



C5.1 Knowledge Quiz: Carbon Chemistry

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





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

Chemistry only

State the general formula for alkenes.	C_nH_{2n}
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Explain why alkenes are described as unsaturated.	They contain a C=C double bond
How many pairs of electrons are shared when a double covalent bond is formed?	2 pairs
Write the chemical formula for propene.	C₃H₆
Predict what will be produced when ethene reacts with hydrogen (in the presence of a catalyst).	Ethane
State the functional group found in alcohols.	-OH
Name the functional group found in alcohols.	Hydroxyl group
State the chemical formula of ethanol.	C₂H₅OH
Give a use of methanol.	As a chemical feedstock
Give a use of ethanol.	A solvent, a fuel or in alcoholic drinks
Write a word equation for the reaction between sodium and ethanol.	Sodium + ethanol → sodium ethoxide + hydrogen (gas)
Describe how ethanol is produced through fermentation.	Glucose is broken down by microorganisms such as yeast, in the absence of oxygen to form ethanol and carbon dioxide.
Describe the conditions required for fermentation.	No oxygen present, a sugar solution mixed with yeast and a warm temperature
State the word equation for fermentation.	Glucose → ethanol + carbon dioxide
Describe how ethanol can be produced from ethene.	Ethene can be hydrated with steam to produce ethanol
Describe the conditions required for producing ethanol from ethene.	This requires a high temperature (300 °C), a pressure of 60-70 atm and a catalyst
Give an advantage of using fermentation to produce ethanol rather than ethene.	Fermentation uses a renewable raw material (sugar, usually from crops).





Give an advantage of using ethene to produce ethanol rather than fermentation	The reaction is much faster and produces ethanol with higher purity.
State the functional group found in carboxylic acids.	-COOH
Name the functional group found in carboxylic acids.	Carboxyl group
State the chemical formula of propanoic acid.	C₂H₅COOH
Name the carboxylic acid found in vinegar.	Ethanoic acid
State the pH range of aqueous solutions of carboxylic acids.	Less than 7
Write the general equation for the reaction between a carboxylic acid and a metal carbonate.	Carboxylic acid + metal carbonate → salt + water + carbon dioxide
Describe how an ester is formed.	Through the reaction between an alcohol and a carboxylic acid
Write the general equation for how an ester is formed.	Alcohol + carboxylic acid → ester + water
State the functional group found in esters.	-COO-
Give two uses of esters.	In scented products or as solvents
Name the ester produced through the reaction between ethanol and ethanoic acid.	Ethyl ethanoate
Describe the process of addition polymerisation.	Monomers with C=C double bonds are broken open and joined to form a long chain polymer
Name the monomer used to produce poly(propene).	Propene
Name the polymer made through addition polymerisation of ethene.	Poly(ethene)
Describe the process of condensation polymerisation.	Monomers each have two functional groups, which join to make a long chain polymer and release a small molecule, which is usually water



Compare the products of addition polymerisation and condensation polymerisation.	Addition polymerisation only makes a polymer but condensation polymerisation makes a polymer and a small molecule, usually water
Give three naturally occurring polymers.	DNA, proteins, starch, cellulose
Describe the structure of DNA.	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.

