

Chapter #03

Organic Chemistry

DATE: ___/___/___

Soch Badlo by MAK	Isomerism: The Compounds that have same molecular formula but different arrangement of atoms in their molecules are called isomers. This phenomenon is called isomerism. Example: Butane has two isomers. $\text{CH}_3-\text{CH}_2-\text{CH}_2-\text{CH}_3$ (C_4H_{10}) <i>n</i>-butane $\text{CH}_3-\text{CH}-\text{CH}_3$ $\quad \quad \quad \text{CH}_3$ iso-butane Pentane has three isomers. $\text{CH}_3-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CH}_3$ (C_5H_{12}) <i>n</i>-Pentane $\text{CH}_3-\text{CH}-\text{CH}_2-\text{CH}_3$ $\quad \quad \quad \text{CH}_3$ iso-pentane $\text{CH}_3-\text{C}-\text{CH}_3$ $\quad \quad \quad \text{CH}_3$ neo-pentane Hexane has 5 isomers. $\text{CH}_3-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CH}_3$ (C_6H_{14}) <i>n</i>-hexane $\text{CH}_3-\text{CH}(\text{CH}_3)-\text{CH}_2-\text{CH}_2-\text{CH}_3$ 2-Methyl pentane (ISO) $\text{CH}_3-\text{CH}_2-\text{CH}(\text{CH}_3)-\text{CH}_2-\text{CH}_3$ 3-Methyl pentane $\text{CH}_3-\text{C}(\text{CH}_3)_2-\text{CH}_2-\text{CH}_3$ 2,2-Dimethyl butane (Neo) $\text{CH}_3-\text{CH}(\text{CH}_3)-\text{CH}(\text{CH}_3)-\text{CH}_3$ 2,3-Dimethyl butane	Organic Chemistry: The study of carbon containing compounds and their properties is called organic chemistry. Organic compound: Organic compounds are defined as the hydrocarbons and its derivatives. Formula and its type: Formula: Symbolic representation of a compound that give idea about type of element & ratio b/w it. $\text{H}_2\text{O} \Rightarrow$ water Hydrogen oxygen $\quad \quad \quad 2 \quad \quad 1$ ratio Types Molecular formula Structural formula Condensed formula Dot & cross formula ↓ Actual no. of atom in a compound Shows arrangement of diff. atoms around the carbon atom present in a compound. Ethane: C_2H_6 Molecular formula $\text{H}-\text{C}-\text{C}-\text{H}$ $\quad \quad \quad \text{H} \quad \quad \text{H}$ Condensed formula: Formula where groups of atom are shown in order as they appear in structural formula with no bond or dashes. Ethane: CH_3CH_3 Condensed formula Dot & Cross formula: formula in which electrons are shown as dot & cross b/w various atom in a molecule. Methane: $\text{H} \times \text{C} \times \text{H}$ $\quad \quad \quad \text{H}$ Key = C • H x Saturated: Hydrocarbons whose C-C atom have all single bond is called Saturated hydrocarbon. They are called alkane. Unsaturated: Hydrocarbons whose containing carbon carbon multiple bonds are called unsaturated i.e. $\text{C}=\text{C}$, $\text{C}\equiv\text{C}$. They are called alkenes & alkynes. General formula Alkane: $\text{C}_n\text{H}_{2n+2}$ Alkyne: $\text{C}_n\text{H}_{2n-2}$
Name:- Neha Jyotima		
Name:- Ayesha		
Teacher:- Nam Ayesha	Catination: The self-linking ability of carbon is called catination. $\text{CH}_3-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CH}_3$ <i>n</i>-pentane  Benzene Naming Alkanes: An international body, the international union of pure and applied chemistry (IUPAC) We can easily recognize organic compound by its IUPAC name. Such names are called systematic names. Parts →	Definition Hydrocarbons whose C-C atom have all single bond is called Saturated hydrocarbon. They are called alkane. Hydrocarbons whose containing carbon carbon multiple bonds are called unsaturated i.e. $\text{C}=\text{C}$, $\text{C}\equiv\text{C}$. They are called alkenes & alkynes. General formula Alkane: $\text{C}_n\text{H}_{2n+2}$ Alkyne: $\text{C}_n\text{H}_{2n-2}$ Example $\text{H}-\text{C}-\text{H}$ $\quad \quad \quad \text{H}$ Methane $\text{H}-\text{C}=\text{C}-\text{H}$ $\quad \quad \quad \text{H} \quad \quad \text{H}$ Ethene $\text{H}-\text{C}\equiv\text{C}-\text{H}$ Ethyne

