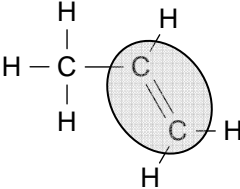
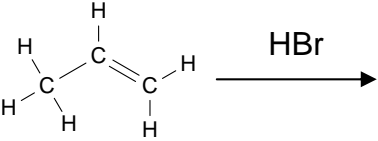
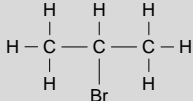
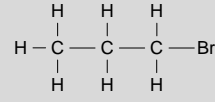
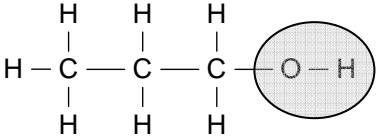
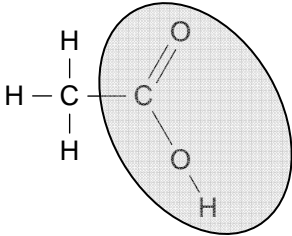
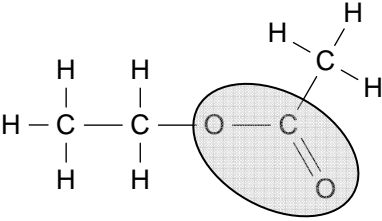
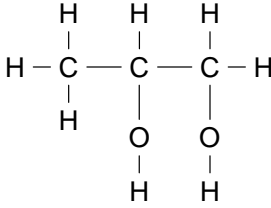
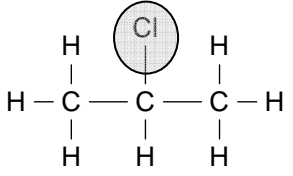
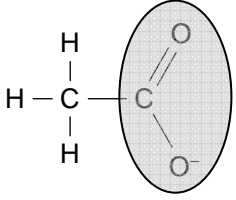
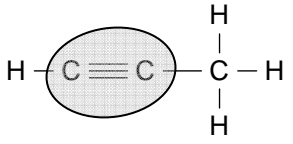
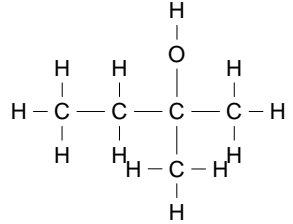
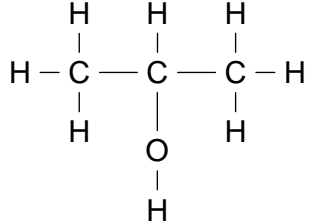
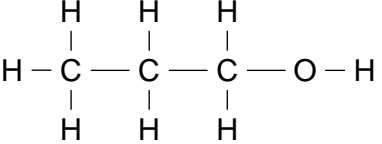
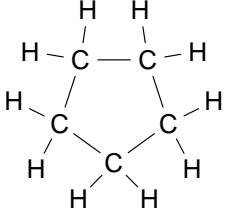
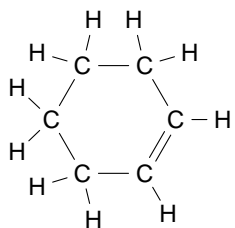
 <p>Functional group* and name?</p>	<p>Alkane C-C single bond (propane)</p> <p>*alkanes not really regarded as a functional group</p>	 <p>Functional group and name?</p>	<p>Alkene C=C double bond (propene)</p>
<p>Addition of an unsymmetrical reagent to unsymmetrical alkene</p> 	<p>major</p>  <p>&</p> <p>minor</p> 	 <p>Functional group and name?</p>	<p>Alcohol - OH group (1-propanol)</p>
<p>Functional groups Eg -OH, C=C, -COOH</p>	<p>Specific groups of atoms within molecules, responsible for the characteristic chemical reactions of those molecules.</p>	 <p>Functional group and name?</p>	<p>Carboxylic acid - COOH group (ethanoic acid)</p>
 <p>Functional group and name?</p>	<p>Ester R-COO-R (ethyl ethanoate)</p>	 <p>Name?</p>	<p>Diol Has 2x -OH groups (propan-1-2-diol)</p>

