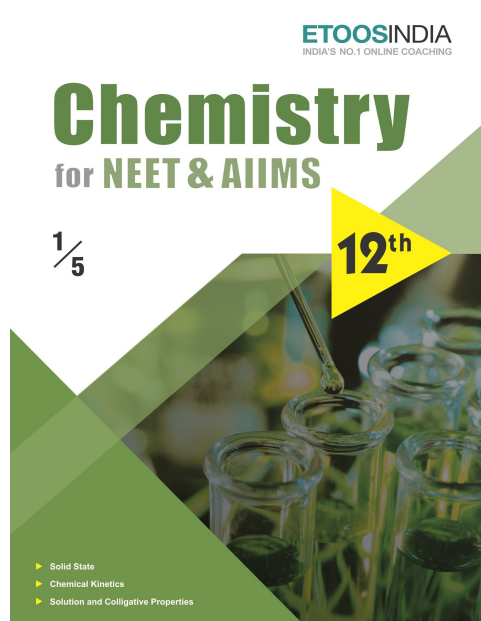
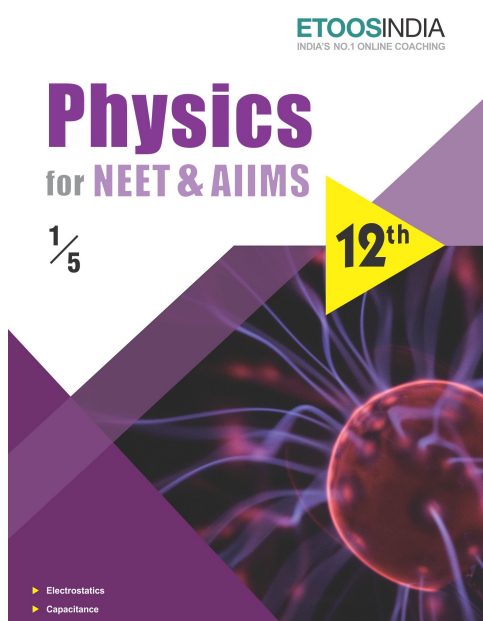
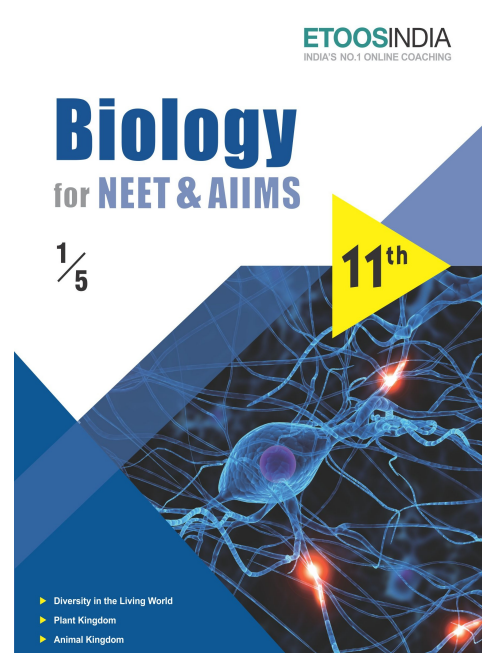
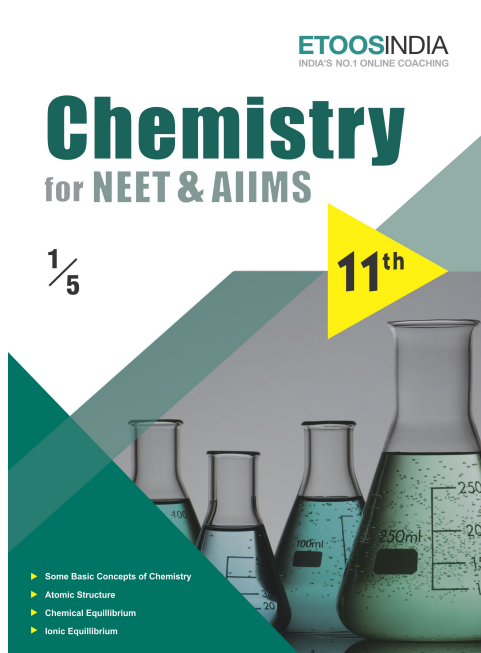
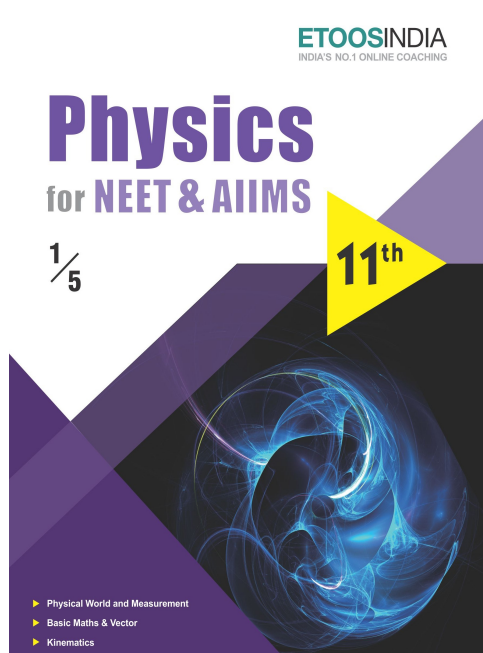


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**ETOOS Comprehensive Study Material
For NEET & AIIMS**

ALDEHYDE, KETONE AND CARBOXYLIC ACID

In organic chemistry, we have learnt to derive from compounds containing only carbon and hydrogen i.e. from the hydrocarbons, all other types of combinations such as alcohol, aldehyde, ketones, acids etc.

