enamines.	Application of enolates in Organic Synthesis	PPT, Flipped classrooms, Group discussions, E-content 	Assess the chemical properties of enolates and fats and detergents.	<u>Knowledge Based</u> -Define Claisen Condensation -What is tautomerism. <u>Understanding Based</u> -Differentiate between tautomerism and resonance. <u>Higher Order Thinking Skills Based</u> -How AAE is synthesised . -Elaborate Stork enamine reaction.	Knowledge--60 Understanding-30 Higher Order-10  Head


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SOPHIA GIRLS' COLLEGE, (AUTONOMOUS) AJMER
M.Sc. CHEMISTRY (PREVIOUS)
SEMESTER I

ORGANIC REACTION MECHANISM I (CHEM-102)

MAX. MARKS: 100 (70 EXT; 30 INT)

MIN. MARKS: 40 (28 EXT;12 INT)

COURSE PLAN

SEM/ Month	Unit/Topic	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
SEM I JAN	UNIT II SN ² , SN ¹ , mixed and SET mechanism	Aliphatic Nucleophilic substitution	Diagrams, PPT, Audio-Visuals	Review various aliphatic and aromatic substitution reactions	<u>Knowledge Based</u> - What is SET Mechanism. -Define ipso attack.	Knowledge-25 Understanding-45 Higher Order-30
	ArSN ¹ , ArSN ² , benzyne and SRN1 mechanism. Reactivity-effect of substrate structure, leaving group and attacking nucleophile. The von Richter, Sommelet- Hauser and Smiles rearrangements.	Aromatic Nucleophilic Substitution	E-Content, PPT, Problem solving		<u>Understanding Based</u> - Explain benzyne Mechanism. - Describe Arenium ion mechanism.	



	Bimolecular mechanism, SE1 mechanism, electrophilic substitution accompanied by double bond shifts. Effect of substrates, leaving group and the solvent polarity.	Aliphatic Electrophilic Substitution	Group discussion, PPT		<u>High Order thinking-</u> -Elaborate Ortho/para ratio. - Elaborate Diazonium Coupling.	
	Arenium ion mechanism, orientation and reactivity, energy profile diagrams. Ortho/para ratio, ipso attack, orientation in other ring system. Quantitative treatment of reactivity in substrates and electrophiles. Diazonium coupling, Vismier reaction, Gattermann-koch reaction.	Aromatic Electrophilic Substitution	Animated videos, PPT			

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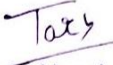
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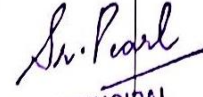


SOPHIA GIRLS' COLLEGE, (AUTONOMOUS) AJMER
M.SC CHEMISTRY (PREVIOUS)
Practical (CHEM-105)

SEM/ Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
SEM I NOV- DEC.	INORGANIC PREPARATIONS <ul style="list-style-type: none"> • Tris(thiourea)copper (II)sulphate. • CisPotassiumDiaquatrioxalatochromate(III). • SodiumDiamminetetrahydroxycobalt(III). • Tris(acetylacetonato)manganese (II). • Potassium Trioxalatoferrate(III). • Prussian Blue. • Hexamminecobalt(III) • Hexanitro-N-cobaltate(III). • Vanadyl acetylacetonate • Dichloridobis(pyridine)cobalt(II). • Hexamminenickel(II) chloride. • Bis(dimethylglyoximate)nickel (II). • Tetramminecopper(II) sulphate. 	Methods of Synthesis of various inorganic compounds	Demonstration of the exercise	Understand the practical applications of various aspects of chemistry	<u>Knowledge Based</u> - Practical File Work <u>Understanding Based</u> To study the strength of strong and weak acids in a given mixture conductometrically. -To separate and identify the components of the given organic ternary mixture. <u>Higher Order Thinking Skills</u>	Knowledge--20 Understanding-40 Higher Order-40