 <p>Functional group and name?</p>	<p>Haloalkane $R - X$ Where X is F, Cl, Br or I (2-chloropropane)</p>	 <p>Functional group and name?</p>	<p>Carboxylate ion (ethanoate ion)</p>
 <p>Functional group and name?</p>	<p>Alkynes $C \equiv C$ triple bond (propyne)</p>	<p>Naming C 1 - 6</p>	<p>1 meth- 2 eth- 3 prop- 4 but- 5 pent- 6 hex-</p>
<p>Classification of alcohol</p> 	<p>Tertiary alcohol 3 alkyl groups attached to the C with the -OH</p>	<p>Classification of alcohol</p> 	<p>Secondary alcohol 2 alkyl groups attached to the C with the -OH</p>
<p>Classification of alcohol</p> 	<p>Primary alcohol 1 (or 0) alkyl group attached to the C with the -OH</p>	 <p>Functional group and name?</p>	<p>Cycloalkane (cyclopentane)</p>



Functional group and name?

Cycloalkene
(cyclohexene)

Addition of Br₂
across a double bond

Bromination
Br₂

To convert alcohol to
alkene

Dehydration
Conc. H₂SO₄

Addition of Cl₂
across a double bond

Chlorination
Cl₂

Substitution of alkanes –
with Br₂ or Cl₂

Cl₂* & UV light
and/or heat
* or Br₂
Limited to monosubstitution

Addition of H₂
across a double bond
(turn unsaturated → saturated
molecule)

Hydration
H₂, Pt
Pt platinum catalyst

To convert a PRIMARY
alcohol into a carboxylic
acid

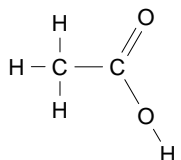
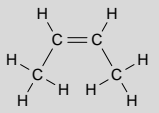
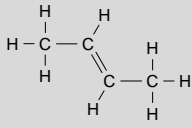
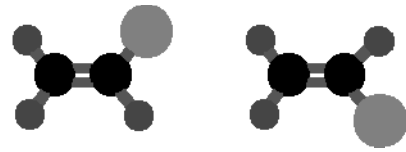
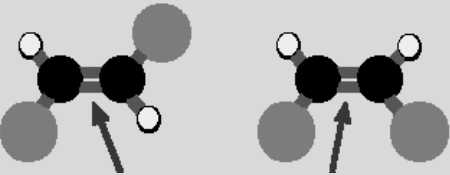
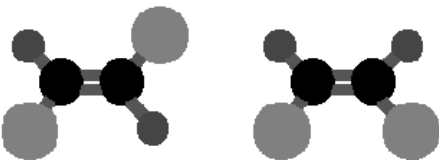
H⁺/Cr₂O₇²⁻
Warm
Or use H⁺/MnO₄⁻, warm

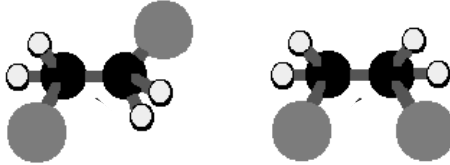
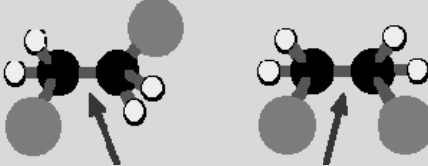
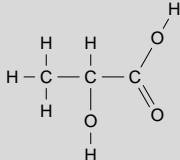
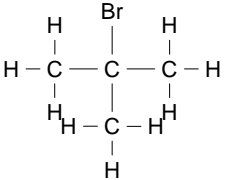
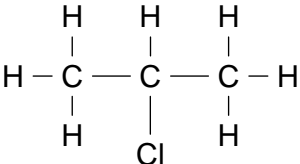
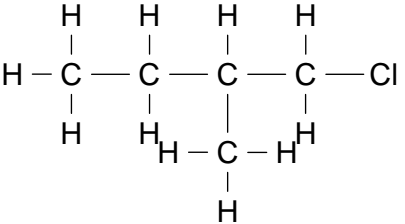
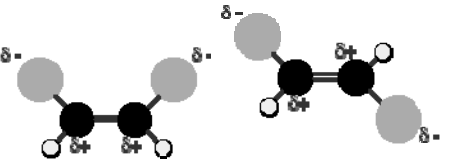
Addition of H₂O
H-OH
across a double bond