"OTTO WALLACH"

INTRODUCTION

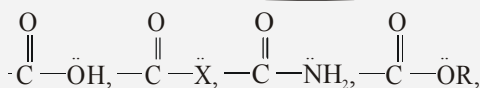
Organic Compounds having >C=O group are called carbonyl compounds and >C=O group is known as carbonyl or oxo group. Its general formula is $\text{C}_n\text{H}_{2n}\text{O}$ ($n = 1, 2, 3, \dots$). Carbonyl compounds are grouped into two categories.

In aldehydes, the carbonyl group is bonded to a carbon and hydrogen while in ketones, it is bonded to two carbon atoms. The carbonyl compounds in which carbonyl group is bonded to oxygen are known as carboxylic acids, and their derivatives (e.g. esters, anhydrides) while in compounds where carbon is attached to nitrogen and to halogens are called amides and acyl halides respectively.

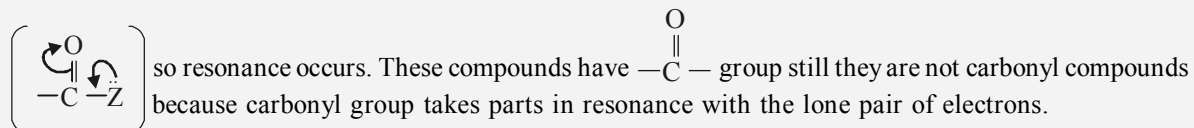
Aldehydes, ketones and carboxylic acids play an important role in biochemical processes, add fragrance and flavour to many food products and pharmaceuticals.



ETOOS KEY POINTS



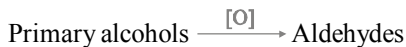
In all the compounds given above, lone pair of electrons and double bond are conjugate.



General Methods of Preparation :

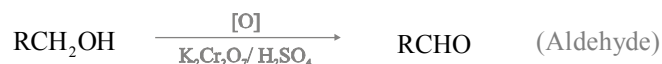
(A) For both Aldehydes and Ketones

By Oxidation of Alcohols :

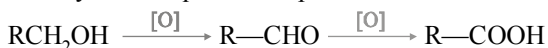


By $\text{K}_2\text{Cr}_2\text{O}_7 / \text{H}_2\text{SO}_4$:

Oxidation of primary alcohols gives aldehyde and oxidation of secondary alcohols gives Ketones. Here, ($\text{K}_2\text{Cr}_2\text{O}_7 / \text{H}_2\text{SO}_4$) is a strong oxidising agent.



Aldehydes are quite susceptible to further oxidation to acids -



Thus oxidation of primary alcohols is made at the temperature much above the boiling point of aldehyde and thus aldehydes are vapourised out and prevented from being oxidised.

Note : Aldehydes can be prepared from 1° alcohol, secondary alcohols can be oxidized to ketones, by oxidation with pyridinium chlorochromate (PCC) in CH_2Cl_2 solvent, pyridinium dichromate (PDC) and with Jones reagent ($\text{CrO}_3 + \text{H}_2\text{SO}_4$) in acetone.

Oppenauer Oxidation :

The oxidation of secondary alcohols to ketones by heating them with specific reagent : $[(\text{CH}_3)_3\text{CO}]_3\text{Al}$ (Aluminium-t-butoxide) in presence of acetone. Primary alcohols may also be oxidized to aldehydes if ketones is replaced by a better hydrogen acceptor, e.g. p-benzoquinone. The equilibrium can be controlled by the amount of acetone, an excess of which favours the oxidation of the alcohol.

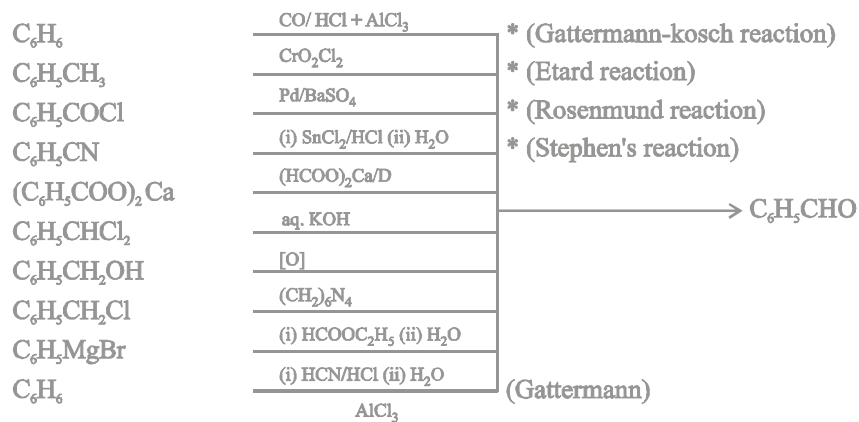


Note : The reaction is the reverse of Meerwein-Ponndorf-verley reduction.

