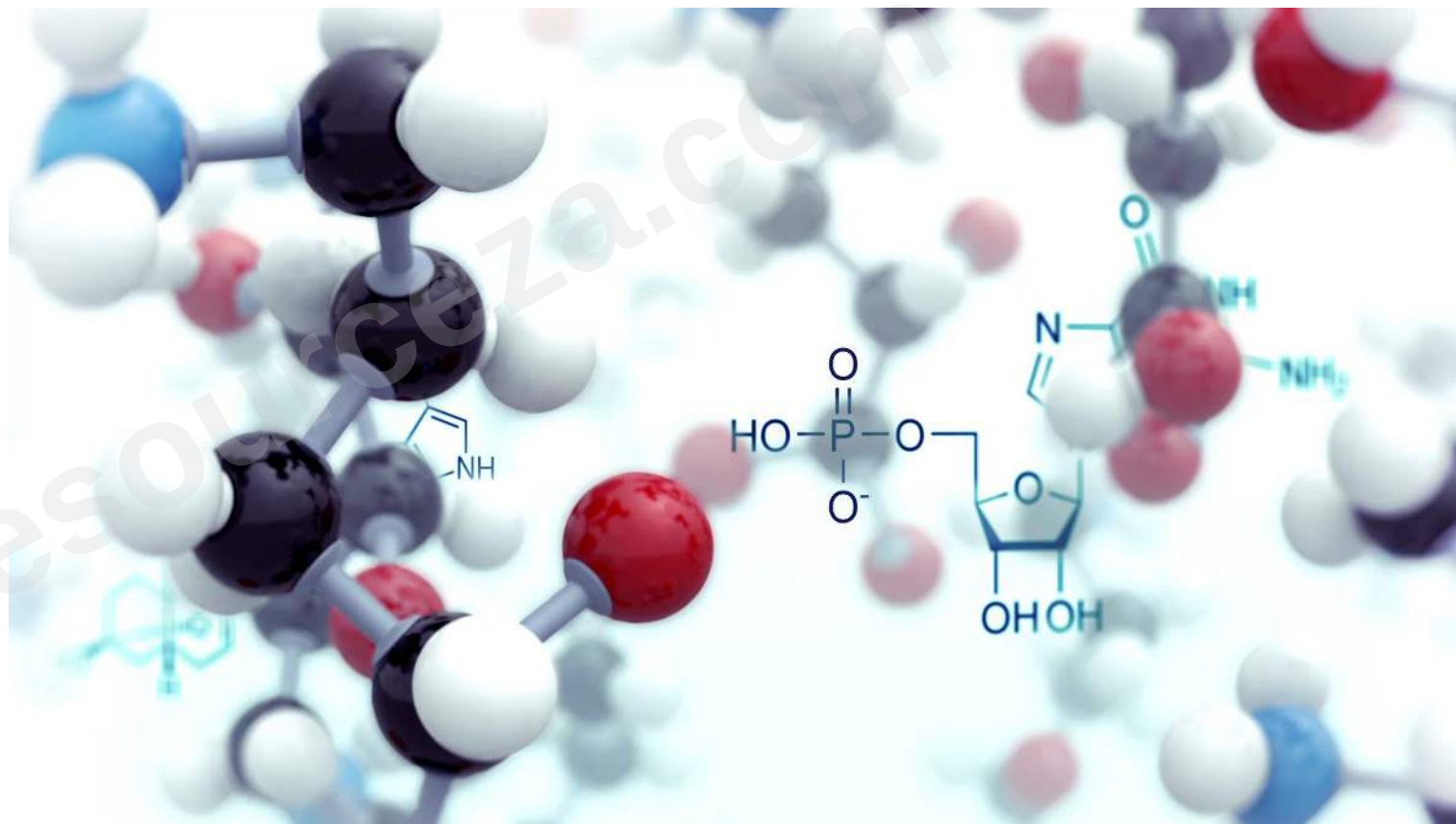




ORGANIC CHEMISTRY 2

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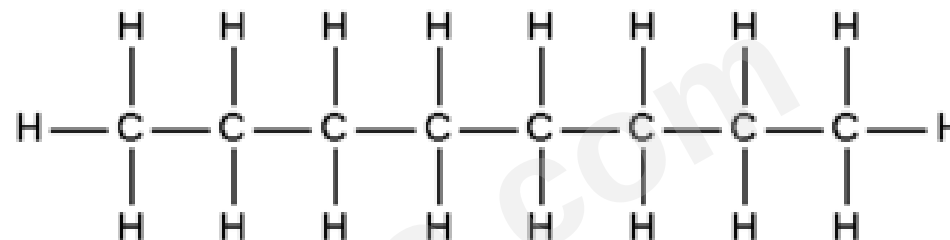
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Structure & Physical Properties

- Melting & boiling point of hydrocarbons increases with increased molecular mass – stronger intermolecular forces
- Molecular mass determines phase – gaseous, liquid, solid at room temp.
- Straight chains have higher melting & boiling points.