JAN	Organic Chemistry Qualitative Analysis Separation, purification and identification of compounds of binary mixture (two solids). Quantitative Analysis (a) Determination of Iodine value of an oil sample. (b) Determination of Acid Value of an oil sample. (c) Determination of Saponification value of an oil sample.	Qualitative Analysis and Quantitative Analysis			Based - Viva Voce	
FEB	PHYSICAL <ul style="list-style-type: none"> Determination of solubility and solubility product of sparingly soluble salts (e.g., $PbSO_4$, $BaSO_4$) conductometrically. Determination of the strength of strong and weak acids in a given mixture conductometrically. To construct the phase diagram for three component system (e.g., chloroform-acetic acid-water). Determination of the dissociation constant of acetic acid in DMSO, DMF acetone and dioxane by titrating it with KOH. Determination of the dissociation constant of monobasic/dibasic acid 	Instrumentation	Exercises by Use of different Apparatus, instruments, like pH meter, conductivity meter 			 Head Department of Chemistry Sophia Girls' College (Autonomous), Ajmer


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SOPHIA GIRLS' COLLEGE, (AUTONOMOUS) AJMER
M.SC CHEMISTRY (FINAL)
SEMESTER III (M.Sc. F)

GREEN AND ENVIRONMENTAL CHEMISTRY (CHEM-303)

MAX MARKS: 100 (70EXT; 30 INT)

MIN. MARKS: 40 (28 EXT; 12 INT)

COURSE PLAN

SEM/ Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
SEM III NOV-JAN	Unit-II Different approaches to green synthesis : Use of green reagents, green solvents. Synthetic organic transformations under microwave, heterocyclic synthesis.	Application of greener alternative approaches Dye	Quiz, Animated Videos, PPT.	Illustrate application of greener alternative approaches	<u>Knowledge Based</u> -Define Green Chemistry? <u>Understanding Based</u> - Explain Green reagent. <u>Higher Order Thinking Skills Based</u> -Elaborate different type of heterocyclic synthesis.	Knowledge-25 Understanding-45 Higher Order-30 Tary Head Department of Chemistry Sophia Girls' College (Autonomous) , Ajmer

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COURSE PLAN

U.G. & P.G Programs

2020-21

EVEN SEMESTER



SOPHIA GIRLS' COLLEGE, (AUTONOMOUS) AJMER
B. Sc. I (SEMESTER II)

PHYSICAL CHEMISTRY (PAPER I) (CHE-201)

Max. Marks: 75 (50 Ext; 25 Int)

Min. Marks: 30(20 Ext; 10 Int)

Credit: 03

COURSE PLAN

SEM II Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
SEM II APRIL	Colloidal State Definition and classification of colloids. Solids in liquids (sols): properties- kinetic, electrical, electroosmosis; stability of colloids, precipitation of colloid, protective action, Hardy-Schulze law, gold number. Liquids in liquids (emulsions); types of emulsions, preparation & application, deemulsification, Emulsifier. Liquids in solids (gels): classification, properties and application, general applications of colloids.	Properties of Colloids	Flow Chart, Diagram, PPT	Predict properties of solid state and colloidal states of matter.	<u>Knowledge Based</u> -Define Unit cell. -Illustrate law of rational Indices <u>Understanding Based</u> -Compare Miller and Weiss parameters. -Derive Vander Wall Constants <u>Higher Order Thinking Skills Based</u> -Discuss application	Knowledge--60 Understanding-30 Higher Order-10



Sem II MAY - JUNE	UNIT II Gaseous States Kinetic theory of gases, Deviation of real gases from ideal behaviour, causes of deviation, Vander Waals equation of state.	Nature of real gases	Animated Video, PPT		of Colloids. -Explain Maxwell's distribution of molecular velocities.	
	PV isotherms of real gases, continuity of states, relationship between critical constant and Vander Waals constants, calculation of Vander Waal's constant, law of corresponding states, reduced equation of state.	Critical Phenomenon of real gases	Flipped Classroom, Quiz, Group Discussion			
	Molecular velocities: Root mean square, average and most probable velocities, Qualitative discussion of the Maxwell's distribution of molecular velocities, collision number, mean free path and collision diameter, Liquifaction of gases (by various methods).	Velocity of gaseous molecules and Maxwell Boltzmann law	Group discussions, Problem solving class <i>Divya</i>			<i>Tary</i> Head