BENZALDEHYDE (C₆H₅CHO)

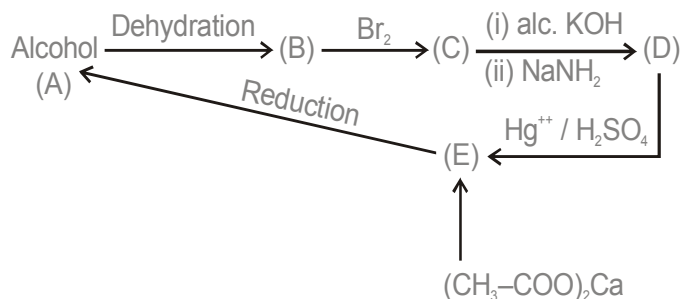
Oil of bitter almonds

General Method of Preparation :



SOLVED EXAMPLE

Ex. 1 Find out unknown in following reactions.

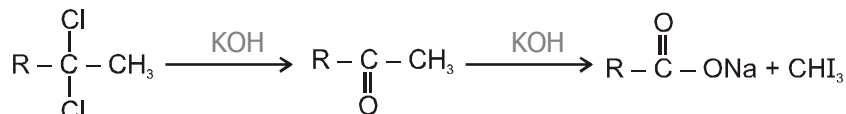


Sol. Since E is obtained on dry distillation of calcium salt of acetic acid hence E will be $\text{CH}_3\text{-}\overset{\text{O}}{\parallel}{\text{C}}\text{-CH}_3$. Thus other unknowns are



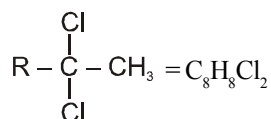
Ex. 2 What will be structure of aromatic $\text{C}_8\text{H}_8\text{Cl}_2$ (A), which on aqueous alkali hydrolysis gives product (B). (B) gives positive iodoform test.

Sol. Since (B) is showing iodoform test hence it will be methylketone only as it is obtained on aqueous alkali hydrolysis of (A) which will be non-terminal gem dihalides as –

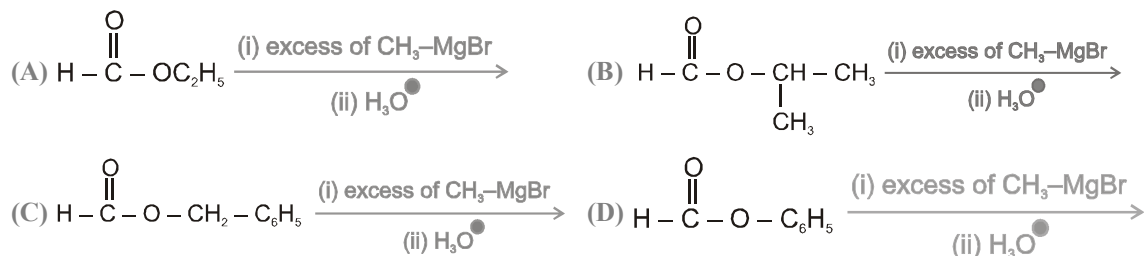


(A)

Now unknown 'R' can be known as :



Ex. 3 Write the products of the following reactions.

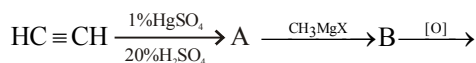


Exercise # 1

SINGLE OBJECTIVE

NEET LEVEL

1. The end product in the following sequence of reaction is



- (A) Acetic acid (B) Isopropyl alcohol (C) Acetone (D) Ethanol

2. In the following reaction, product P is $\text{R}-\overset{\text{O}}{\parallel}{\text{C}}-\text{Cl} \xrightarrow[\text{Pd}-\text{BaSO}_4]{\text{H}_2} \text{P}$

- (A) RCH_2OH (B) RCOOH (C) RCHO (D) RCH_3

3. Acetophenone is prepared from

- (A) Rosenmund reaction (B) Sandmeyer reaction (C) Wurtz reaction (D) Friedel craft reaction

4. Compound which gives acetone on ozonolysis

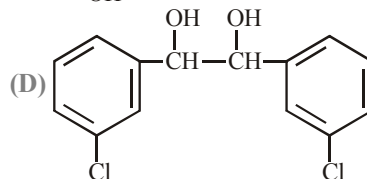
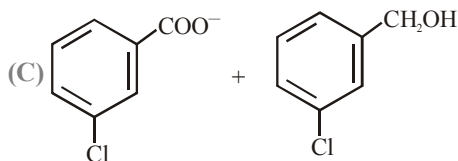
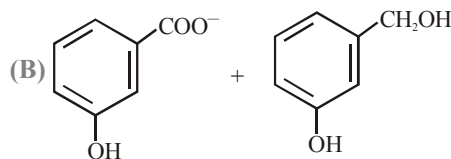
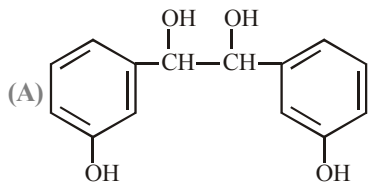
- (A) $\text{CH}_3-\text{CH}=\text{CH}-\text{CH}_3$ (B) $(\text{CH}_3)_2\text{C}=\text{C}(\text{CH}_3)_2$ (C) $\text{C}_6\text{H}_5\text{CH}=\text{CH}_2$ (D) $\text{CH}_3\text{CH}=\text{CH}_2$

