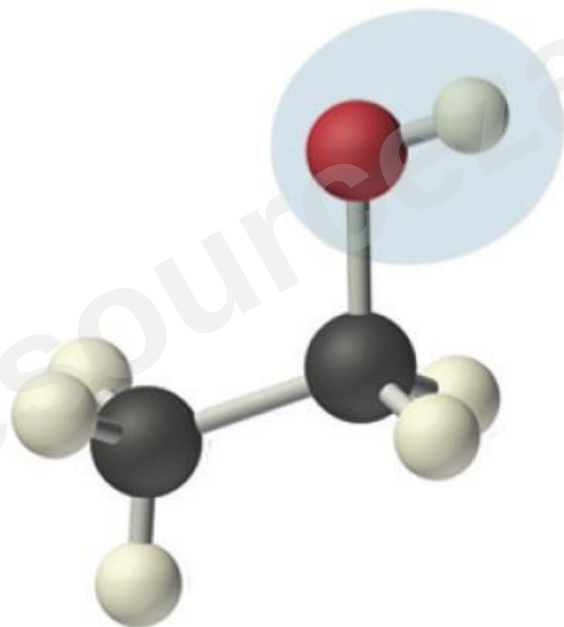


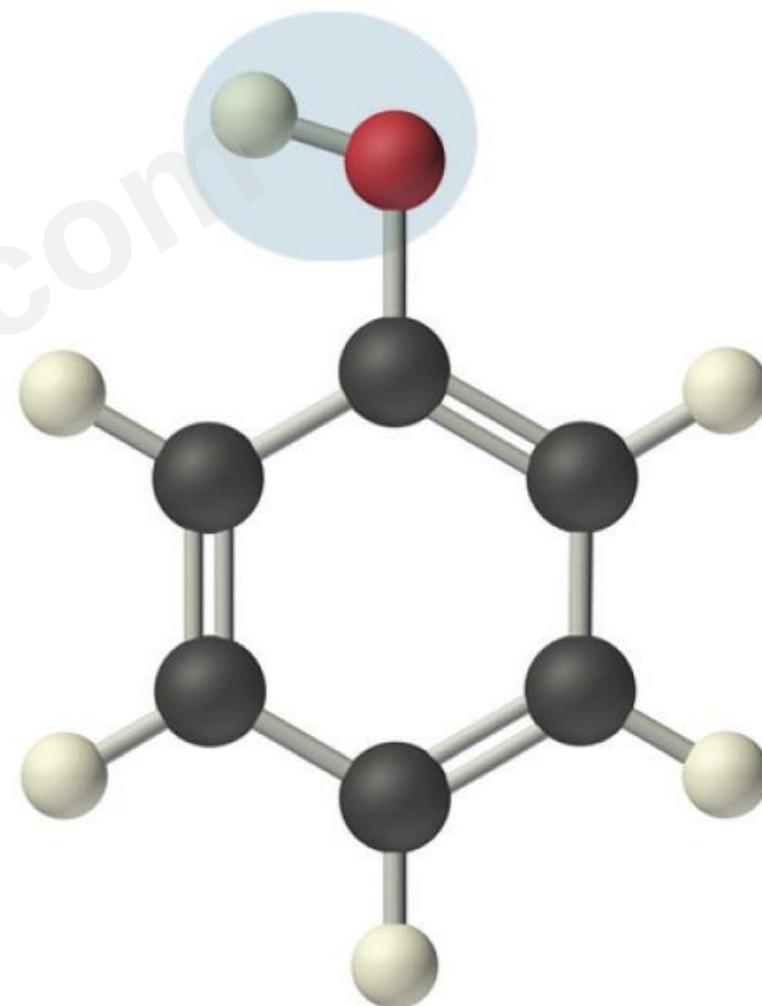


ORGANIC CHEMISTRY 3

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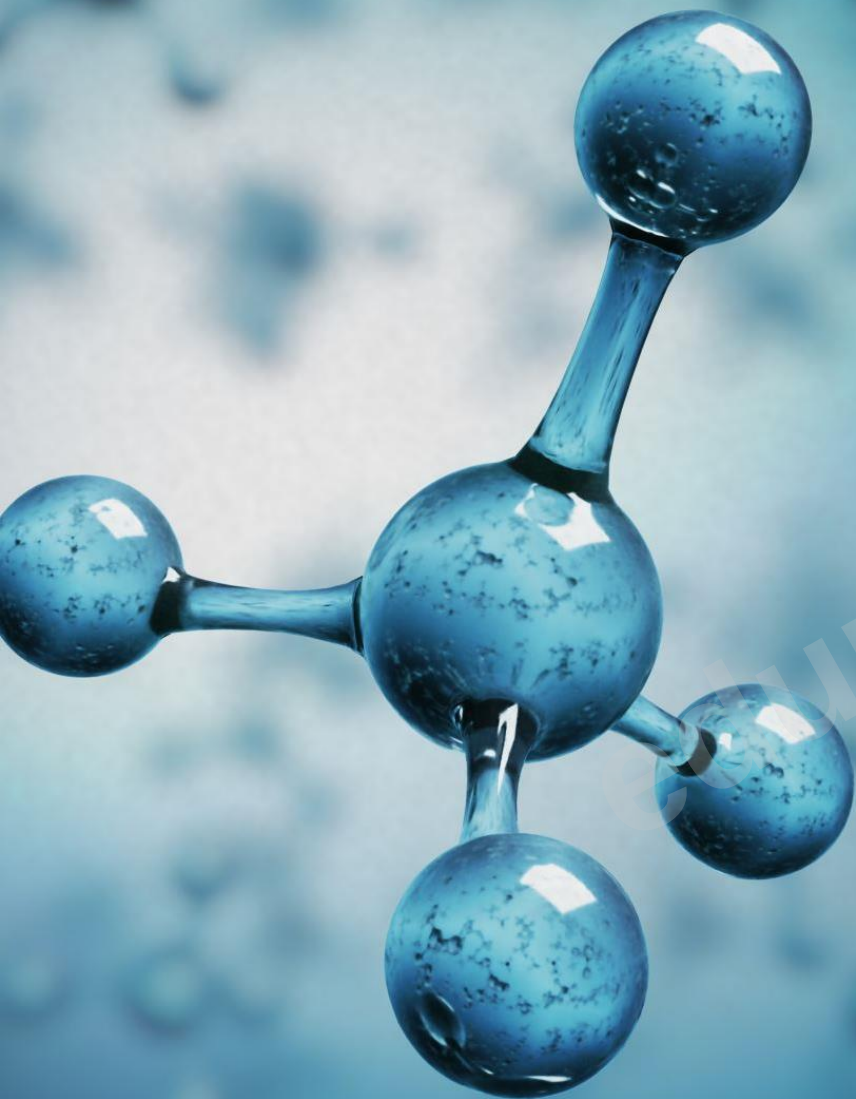


Ethanol, $\text{CH}_3\text{CH}_2\text{OH}$



Phenol, $\text{C}_6\text{H}_5\text{OH}$

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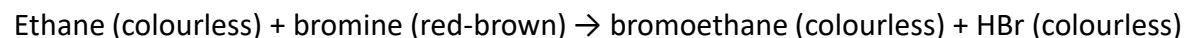
Hydrocarbons

- Used extensively in fuels – burn to release heat, carbon dioxide & water



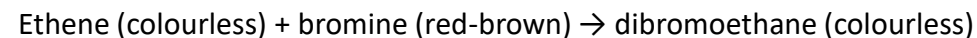
Alkanes are very unreactive but will undergo substitution reactions.

* hydrogen atoms are replaced by halogens (slow reaction, in sunlight)



Alkenes – more reactive, undergo addition reactions.

* the double bond 'breaks' to add to the molecule (fast reaction)



Reactions – addition, elimination, substitution

- **Addition reactions** – atoms added to an unsaturated compound through breaking of double bonds (see p230)
 - Hydration – water
 - Presence of a strong acid, use excess water
 - Halogenation – haloalkane (X_2)
 - Where X is Br, Cl or I
 - Hydrohalogenation – haloalkane (HX)
 - No water present
 - Hydrogenation – hydrogen
 - Addition of catalyst – Ni, Pt, Pd in Hydrogen gas

- **Elimination reactions** – two atoms removed from a saturated compound – forms an unsaturated compound (double bond) (see p231)