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ORGANIC CHEMISTRY (PAPER II) (CHE-602)

COURSE PLAN

SEM VI Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
SEM VI MARCH	UNIT I Carbohydrates Definition, Classification and nomenclature. Monosaccharides, mechanism of osazone formation, interconversion of glucose and fructose, chain lengthening and chain shortening of aldoses. Configuration of monosaccharides. Erythro and threo diastereomers. Conversion of glucose into mannose. Determination of ring size of monosaccharides. Cyclic structure of D(+)-glucose. Mechanism of mutarotation. An introduction to disaccharides (maltose, sucrose and lactose) and polysaccharides(starch and cellulose) without involving structure determination.	Structural and functional analysis of Carbohydrates	PPT, Flipped classrooms, Group discussions	Summarize the properties of carbohydrates	<u>Knowledge Based</u> -Define Polysaccharide . -Draw the Haworth projection formula of Fructose. <u>Understanding Based</u> - What is the relation between a nucleoside and nucleotide? - Compare pyridine and pyrrole on the basis of the following properties: (i) Basic nature (ii) Nucleophilic	Knowledge--40 Understanding-40 Higher Order-20



APRIL

UNIT II

Amino Acids, Peptides, Proteins and Nucleic Acids

Classification, structure and stereochemistry of amino acids. Acid base behaviour, isoelectric point and electrophoresis. Preparation and reactions of α - amino acids.

Structure and nomenclature of peptides and proteins. Classification of proteins. Peptide structure determination, end group analysis, selective hydrolysis of peptides. Classical peptide synthesis, solid-phase peptide synthesis. Structures of peptides and structures of proteins. Proteins denaturation/ renaturation.

Nucleic acids: Introduction, Constitution of nucleic acids. Ribonucleosides and ribonucleotides. The double helical structure of DNA

Structure, classification, properties and synthesis of amino acid, peptides, proteins and nucleic acid

Flipped classrooms, Quiz, Animated Videos

Explain the nature and behavior of amino acids and nucleic acids.

substitution

(iii) Electrophilic substitution

Higher Order Thinking Skills Based

- Describe double helical structure of DNA.

- Discuss the comparative aromatic nature of pyrrole, thiophene and furan.



<p>MAY - JULY</p> <p><i>Sr. Pearl</i></p>	<p>UNIT III</p> <p>Heterocyclic compounds</p> <p>Introduction : Molecular orbital picture and aromatic characteristics of pyrrole, furan, thiophene and pyridine. Methods of synthesis and chemical reactions with particular emphasis on the mechanism of electrophilic substitution. Mechanism of nucleophilic substitution reactions in pyridine derivatives. Comparison of basicity of pyridine, piperidine and pyrrole.</p>	<p>Aromatic characteristics, preparation and chemical reactions of five membered and six membered heterocyclic compounds</p>	<p>PPT, Group discussions, Audio-visual</p> <p><i>Dys</i></p>	<p>Assess the reactivity and stability of heterocyclic compounds.</p>		<p><i>Tax</i></p>
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SOPHIA GIRLS' COLLEGE, (AUTONOMOUS) AJMER
M.Sc. CHEMISTRY (PREVIOUS)
SEMESTER II

GROUP THEORY AND SPECTROSCOPY (CHEM-204)

MAX. MARKS: 100 (70 EXT; 30 INT)

MIN. MARKS: 40 (28 EXT; 12 INT)

COURSE PLAN

SEM/ Month	Unit/Topic	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
SEM II APRIL	Unit – I Symmetry and Group theory in Chemistry Symmetry elements and Symmetry operation. definitions of group, sub-group, relation between orders of finite group and its subgroup, Conjugacy relation and classes. Point symmetry group. Group multiplication table (C_2 , C_{2h}).	Symmetry and Group theory.	Diagrams. Tables, PPT. Audio-visual.	Interpret the symmetry and group theory in chemical science.	<u>Knowledge Based</u> -What is symmetry elements? -State Mutual exclusion principle? <u>Understanding Based</u> -Differentiate between Plane of symmetry and Axis of symmetry? -Explain Resonance	Knowledge-25 Understanding-45 Higher Order-30