5. Identify the reaction X and the product Y

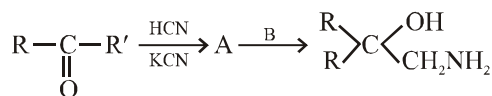


- (A) $\text{X} = \text{MgCl}_2$; $\text{Y} = \text{CH}_3\text{CH}=\text{CH}_2$ (B) $\text{X} = \text{CH}_3\text{MgCl}$; $\text{Y} = \text{C}_2\text{H}_5\text{COCH}_3$
 (C) $\text{X} = \text{CH}_3\text{MgCl}$; $\text{Y} = (\text{CH}_3)_3\text{C}-\text{OH}$ (D) $\text{X} = \text{C}_2\text{H}_5\text{MgCl}$; $\text{Y} = (\text{CH}_3)_3\text{C}-\text{OH}$

6. When m-chlorobenzaldehyde is treated with 50% KOH solution, the product (s) obtained is (are)



7. A and B in the following are



- (A) $\text{A} = \text{RR}'\text{C} \begin{matrix} \text{CN} \\ \diagdown \\ \text{OH} \end{matrix}$, $\text{B} = \text{LiAlH}_4$

- (B) $\text{A} = \text{RR}'\text{C} \begin{matrix} \text{OH} \\ \diagdown \\ \text{COOH} \end{matrix}$, $\text{B} = \text{NH}_3$

- (C) $\text{A} = \text{RR}'\text{C} \begin{matrix} \text{CN} \\ \diagdown \\ \text{OH} \end{matrix}$, $\text{B} = \text{H}_3\text{O}^{\oplus}$

- (D) $\text{A} = \text{RR}'\text{CH}_2\text{CN}$, $\text{B} = \text{NaOH}$

8. Reduction of Aldehydes and Ketones to hydrocarbon take place in the presence of

- (A) Zn amalgam and HCl acid (B) $\text{Pd} / \text{BaSO}_4$
 (C) Anhydrous AlCl_3 (D) Ni / Pt

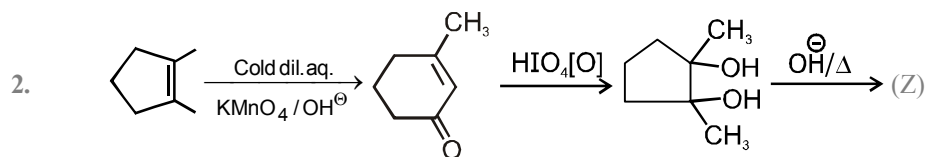
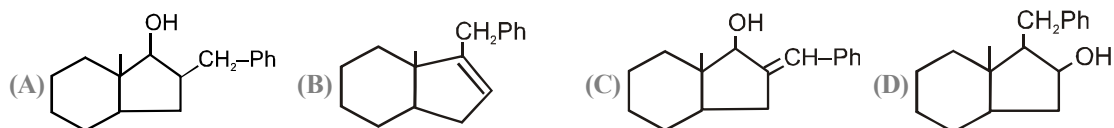
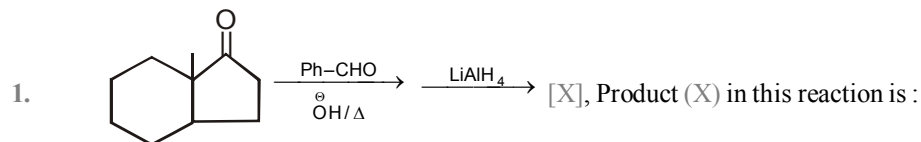
9. Reduction of $> \text{C} = \text{O}$ to CH_2 can be carried out with

- (A) Catalytic reduction (B) $\text{Na} / \text{C}_2\text{H}_5\text{OH}$
 (C) Wolf-Kishner reduction (D) LiAlH_4

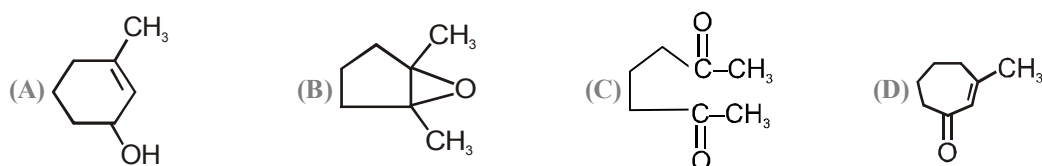
Exercise # 2

SINGLE OBJECTIVE

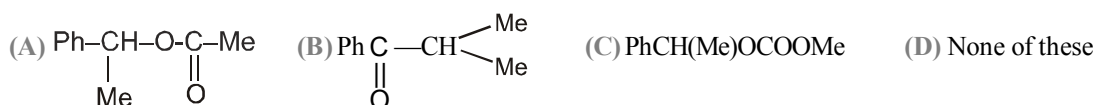
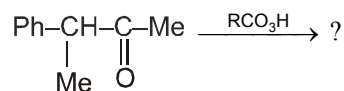
AIIMS LEVEL



