



## C5.1 Knowledge Quiz: Carbon Chemistry

Describe what crude oil is and where it is found.	<b>Crude oil is the remains of ancient plankton biomass and it is found in rocks.</b>
Define a hydrocarbon.	<b>A molecule that contains hydrogen and carbon atoms only.</b>
State the general formula of the alkanes.	<b><math>C_nH_{2n+2}</math></b>
Name the first four alkanes.	<b>Methane, ethane, propane, butane</b>
State the chemical formula of ethane.	<b><math>C_2H_6</math></b>
Describe how crude oil is separated into fractions.	<b>Through fractional distillation, where crude oil is heated so the fractions evaporate and then condense at different temperatures depending on their boiling points.</b>
Compare the temperature at the top and bottom of a fractionating column.	<b>The bottom is much hotter than the top.</b>
State the order of the fractions that make up crude oil in order of increasing hydrocarbon chain length.	<b>Liquefied petroleum gases, petrol, kerosene, diesel, heavy fuel oil, bitumen</b>
Describe the pattern of viscosity and hydrocarbon chain length.	<b>The longer the chain length, the greater the viscosity.</b>
Describe the pattern of flammability and hydrocarbon chain length.	<b>The longer the chain length, the lower the flammability.</b>
Describe the pattern of boiling point and hydrocarbon chain length.	<b>The longer the chain length, the higher the boiling point.</b>
State the general equation for the combustion of alkanes.	<b>Alkane + oxygen <math>\rightarrow</math> carbon dioxide + water</b>
Give one disadvantage of burning hydrocarbons.	<b>It releases carbon dioxide, which contributes to global warming.</b>
Explain when incomplete combustion happens.	<b>If there is not enough air (oxygen) present.</b>
Compare the products of complete and incomplete combustion.	<b>Both produce water but complete combustion produces carbon dioxide while incomplete combustion produces carbon and carbon monoxide.</b>





Explain why large hydrocarbon molecules are cracked.	<b>As there is greater demand for shorter hydrocarbons (as fuels).</b>
Describe what happens when large hydrocarbon molecules are cracked.	<b>They can be broken down (by steam or catalytic cracking) to form a shorter chain alkane and an alkene.</b>
Explain how bromine water can be used to tell the difference between an alkane and an alkene.	<b>Alkenes are unsaturated so bromine water will turn from orange to colourless when added to an alkene but alkanes are saturated so bromine water would not change colour.</b>
What are polymers?	<b>Long molecules made of repeating subunits.</b>
What is the name of the units that make up polymers?	<b>Monomers</b>
What links the atoms in polymers together?	<b>Covalent bonds</b>
In the displayed formula for a polymer, what does the $n$ outside the brackets represent?	<b>The number of repeating units found in the polymer</b>
Why are polymers generally solids at room temperature?	<b>The intermolecular forces between polymer chains are relatively strong</b>
What do the properties of polymers depend on?	<b>The conditions in which they are made.</b>
What does LDPE stand for?	<b>Low density poly(ethene)</b>
What does HDPE stand for?	<b>High density poly(ethene)</b>
What is the monomer that makes up both LDPE and HDPE?	<b>Ethene</b>
What are thermosoftening polymers?	<b>Long chain molecules that melt when heated</b>
What are thermosetting polymers?	<b>Long chain molecules that do not melt when heated</b>

### Chemistry only

State the general formula for alkenes.	<b><math>C_nH_{2n}</math></b>
----------------------------------------	-------------------------------





Explain why alkenes are described as unsaturated.	<b>They contain a C=C double bond</b>
How many pairs of electrons are shared when a double covalent bond is formed?	<b>2 pairs</b>
Write the chemical formula for propene.	<b>C<sub>3</sub>H<sub>6</sub></b>
Predict what will be produced when ethene reacts with hydrogen (in the presence of a catalyst).	<b>Ethane</b>
State the functional group found in alcohols.	<b>-OH</b>
Name the functional group found in alcohols.	<b>Hydroxyl group</b>
State the chemical formula of ethanol.	<b>C<sub>2</sub>H<sub>5</sub>OH</b>
Give a use of methanol.	<b>As a chemical feedstock</b>
Give a use of ethanol.	<b>A solvent, a fuel or in alcoholic drinks</b>
Write a word equation for the reaction between sodium and ethanol.	<b>Sodium + ethanol → sodium ethoxide + hydrogen (gas)</b>
Describe how ethanol is produced through fermentation.	<b>Glucose is broken down by microorganisms such as yeast, in the absence of oxygen to form ethanol and carbon dioxide.</b>
Describe the conditions required for fermentation.	<b>No oxygen present, a sugar solution mixed with yeast and a warm temperature</b>
State the word equation for fermentation.	<b>Glucose → ethanol + carbon dioxide</b>
Describe how ethanol can be produced from ethene.	<b>Ethene can be hydrated with steam to produce ethanol</b>
Describe the conditions required for producing ethanol from ethene.	<b>This requires a high temperature (300 °C), a pressure of 60-70 atm and a catalyst</b>
Give an advantage of using fermentation to produce ethanol rather than ethene.	<b>Fermentation uses a renewable raw material (sugar, usually from crops).</b>





Give an advantage of using ethene to produce ethanol rather than fermentation	<b>The reaction is much faster and produces ethanol with higher purity.</b>
State the functional group found in carboxylic acids.	<b>-COOH</b>
Name the functional group found in carboxylic acids.	<b>Carboxyl group</b>
State the chemical formula of propanoic acid.	<b>C<sub>2</sub>H<sub>5</sub>COOH</b>
Name the carboxylic acid found in vinegar.	<b>Ethanoic acid</b>
State the pH range of aqueous solutions of carboxylic acids.	<b>Less than 7</b>
Write the general equation for the reaction between a carboxylic acid and a metal carbonate.	<b>Carboxylic acid + metal carbonate → salt + water + carbon dioxide</b>
Describe how an ester is formed.	<b>Through the reaction between an alcohol and a carboxylic acid</b>
Write the general equation for how an ester is formed.	<b>Alcohol + carboxylic acid → ester + water</b>
State the functional group found in esters.	<b>-COO-</b>
Give two uses of esters.	<b>In scented products or as solvents</b>
Name the ester produced through the reaction between ethanol and ethanoic acid.	<b>Ethyl ethanoate</b>
Describe the process of addition polymerisation.	<b>Monomers with C=C double bonds are broken open and joined to form a long chain polymer</b>
Name the monomer used to produce poly(propene).	<b>Propene</b>
Name the polymer made through addition polymerisation of ethene.	<b>Poly(ethene)</b>
Describe the process of condensation polymerisation.	<b>Monomers each have two functional groups, which join to make a long chain polymer and release a small molecule, which is usually water</b>





Compare the products of addition polymerisation and condensation polymerisation.	<b>Addition polymerisation only makes a polymer but condensation polymerisation makes a polymer and a small molecule, usually water</b>
Give three naturally occurring polymers.	<b>DNA, proteins, starch, cellulose</b>
Describe the structure of DNA.	<b>DNA is made up of two polymer strands held in a double helix. Each polymer strand contains repeating nucleotide units, which each contain a base, a sugar and a phosphate group.</b>