1	Formic acid ^{Carboxylic acid} → Ant	Formaldehyde ^{aldehyde}
2	Acetic acid ^{Acid} → ^{Strong} Astringent	Acetaldehyde
3	Propionic acid → fat	Propionaldehyde
4	Butyric acid ^{Butter}	Butyraldehyde
5	Valeric acid → Plant	Valeraldehyde

Parts				Name	Formula	alkyl name	formula of Alkyl																																																																																				
Stem Suffin				Metane	CH_4	Methyl	$-CH_3$																																																																																				
Stem: The stem tells the no of carbon atom in the chain.				Ethane	C_2H_6	Ethyl	CH_3-CH_2 ($-C_2H_5$)																																																																																				
				Propane	C_3H_8	Propyl	C_3H_7-																																																																																				
				Butane	C_4H_{10}	Butyl	C_4H_9-																																																																																				
				Pentane	C_5H_{12}	Pentyl	$C_5H_{11}-$																																																																																				
				hexane	C_6H_{14}	hexyl	$C_6H_{13}-$																																																																																				
				heptane	C_7H_{16}	heptyl	$C_7H_{15}-$																																																																																				
				Octane	C_8H_{18}	octyl	$C_8H_{17}-$																																																																																				
				Nonane	C_9H_{20}	Nonyl	$C_9H_{19}-$																																																																																				
				Decane	$C_{10}H_{22}$	Decyl	$C_{10}H_{21}-$																																																																																				
<table border="1"> <thead> <tr> <th>Stem</th><th>No of carbon</th><th>Stem</th><th>No of carbon</th></tr> </thead> <tbody> <tr> <td>Meth-</td><td>1</td><td>Hep-</td><td>7</td></tr> <tr> <td>Eth-</td><td>2</td><td>Oct-</td><td>8</td></tr> <tr> <td>Prop-</td><td>3</td><td>Non-</td><td>9</td></tr> <tr> <td>But-</td><td>4</td><td>Dec</td><td>10</td></tr> <tr> <td>Pent-</td><td>5</td><td></td><td></td></tr> <tr> <td>Hex-</td><td>6</td><td></td><td></td></tr> </tbody> </table>				Stem	No of carbon	Stem	No of carbon	Meth-	1	Hep-	7	Eth-	2	Oct-	8	Prop-	3	Non-	9	But-	4	Dec	10	Pent-	5			Hex-	6			Butane: $CH_3-CH_2-CH_2-CH_3$ $-CH_2-CH_2-CH_2-CH_3$ $CH_3-CH-CH_2-CH_3$																																																											
Stem	No of carbon	Stem	No of carbon																																																																																								
Meth-	1	Hep-	7																																																																																								
Eth-	2	Oct-	8																																																																																								
Prop-	3	Non-	9																																																																																								
But-	4	Dec	10																																																																																								
Pent-	5																																																																																										
Hex-	6																																																																																										
Suffin: Suffin is placed after, it tells the class of compound. Example: The suffix "ane" is used.				n-Butyl iso-butyl																																																																																							
Butane → suffix it indicates alkene				Classification of organic compound:																																																																																							