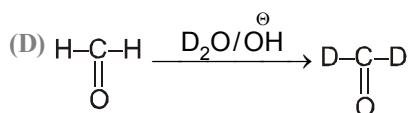
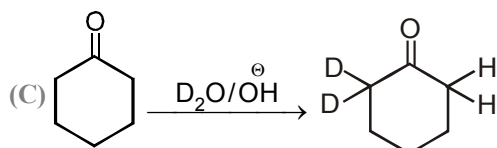
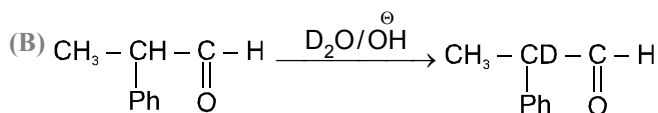
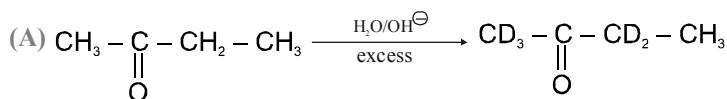
The products of the above reaction is / are :



3. What will be the product of the following reaction



4. In which of the following reaction deuterium exchange is observed ?

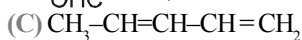
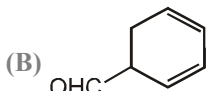
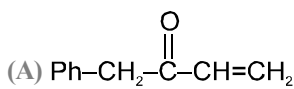


Exercise # 3

PART - 1

MATRIX MATCH COLUMN

1. Column-I



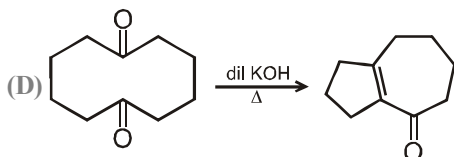
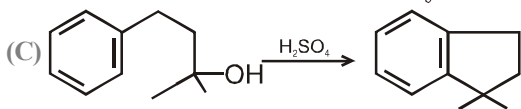
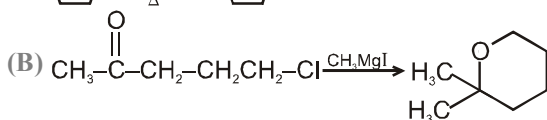
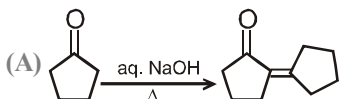
Column-II

(p) 1, 4-addition

(q) Tautomerism

(r) $\text{AgNO}_3/\text{NH}_4\text{OH}$

2. Column-I



Column-II

(p) Nucleophilic substitution

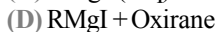
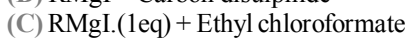
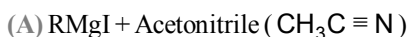
(q) electrophilic substitution

(r) Dehydration

(s) Nucleophilic addition

3. Match the product of Column- II with the reaction given in Column- I.

Column- I



Column- II

(p) Alkanone

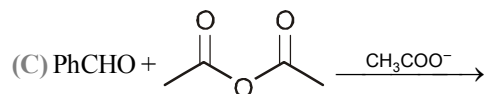
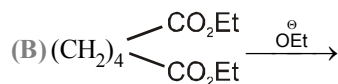
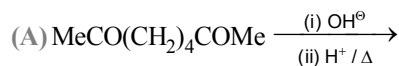
(q) Ester

(r) 1° Alcohol

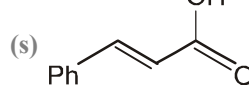
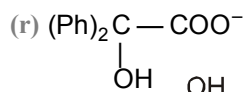
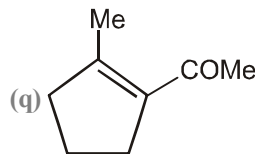
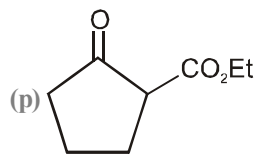
(s) Dithionic acid

4. Match the column

Column I



Column II



Exercise # 4

PART - 1

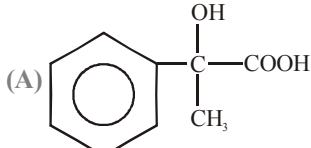
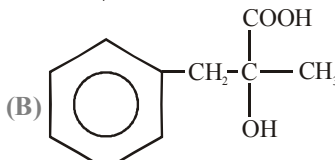
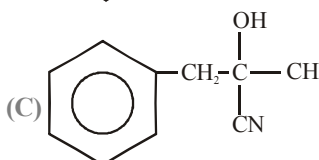
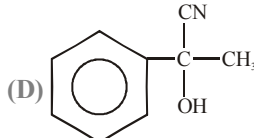
PREVIOUS YEAR (NEET/AIPMT)

