1.5 Alcohols and Ethers

- Similar in structure. Alcohols are R–OH and ethers are R–O–R'.

Alcohols

- Most are toxic, including ethanol.
- Alcohols contain the –OH (hydroxyl) functional group.
- When naming the –e in the parent alkane is dropped and the suffix –ol is added.

1º, 2º, and 3º Alcohols

- When naming, give the carbon number the hydroxyl is attached to (this is often omitted if on the first carbon).
- E.g. 1º alcohol 2º alcohol 3º alcohol

1-butanol 2-butanol 2-methyl-2-propanol

Polyalcohols

- Alcohols that contain more than 1 hydroxyl
- E.g. 1,2-ethanediol (ethylene glycol – *antifreeze*)
- E.g. 1,2,3-propanetriol (glycerol or glycerine)

Cyclic Alcohols

- Often named using common names such as menthol or cholesterol.
- Phenol is an aromatic alcohol also known as hydroxybenzene. (don't confuse it with phenyl)

phenyl phenol

Properties of Alcohols

- The –OH functional group makes alcohols polar and the presence of oxygen allows for hydrogen bonding. Therefore alcohols have high boiling points.
- Long chain alcohols exhibit both polar and non-polar properties.

Reactions with Alcohols

- Hydration Reaction to produce alcohol:
  1-butene + water → 2-butanol
- Combustion of alcohol: $2CH_3OH + 3O_2 \rightarrow 4H_2O + 2CO_2$
- Alcohols to Alkenes (An elimination reaction or dehydration)
  propanol → propene + water

Ethers

- Once used as anesthetics. Now are primarily used as solvents.
- General formula is R – O – R' (2 alkyl groups attached to an oxygen atom).
- Have a V shape at the oxygen, which makes the molecule slightly polar and gives them a higher boiling point than a similar alkane. It also allows them to be soluble in both polar and non-polar substances.

Naming Ethers

- Common naming: name both alkyls and add the word ether.
- IUPAC naming: add the suffix oxy to the smaller alkane and name the larger alkane.
- E.g. ethyl methyl ether = methoxyethane

Reactions: Ethers from Alcohol (Condensation Reactions)

- A condensation reaction is when a smaller molecule is lost in the reaction where a larger molecule is formed. If the molecule is water it is known as condensation.
- E.g. methanol + methanol → methoxymethane + water

Homework

- Practice 1,2,3,4,5,7,8,11,12
- Questions 1,2,3,4,5,6,7