Characteristics...

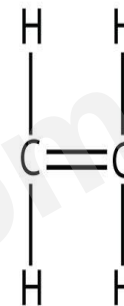
- Alkanes
 - Saturated
 - Unreactive
 - Non-polar – very weak intermolecular forces (induced dipole)
 - B.p increases with molecular mass
 - Gaseous – methane, ethane, propane, butane
 - Liquid – pentane, hexane, heptane, octane
 - Used as fuels – combust in air (oxygen), release heat, produce carbon dioxide + water



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- Alkenes

- At least one double bond
- Unsaturated
- More reactive than alkanes
- Non-polar – very weak intermolecular forces (induced dipole)
- Ethene (simplest) – plastic polythene
- Propene – polymer polypropene (polypropylene)
- B.p increases with molecular mass



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- Alkynes

- At least one triple bond
- Unsaturated
- Most reactive of the above groups
- Non-polar – very weak intermolecular forces (induced dipole)
- Ethyne – very reactive
 - Combusts in oxygen to give a very hot flame
 - Used in welding torches

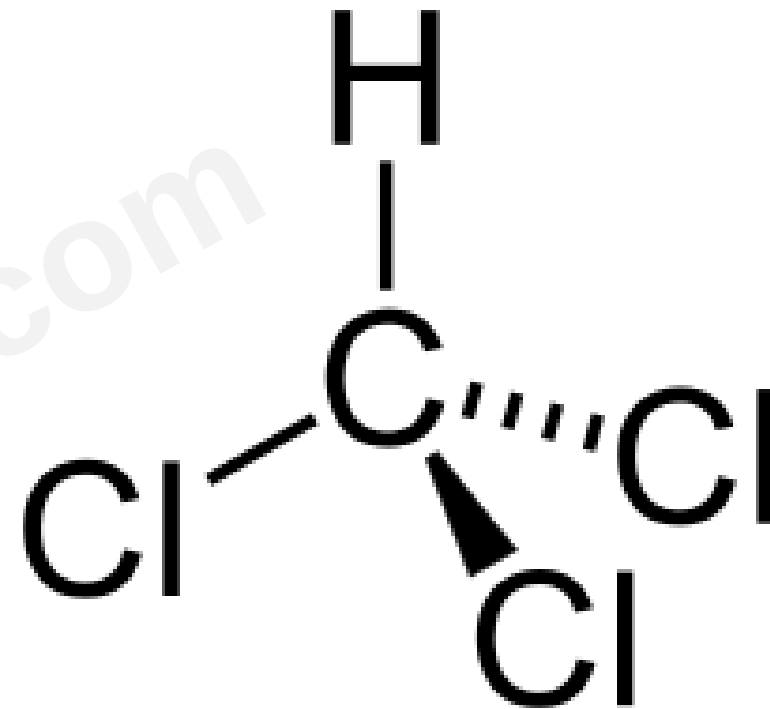


ethyne (acetylene)

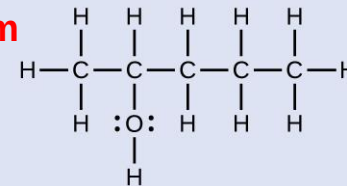
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- Haloalkanes

- At least one halogen
- Polar molecules – slightly stronger intermolecular forces (dipole-dipole forces)
- Volatile liquids – do not mix with water
- Solvents for fats & oils
- Tetrachloromethane is a toxic solvent in dry cleaning – replaced with tetrachloroethene
- Used as propellants in aerosols
- Chloroform was used for anaesthesia in the past but was replaced as it is toxic and caused liver damage

