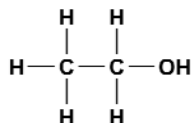
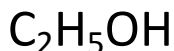


Introduction:

Macromolecules often contain one or more specific groups of atoms (sub-atoms), called **functional groups**. These sub-structural components are responsible for the chemical behaviour of a macromolecule. This activity will help you learn about the various functional groups that are found in biological macromolecules.

The **structural diagram** graphically outlines the bonding arrangement of a particular molecule. For example, ethanol's **molecular formula** is C_2H_5OH but its **structural formula** is represented graphically with the hydroxyl group written $-OH$.



See p. 25 for a list of functional groups.

Procedure:

Make & Draw each of the following and answer the questions in your notes.

- Construct a **water** molecule.
 - Draw a water molecule. Label the partially $-$ and $+$ ends.
 - What specific type of bond occurs between the O and H atoms in a molecule of water? _____
 - What specific type of bond occurs between separate water molecules? _____

- Construct a **carbon dioxide** molecule.
 - How many bonds link each oxygen atom to the carbon dioxide atom? _____
 - Which type of bond is present in the molecule? _____
 - Is this molecule polar or non-polar overall? Why? _____
 - _____

- Construct a **methane** molecule (CH_4).
 - Describe the shape of the model. _____
 - Is methane a polar molecule? How do you know? _____
 - Draw a methane molecule. _____
 - Can you tell whether molecules are polar from the models? Explain. _____

- Remove one H atom and replace it with a methyl group (CH_3). You have formed **ethane**.
 - Draw a structural diagram of ethane.
 - Why is ethane called a hydrocarbon? _____

SBI4U: Biochemistry

5. **Alcohols** are characterized by having an –OH (hydroxyl) group. Using your previous model for **ethane** make **ethanol**.

- a. Write its **chemical** formula. _____
- b. Draw ethanol and label the functional group.

c. Ethanol is a liquid and ethane is a gas. Explain why these molecules exist in these states.

6. **Recreate an ethane molecule.**

Remove two H atoms from one C and attach an O atom (it is a double bond). You have made **acetaldehyde**, it is in coffee and is produced by fruits.

a. Draw the structural diagram for this molecule

b. What functional group does it contain? Which type is it? _____

c. Is this molecule polar or non-polar? _____

7. Using the acetaldehyde molecule, remove the H atom from the C with the O and replace it with a hydroxyl group (-OH)

a. Draw the structural diagram of this molecule.

b. What functional group does this molecule contain? _____

8. Remove the hydroxyl group and add a **methyl** group (CH₃). You have just made **acetone**.

a. Draw the structural diagram.

b. What functional group does it contain? Which type is it? _____

9. Construct the molecule CH₃NH₂ (called methylamine)

a. Draw the structural diagram for this molecule.

b. What functional group(s) does it contain? _____

10. Name 2 functional groups that were not constructed in this activity.