Rules:				open chain close chain																																																																																							
Find the longest chain of carbon atoms.				straight chain branch chain																																																																																							
Number the chain from the nearest substituent.				Homocyclic/Carbocyclic Heterocyclic																																																																																							
Name and number substituents.				Alicyclic Aromatic																																																																																							
Combine names list substituents with their positions, followed by the parent chain.				Functional group: An atom or group of atom that gives a family of organic compounds characteristic chemical and Physical Properties is called functional group.																																																																																							
Use prefix (di, tri, etc) for multiple identical substituents.				<table border="1"> <thead> <tr> <th>Name</th><th>Definition</th><th>functional group</th><th>General formula</th><th>IUPAC (Suffin)</th><th>Example</th></tr> </thead> <tbody> <tr> <td>Alkane</td><td>H with C-C</td><td>-X</td><td>$R-H$</td><td>-ane</td><td>$CH_4 \Rightarrow$ Methane</td></tr> <tr> <td>Alkene</td><td>H with C=C</td><td>$-C=C-$</td><td>$R-C=C-R$</td><td>-ene</td><td>$C_2H_4 \Rightarrow$ Ethene</td></tr> <tr> <td>Alkyne</td><td>H with C≡C</td><td>$-C≡C-$</td><td>$R-C≡C-R$</td><td>-yne</td><td>$C_2H_2 \Rightarrow$ Ethyne</td></tr> <tr> <td>Haloalkane</td><td>Alkane with a halogen (Cl, Br, I) atom</td><td>$R-X$</td><td>$R-X$</td><td>-yl</td><td>$CH_3Br \Rightarrow$ Methyl Bromide</td></tr> <tr> <td>Alcohol</td><td>Compound with a hydroxyl group</td><td>$-OH$</td><td>$R-OH$</td><td>-ol</td><td>CH_3OH methyl alcohol</td></tr> <tr> <td>Phenol</td><td>Compound with a -OH attached to a benzene ring</td><td>$-OH$</td><td></td><td></td><td>C_6H_5OH Phenol</td></tr> <tr> <td>Ethers</td><td>Compound with two C groups</td><td>$-O-$</td><td>$R-O-R'$</td><td>-ether</td><td>CH_3-O-CH_3 Dimethyl ether</td></tr> <tr> <td>Aldehyde</td><td>Compound with a -CHO at end</td><td>$-CHO$</td><td>$R-CHO$</td><td>-al</td><td>CH_2O Formaldehyde</td></tr> <tr> <td>Ketones</td><td>Compound with carbonyl group C=O</td><td>$-C(=O)-$</td><td>$R-C(=O)-R'$</td><td>-one</td><td>CH_3COCH_3 Acetone</td></tr> <tr> <td>Carboxylic acid</td><td>$COOH$ group</td><td>$-COOH$</td><td>$R-COOH$ or $COOH$</td><td>-oic acid</td><td>CH_3COOH Acetic Acid</td></tr> <tr> <td>Ester</td><td>Compound with O b/w two C groups</td><td>$-COO-$</td><td>$R-COOR'$</td><td>-oate</td><td>$CH_3-COOCH_3$</td></tr> <tr> <td>Amine</td><td>Compound with N atom bond of C</td><td>$-NH_2$</td><td>$R-NH_2$</td><td>-amine</td><td>CH_3NH_2 Methyl amine</td></tr> <tr> <td>Amide</td><td>Compound with carbonyl group bond of N</td><td>$-CONH_2$</td><td>$R-C(=O)NH_2$</td><td>-amide</td><td>$CH_3-CO-NH_2$ Ethanamide</td></tr> </tbody> </table>				Name	Definition	functional group	General formula	IUPAC (Suffin)	Example	Alkane	H with C-C	-X	$R-H$	-ane	$CH_4 \Rightarrow$ Methane	Alkene	H with C=C	$-C=C-$	$R-C=C-R$	-ene	$C_2H_4 \Rightarrow$ Ethene	Alkyne	H with C≡C	$-C≡C-$	$R-C≡C-R$	-yne	$C_2H_2 \Rightarrow$ Ethyne	Haloalkane	Alkane with a halogen (Cl, Br, I) atom	$R-X$	$R-X$	-yl	$CH_3Br \Rightarrow$ Methyl Bromide	Alcohol	Compound with a hydroxyl group	$-OH$	$R-OH$	-ol	CH_3OH methyl alcohol	Phenol	Compound with a -OH attached to a benzene ring	$-OH$			C_6H_5OH Phenol	Ethers	Compound with two C groups	$-O-$	$R-O-R'$	-ether	CH_3-O-CH_3 Dimethyl ether	Aldehyde	Compound with a -CHO at end	$-CHO$	$R-CHO$	-al	CH_2O Formaldehyde	Ketones	Compound with carbonyl group C=O	$-C(=O)-$	$R-C(=O)-R'$	-one	CH_3COCH_3 Acetone	Carboxylic acid	$COOH$ group	$-COOH$	$R-COOH$ or $COOH$	-oic acid	CH_3COOH Acetic Acid	Ester	Compound with O b/w two C groups	$-COO-$	$R-COOR'$	-oate	$CH_3-COOCH_3$	Amine	Compound with N atom bond of C	$-NH_2$	$R-NH_2$	-amine	CH_3NH_2 Methyl amine	Amide	Compound with carbonyl group bond of N	$-CONH_2$	$R-C(=O)NH_2$	-amide	$CH_3-CO-NH_2$ Ethanamide