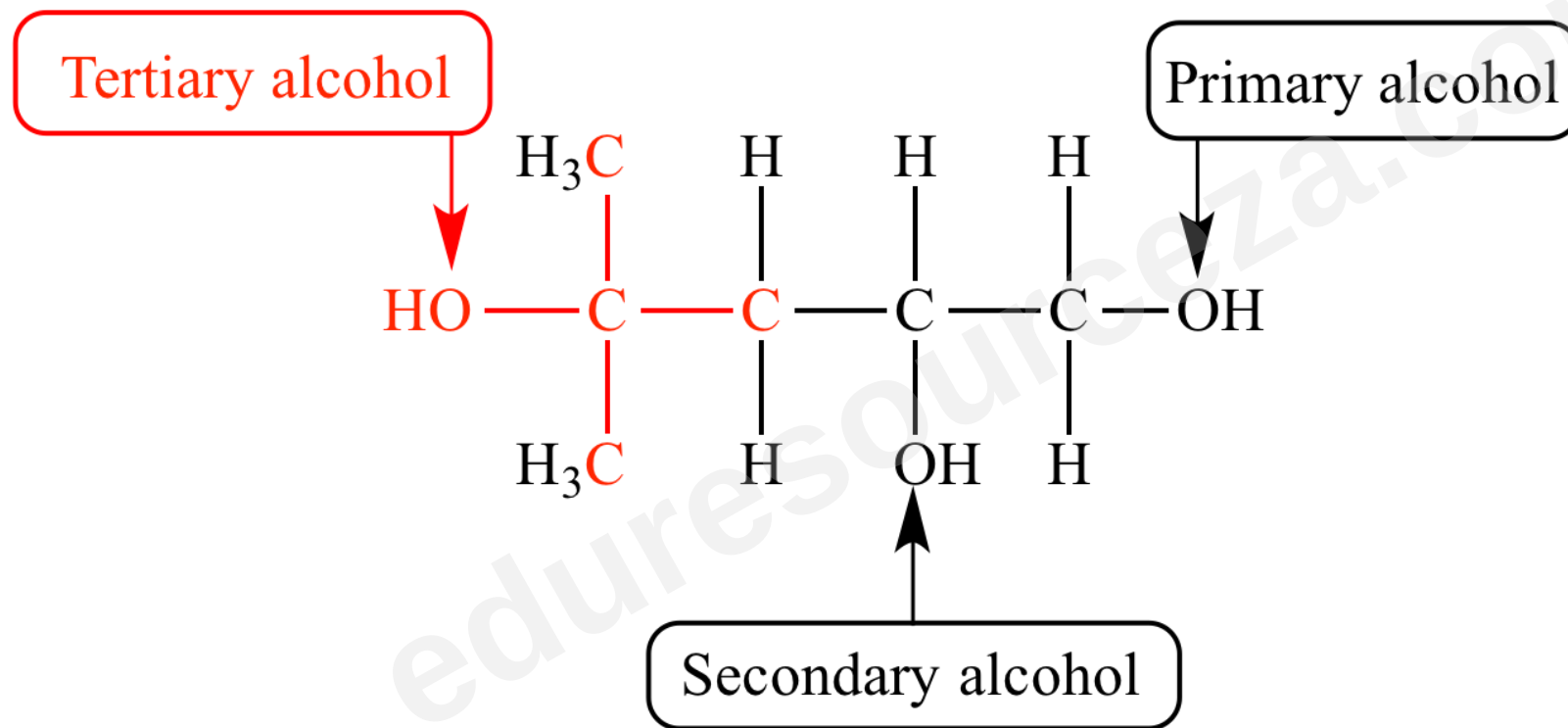


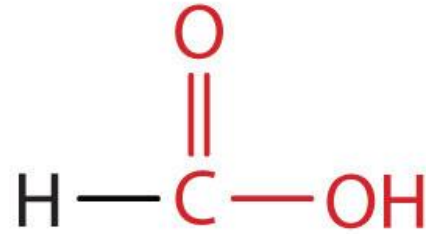
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- Alcohols
 - At least one hydroxyl group
 - Polar molecules – form hydrogen bonds (very strong intermolecular forces)
 - High melting & boiling points
 - Methanol – methylated spirits – very poisonous
 - Ethanol – from fermented plants – making beer, wine and other alcoholic drinks
 - Glycerine (glycerol) is an alcohol with three OH groups
 - Good solvents – one end of molecule is polar, the other is non-polar
 - Alcohols are miscible with water (forming a homogeneous mixture when added together)
 - Undergo oxidation to form carboxylic acids
 - 3 types of alcohols:
 - Primary – hydroxyl group is on the longest carbon chain (on end)
 - Secondary – hydroxyl group is between two carbons
 - Tertiary – hydroxyl is on the carbon chain connected to three carbon atoms





Formic acid

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- Carboxylic acids (fatty acids)
 - Contain the carboxyl group (-COOH)
 - Polar molecules, form hydrogen bonds – strong intermolecular forces – high melting & boiling points
 - Methanoic acid – found in bees, ants and stinging nettles (formic acid)
 - Ethanoic acid – found in vinegar (acetic acid)
 - Weak acids
 - Sodium ethanoate (CH₃COONa) – flavoring in salt & vinegar crisps

- Esters
 - Polar molecules – slightly stronger intermolecular forces than in pure hydrocarbons (dipole-dipole forces)
 - Formed from carboxylic acid and an alcohol – esterification
 - Sulphuric acid is used as a catalyst (dehydrating agent)
 - Have pleasant sweet smells – found in flowers and fruits