	C_{2v} , C_{3v})				Raman effect?	
	Raman Spectroscopy Classical and quantum theories of Raman effect. Pure rotational, vibrational and vibrational-rotational Raman spectra, selection rules, mutual exclusion principle. Resonance Raman spectroscopy, coherent anti Stokes Raman spectroscopy (CARS).	Raman Spectroscopy and its applications.	PPT, Diagrams, Animated Video		<u>Higher Order Thinking Skills Based</u> - Construct group multiplication table of C_{3v} using appropriate example. -Derive classical theory of Raman effects.	
MAY – JUNE	Unit - II Photoelectron spectroscopy Basic principles, photo-electric effect, ionization process, Koopman's theorem. Photoelectron spectra of simple molecules. ESCA. Chemical information from ESCA. Auger electron spectroscopy-basic idea. Photoacoustic Spectroscopy: Basic principle of photoacoustic	Photoelectron and Photoacoustic spectroscopy.	PPT, Chart, Animated Video, Audio Visual	Analyse the molecular and photoelectron spectroscopy		



	spectroscopy(PAS), PAS-gases and condensed systems, chemical and surface applications.					
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SOPHIA GIRLS' COLLEGE, (AUTONOMOUS)
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M.SC CHEMISTRY (PREVIOUS)

Practicals (CHEM-205)

MIN. MARKS: 40 (28 EXT; 12 INT)

MAX MARKS: 100 (70EXT; 30 INT)


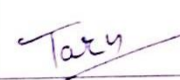
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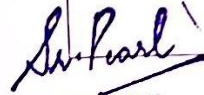
SEM/ Month	UNIT/TOPIC	Concepts/facts	Teaching Pedagogy	Learning Outcomes	Questions	Marks Weightage (%)
SEM-II MAY - JUNE	Organic Chemistry (a) Organic synthesis (any five) (i) Acetylation: Acetylation of cholesterol and separation of cholesteryl acetate by column chromatography. (ii) Oxidation: Adipic acid by chromic acid oxidation of cyclohexanol. (iii) Aldol condensation: Dibenzal acetone from benzaldehyde. (iv) Sandmeyer reaction: p-chlorotoluene from p-toluidine. (v) Cannizzaro reaction: 4-chlorobenzaldehyde as substrate.	Organic synthesis and Quantitative Analysis	Demonstration of the organic synthesis reaction	Understand the practical applications of various aspects of chemistry	<u>Understanding Based</u> - Mechanism of various Chemical reactions. - To analyse the concept of DO, BOD and COD. <u>Higher Order Thinking Skills Based</u> - Viva Voce	




July	<p>PHYSICAL CHEMISTRY (Students are required to perform at least five experiments from the following experiments.)</p> <p>(i) Determination of strengths of halides in a mixture potentiometrically.</p> <p>(ii) Determination of the strengths of strong and weak acids in a given mixture using a potentiometer/pH meter.</p> <p>(iii) Determination of partition coefficient of I_2 between water and CCl_4.</p> <p>(iv) Determination of equivalent conductance of a strong electrolyte such as KCl, $AgNO_3$ etc. at several concentrations and hence verify the Onsager's Equation.</p> <p>(v) To construct the phase diagram for three component system (e.g., chloroform-acetic acid-water).</p>	Instrumentation	Exercises with Use of different Apparatus, instruments like pH meter, conductivity meter			
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	<p>(vi) Friedel Crafts Reaction: β-Benzoylpropionic acid from succinic anhydride and benzene.</p> <p>(vii) Aromatic electrophilic substitutions: Synthesis of p- nitroaniline and p- bromoaniline</p> <p>(b) Quantitative Analysis (any two)</p> <p>(i) Determination of DO of a water sample.</p> <p>(ii) Determination of COD of a water sample.</p> <p>(iii) Determination of BOD of a water sample</p>					
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