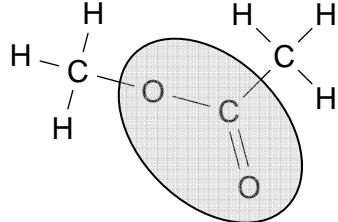
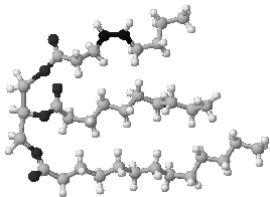
Hydration
H₂O, H⁺ warm with
dilute sulfuric acid

Side chains $\begin{array}{c} \text{H} \\ \\ \text{H}-\text{C}- \\ \\ \text{H} \end{array}$	Methyl CH ₃ - Ethyl C ₂ H ₅ - Propyl C ₃ H ₇ -	F- Cl - Br- I -	Fluoro, chloro, bromo, iodo
di tri tetra eg 2,3-dichlorobutane	di=2, tri=3, tetra=4 of the same group eg trimethyl.... dichloro etc	Naming In names, separate numbers from other numbers with a ____	Comma Eg 2,3 Numbers show LOCATION on the C chain and not “how many”
Acid Hydrolysis of Esters (warm with dilute sulfuric acid)	Produces alcohol + carboxylic acid	Naming In names, separate numbers from letters with a ____	Dash Eg 3-chloro
Alkaline Hydrolysis of Esters (warm with dilute NaOH)	Produces alcohol + sodium salt of carboxylic acid	Naming esters ____yl ____anoate	1st part comes from alcohol, 2 nd part from carboxylic acid Eg ethyl propanoate made from ethanol and propanoic acid

Markovnikoff's rule "The rich get richer" Used to predict major/minor products when adding to asymmetric* alkene *unsymmetrical	The H of the reagent adds to the carbon of the double bond that already has the most hydrogen atoms	Alkanes C_nH_{2n+2}	Saturated hydrocarbons Insoluble in water Useful as fuels Otherwise quite unreactive
Saturated	Saturated means the molecule has only carbon-carbon single bonds, and so has combined with the maximum number of atoms i.e. no atoms can add to it.	Isomers Isomerism occurs when two or more compounds have the same chemical formula but have different structures.	For C_4H_{10} there are two possibilities - one 'linear' and one with carbon chain 'branching'
Substitution reactions (An H in an alkane is substituted by a halogen eg Cl or Br)	Need the halogen Br_2 or Cl_2 and uv light and/or heat to occur	Alkenes C_nH_{2n}	Unsaturated hydrocarbons Insoluble in water Much more reactive than the alkenes
Addition reactions (one of the carbon=carbon double bonds breaks allowing each carbon atom to form a covalent bond with another atom)	The alkenes are more reactive than alkanes because of the presence of the $C=C$ double bond. The alkenes readily undergo addition reactions with hydrogen or bromine.	Bromine water (orange) Simple test to distinguish an alkene (or alkyne) from an alkane.	Alkenes react rapidly with bromine and decolourise orange bromine water because the organic product is colourless.