1. During reduction of aldehydes with hydrazine and potassium hydroxide, the first is the formation of
[CBSE AIPMT 2000]
(A) $R-CH=N-NH_2$ (B) $R-C \equiv N$
(C) $R-\overset{\overset{O}{\parallel}}{C}-NH_2$ (D) $R-CH=NH$
2. Polarisation of electrons in acrolein may be written as
[CBSE AIPMT 2000]
(A) $\overset{\delta+}{CH_2}=\overset{\delta+}{CH}-\overset{\delta-}{CH}=\overset{\delta-}{O}$
(B) $\overset{\delta+}{CH_2}=\overset{\delta+}{CH}-CH=O$
(C) $\overset{\delta+}{CH_2}=\overset{\delta+}{CH}-CH=\overset{\delta+}{O}$
(D) $\overset{\delta-}{CH_2}=\overset{\delta+}{CH}-CH=O$
3. Reduction by $LiAlH_4$ of hydrolysed product of an ester gives
[CBSE AIPMT 2000]
(A) two acids
(B) two aldehydes
(C) One molecule of alcohol and another of carboxylic acid
(D) two alcohols
4. Benzoic acid may be converted into ethyl benzoate by reaction with
[CBSE AIPMT 2002]
(A) sodium ethoxide (B) ethyl chloride
(C) dry HCl, C_2H_5OH (D) ethanol
5. In the following reaction, product P is
[CBSE AIPMT 2002]
$$R-\overset{\overset{O}{\parallel}}{C}-Cl \xrightarrow[\text{Pd}-BaSO_4]{H_2} P$$

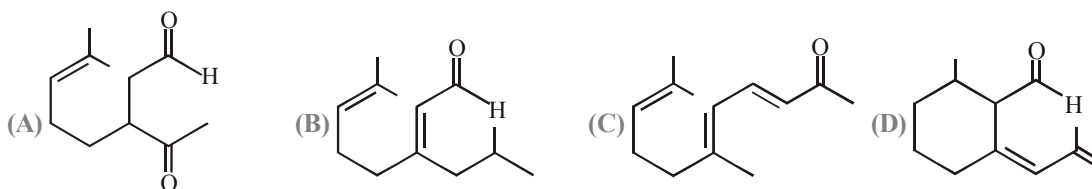
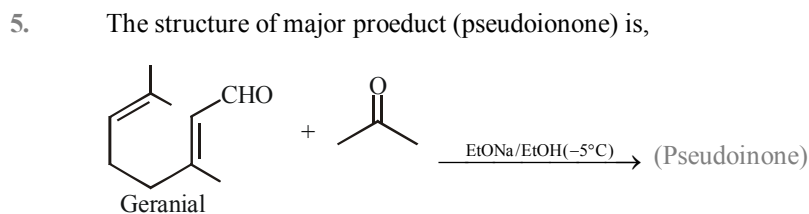
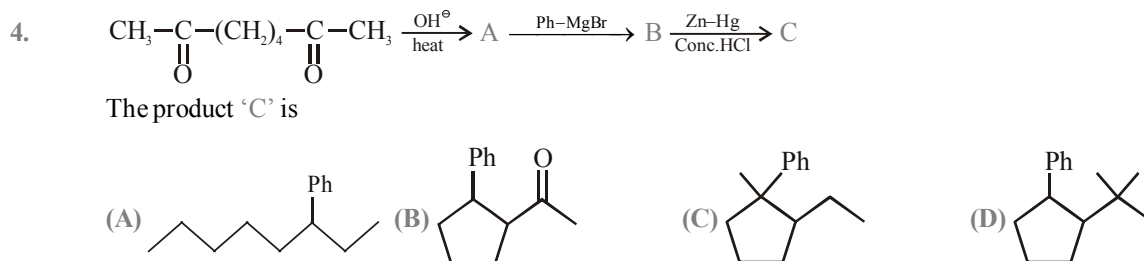
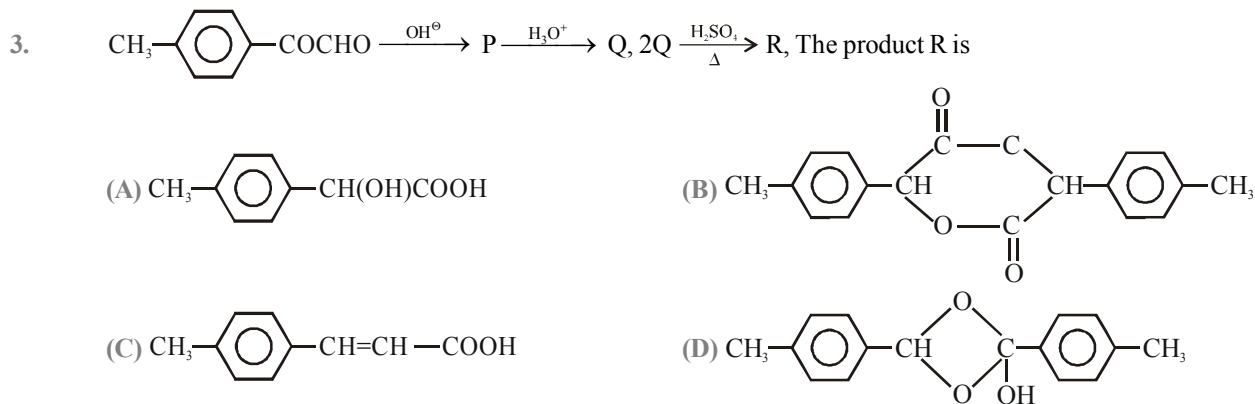
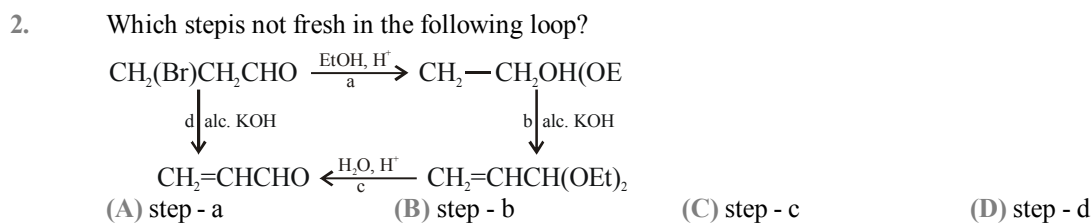
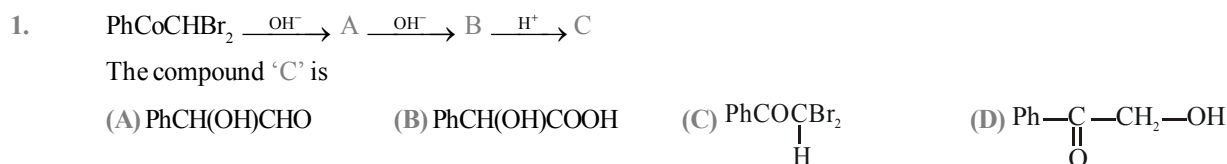
(A) RCH_2OH (B) $RCOOH$
(C) $RCHO$ (D) RCH_3
6. In a set of the given reactions, acetic acid yielded a product C.
$$CH_3COOH + PCl_5 \longrightarrow A \xrightarrow[\text{anhy. } AlCl_3]{C_2H_5} B \xrightarrow[\text{Ether}]{C_2H_5, MgBr} C$$