Name	Definition	functional group	General formula	IUPAC (Suffin)	Example																																																																																						
Alkane	H with C-C	-X	$R-H$	-ane	$CH_4 \Rightarrow$ Methane																																																																																						
Alkene	H with C=C	$-C=C-$	$R-C=C-R$	-ene	$C_2H_4 \Rightarrow$ Ethene																																																																																						
Alkyne	H with C≡C	$-C≡C-$	$R-C≡C-R$	-yne	$C_2H_2 \Rightarrow$ Ethyne																																																																																						
Haloalkane	Alkane with a halogen (Cl, Br, I) atom	$R-X$	$R-X$	-yl	$CH_3Br \Rightarrow$ Methyl Bromide																																																																																						
Alcohol	Compound with a hydroxyl group	$-OH$	$R-OH$	-ol	CH_3OH methyl alcohol																																																																																						
Phenol	Compound with a -OH attached to a benzene ring	$-OH$			C_6H_5OH Phenol																																																																																						
Ethers	Compound with two C groups	$-O-$	$R-O-R'$	-ether	CH_3-O-CH_3 Dimethyl ether																																																																																						
Aldehyde	Compound with a -CHO at end	$-CHO$	$R-CHO$	-al	CH_2O Formaldehyde																																																																																						
Ketones	Compound with carbonyl group C=O	$-C(=O)-$	$R-C(=O)-R'$	-one	CH_3COCH_3 Acetone																																																																																						
Carboxylic acid	$COOH$ group	$-COOH$	$R-COOH$ or $COOH$	-oic acid	CH_3COOH Acetic Acid																																																																																						
Ester	Compound with O b/w two C groups	$-COO-$	$R-COOR'$	-oate	$CH_3-COOCH_3$																																																																																						
Amine	Compound with N atom bond of C	$-NH_2$	$R-NH_2$	-amine	CH_3NH_2 Methyl amine																																																																																						
Amide	Compound with carbonyl group bond of N	$-CONH_2$	$R-C(=O)NH_2$	-amide	$CH_3-CO-NH_2$ Ethanamide																																																																																						
Example: 2-Methyl propane.				Alkane and Alkyl radical:																																																																																							
Add comma b/w number 2,2				Alkane: Alkane are saturated hydrocarbon containing only single bond.																																																																																							
Add (-) hyphen b/w (letter & no) (2-Methyl)				General formula: C_nH_{2n+2}																																																																																							
Alkyl radical: Group of atoms obtained by removing one hydrogen atom from an alkane.				General formula: C_nH_{2n+1} . Represented by: R																																																																																							
Q:-Difference b/w alkane, alkene & alkyne.				ane $\rightarrow$ yl																																																																																							