 - Dehydrohalogenation – elimination of HX
 - Creates a product with a double bond
 - H-atom is removed from the carbon with the least number of H-atoms attached to it
 - The haloalkane must be dissolved in concentrated solution of KOH or NaOH with ethanol, heated under reflux
 - Dehydration – elimination of water from an alcohol
 - Creates an alkene + water
 - Heat alcohol with excess concentrated phosphoric or sulphuric acid (acid-catalyst dehydration)
 - Cracking – large saturated hydrocarbons are broken into smaller unsaturated molecules
 - Thermal cracking – heat, pressure (no catalyst)
 - Catalytic cracking – catalyst, low temp. and pressure

- **Substitution reactions** – atoms are replaced by others (see p231)
 - Hydrolysis of haloalkanes
 - Haloalkane + base
 - Base dissolved in ethanol
 - Produces alcohol + salt
 - Reactions of HX with alcohols
 - Alcohol + HX
 - Tertiary alcohols – at room temp.
 - Primary & secondary alcohols – high temp.
 - Produces haloalkane + water
 - Halogenation of alkanes
 - Alkane + X₂
 - Presence of light or heat
 - Produces alkylhalide + HX

Condensation reactions (esterification) (see p231)

- Alcohol reacts with a carboxylic acid
 - In the presence of an acid catalyst
 - Forms an ester

