**Exercise 2.2.1 Alcohols**

1. **Structure and isomerism**
2. Deduce the molecular formula of the first four members of the homologous series of alcohols.
3. Draw and name the first two alcohols.
4. How many alcohols are there with three carbon atoms? Draw and name them.
5. How many alcohols are there with four carbon atoms? Draw and name them, and state whether they are primary, secondary or tertiary alcohols.
6. **Physical properties**
7. Explain, with the aid of a diagram, why most alcohols are soluble in water.
8. Explain why alcohols are less volatile than most other organic compounds.

**2. Preparation of alcohols**

a) Write equations to show the production of ethanol by

1. fermentation of glucose

ii) hydration of ethene

Give the conditions needed for each process.

b) Suggest how methanol could be made in two steps from methane.

i) Give the reagents and conditions required for each step;

ii) Write equations for each step;

1. State the mechanism of the reaction in each step

**3. Combustion of alcohols**

a) Write equations to show the complete combustion of

1. methanol
2. ethanol
3. butan-1-ol

b) Explain why alcohols are less likely than alkanes to undergo complete combustion.

c) State one other advantage of using alcohols rather than hydrocarbons as fuels.

**4. Dehydration of alcohols**

1. Identify the organic product or products formed by the following dehydration reactions and write an equation for the reaction:
2. ethanol
3. propan-1-ol
4. propan-2-ol
5. butan-1-ol
6. butan-2-ol
7. methylpropan-1-ol
8. methylpropan-2-ol
9. State the conditions required for the dehydration of alcohols.
10. State the type of reaction taking place.
11. Give the names and structures of all eight alcohols with the formula C5H12O. State in each case whether they are primary, secondary or tertiary alcohols.

Identify the three isomers which can give two different alkenes when dehydrated and identify the possible alkene products in each case.

Identify the one isomer which cannot undergo dehydration and explain why this is the case.

**5. Uses of alcohols**

1. State two uses of ethanol
2. State two uses of methanol