Product C would be [CBSE AIPMT 2003]
(A) $CH_3CH(OH)C_6H_5$ (B) $CH_3-\overset{\overset{C_2H_5}{|}}{C}(OH)C_6H_5$
(C) $CH_3CH(OH)C_2H_5$ (D) $CH_3COC_6H_5$
7. Which one of the following orders of acidic strength is correct?
[CBSE AIPMT 2003]
(A) $RCOOH > HOH > HC \equiv CH > ROH$
(B) $RCOOH > HC \equiv CH > HOH > ROH$
(C) $RCOOH > ROH > HOH > HC \equiv CH$
(D) $RCOOH > HOH > ROH > HC \equiv CH$
8. A and B in the following reactions are
[CBSE AIPMT 2003]
$$R-\overset{\overset{O}{\parallel}}{C}-R' \xrightarrow[\text{KCN}]{HCN} A \xrightarrow{B} R-\overset{\overset{OH}{|}}{C}-R'-CH_2NH_2$$

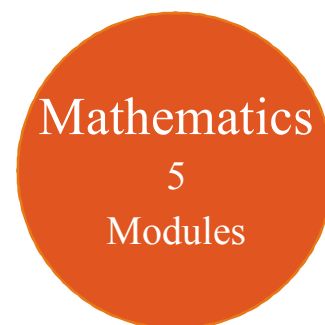
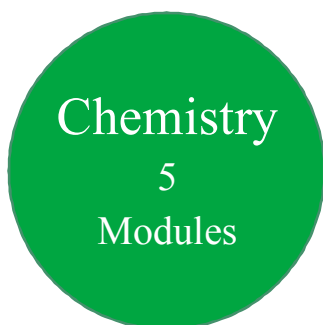
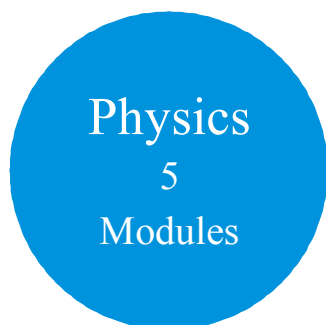
(A) $A = RR'CH_2CN, B = NaOH$
(B) $A = RR'C \begin{cases} OH \\ COOH \end{cases} B = CH_3$
(C) $A = RR'C \begin{cases} OH \\ CN \end{cases} B = CH_3$
(D) $A = RR'C \begin{cases} OH \\ CN \end{cases} B = LiAlH_4$
9. Which one of the following can be oxidised to the corresponding carbonyl compound?
[CBSE AIPMT 2004]
(A) 2-hydroxy propane
(B) Ortho-nitro phenol
(C) Phenol
(D) 2-methyl -2 hydroxy propane
10. In a set of reactions, acetic acid yielded a product D.
$$CH_3COOH \xrightarrow{SOCl_2} A \xrightarrow[\text{anhy. } AlCl_3]{\text{Benzene}} B \xrightarrow{HCN} C \xrightarrow{HOH} D$$

The structure of D would be [CBSE AIPMT 2005]
(A) 
(B) 
(C) 
(D) 