<p>Ethanoic acid Carboxylic acid</p> 	<p>Vinegar contains ethanoic acid CH_3COOH, old name "acetic acid". It is used as a preservative and in food flavourings.</p>	<p>Unsaturated</p>	<p>An unsaturated hydrocarbon (or other organic molecule) contains double or triple bonds between certain C atoms – more atoms can add to it.</p>
<p>Geometrical isomers cis & trans</p>	<p>Atoms making up the isomers are joined up in the same order, but have a different spatial arrangement</p>	<p>Addition polymerisation Most plastics made from alkene compounds by addition polymerisation</p>	<p>The general reaction is small monomer \rightarrow long polymer molecule (small molecules link to form a chain)</p>
<p>Geometrical isomers of but-2-ene</p>	<p>cis</p>  <p>trans</p> 	<p>Geometrical isomers?</p> 	<p>No – to make one into the other just turn one of them upside down</p>
<p>Geometrical isomers – why is a $\text{C}=\text{C}$ necessary?</p>	 <p>No free rotation is possible about the $\text{C}=\text{C}$ bond</p>	<p>Geometrical isomers?</p> 	<p>Yes – to make one into the other you'd have to break bonds/swap atoms (trans on left, cis on right)</p>

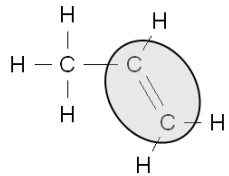
What must you have to get geometrical isomers?	restricted rotation due to C=C AND two different groups on the left-hand end of the bond and two different groups on the right-hand end	Geometrical isomers? 	 <p>No - because it can rotate freely around C-C</p>
Structural formulae – shows what is bonded to what	Expanded  Or condensed <chem>CH3CH(OH)COOH</chem>	Acid reactions of carboxylic acids (weak acids)	Turn blue litmus red Turn UI orange React with metals → H ₂ React with carbonates & hydrogen carbonates → CO ₂
Classification of haloalkane	Tertiary haloalkane 3 alkyl groups attached to the C with the -X 	Classification of haloalkane 	Secondary haloalkane 2 alkyl groups attached to the C with the -X
Classification of haloalkane	Primary haloalkane 1 (or 0) alkyl group attached to the C with the -X 	 <p>Extension – which will be polar?</p>	The cis isomer One side of the molecule will have a slight negative charge while the other is slightly positive. The molecule is therefore polar – the dipoles don't cancel out.

<p>Triglyceride</p> <p>glycerol esterified with three fatty acids.</p>	$\begin{array}{c} \text{CH}_2\text{-OOCR} \\ \\ \text{CH-OOCR}' \\ \\ \text{CH}_2\text{-OOCR}'' \end{array}$ <p>where R, R', and R'' are long alkyl chains</p>	<p>Esterification</p> 	<p>Heat alcohol & carboxylic acid with conc. H_2SO_4 (acts as catalyst & dehydrating agent)</p>
<p>Glycerol</p>	<p>Propan-1-2-3-triol</p> $\begin{array}{c} \text{H} \\ \\ \text{H}-\text{C}-\text{O}-\text{H} \\ \\ \text{H}-\text{C}-\text{O}-\text{H} \\ \\ \text{H}-\text{C}-\text{O}-\text{H} \\ \\ \text{H} \end{array}$	<p>Fatty acids R-COOH</p>	<p>Fatty acids are long chain carboxylic acids – may be saturated or unsaturated or polyunsaturated</p>
<p>Alkaline hydrolysis of Triglycerides Saponification</p>	<p>Produces glycerol and sodium salts of the fatty acids – eg sodium stearate (soap)</p>	<p>Triglycerides</p> 	<p>Tri-glycerides with more unsaturated fatty acids are called 'oils' - liquid at room temp. Tri-glycerides with more saturated fatty acids have higher melting points - fats - solid at room temp.</p>
<p>Molecular formula</p>	<p>Formula of the actual molecule</p> <p>eg lactic acid $\text{C}_3\text{H}_6\text{O}_3$</p>	<p>Empirical formula</p>	<p>Stoichiometric proportions of atoms only - simplest ratio formula</p> <p>Eg CH_2O is e.f. of $\text{C}_3\text{H}_6\text{O}_3$</p>

INSTRUCTIONS

Suggested use: Print on paper, fold and glue so grey portion is back of white portion

OR print on card, cut out & keep as a pair – notes & further detail

<p>I</p>  <p>Functional group and name?</p>	<p>Alkene C=C double bond (propene)</p>
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SPARE CARDS – for any additional cards you wish to make – or to replace any that might have errors that sometimes slip in despite our best efforts.