STRAIGHT OBJECTIVE TYPE



11th Class Modules Chapter Details



PHYSICS	CHEMISTRY	BIOLOGY
<p>Module-1</p> <ol style="list-style-type: none"> 1. Physical World & Measurements 2. Basic Maths & Vector 3. Kinematics <p>Module-2</p> <ol style="list-style-type: none"> 1. Law of Motion & Friction 2. Work, Energy & Power <p>Module-3</p> <ol style="list-style-type: none"> 1. Motion of system of particles & Rigid Body 2. Gravitation <p>Module-4</p> <ol style="list-style-type: none"> 1. Mechanical Properties of Matter 2. Thermal Properties of Matter <p>Module-5</p> <ol style="list-style-type: none"> 1. Oscillations 2. Waves 	<p>Module-1(PC)</p> <ol style="list-style-type: none"> 1. Some Basic Concepts of Chemistry 2. Atomic Structure 3. Chemical Equilibrium 4. Ionic Equilibrium <p>Module-2(PC)</p> <ol style="list-style-type: none"> 1. Thermodynamics & Thermochemistry 2. Redox Reaction 3. States Of Matter (Gaseous & Liquid) <p>Module-3(IC)</p> <ol style="list-style-type: none"> 1. Periodic Table 2. Chemical Bonding 3. Hydrogen & Its Compounds 4. S-Block <p>Module-4(OC)</p> <ol style="list-style-type: none"> 1. Nomenclature of Organic Compounds 2. Isomerism 3. General Organic Chemistry <p>Module-5(OC)</p> <ol style="list-style-type: none"> 1. Reaction Mechanism 2. Hydrocarbon 3. Aromatic Hydrocarbon 4. Environmental Chemistry & Analysis Of Organic Compounds 	<p>Module-1</p> <ol style="list-style-type: none"> 1. Diversity in the Living World 2. Plant Kingdom 3. Animal Kingdom <p>Module-2</p> <ol style="list-style-type: none"> 1. Morphology in Flowering Plants 2. Anatomy of Flowering Plants 3. Structural Organization in Animals <p>Module-3</p> <ol style="list-style-type: none"> 1. Cell: The Unit of Life 2. Biomolecules 3. Cell Cycle & Cell Division 4. Transport in Plants 5. Mineral Nutrition <p>Module-4</p> <ol style="list-style-type: none"> 1. Photosynthesis in Higher Plants 2. Respiration in Plants 3. Plant Growth and Development 4. Digestion & Absorption 5. Breathing & Exchange of Gases <p>Module-5</p> <ol style="list-style-type: none"> 1. Body Fluids & Its Circulation 2. Excretory Products & Their Elimination 3. Locomotion & Its Movement 4. Neural Control & Coordination 5. Chemical Coordination and Integration

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12th Class Modules Chapter Details

Physics
5
Modules

Chemistry
5
Modules

Mathematics
5
Modules

PHYSICS	CHEMISTRY	BIOLOGY
<p>Module-1</p> <ol style="list-style-type: none"> 1. Electrostatics 2. Capacitance <p>Module-2</p> <ol style="list-style-type: none"> 1. Current Electricity 2. Magnetic Effect of Current and Magnetism <p>Module-3</p> <ol style="list-style-type: none"> 1. Electromagnetic Induction 2. Alternating Current <p>Module-4</p> <ol style="list-style-type: none"> 1. Geometrical Optics 2. Wave Optics <p>Module-5</p> <ol style="list-style-type: none"> 1. Modern Physics 2. Nuclear Physics 3. Solids & Semiconductor Devices 4. Electromagnetic Waves 	<p>Module-1(PC)</p> <ol style="list-style-type: none"> 1. Solid State 2. Chemical Kinetics 3. Solutions and Colligative Properties <p>Module-2(PC)</p> <ol style="list-style-type: none"> 1. Electrochemistry 2. Surface Chemistry <p>Module-3(IC)</p> <ol style="list-style-type: none"> 1. P-Block Elements 2. Transition Elements (d & f block) 3. Co-ordination Compound 4. Metallurgy <p>Module-4(OC)</p> <ol style="list-style-type: none"> 1. HaloAlkanes & HaloArenes 2. Alcohol, Phenol & Ether 3. Aldehyde, Ketone & Carboxylic Acid <p>Module-5(OC)</p> <ol style="list-style-type: none"> 1. Nitrogen & Its Derivatives 2. Biomolecules & Polymers 3. Chemistry in Everyday Life 	<p>Module-1</p> <ol style="list-style-type: none"> 1. Reproduction in Organisms 2. Sexual Reproduction in Flowering Plants 3. Human Reproduction 4. Reproductive Health <p>Module-2</p> <ol style="list-style-type: none"> 1. Principles of Inheritance and Variation 2. Molecular Basis of Inheritance 3. Evolution <p>Module-3</p> <ol style="list-style-type: none"> 1. Human Health and Disease 2. Strategies for Enhancement in Food Production 3. Microbes in Human Welfare <p>Module-4</p> <ol style="list-style-type: none"> 1. Biotechnology: Principles and Processes 2. Biotechnology and Its Applications 3. Organisms and Populations <p>Module-5</p> <ol style="list-style-type: none"> 1. Ecosystem 2. Biodiversity and Conservation 3. Environmental Issues

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