

AS 90730 version 2

Describe selected organic compounds and their uses

Level 3 Credits 4

This achievement standard involves describing selected organic compounds and their uses.

Selected organic compounds refers to the structure, and physical and chemical properties of alkanes, alkenes, alcohols, carboxylic acids, fats and oils. Uses refers to uses and/or effects of organic compounds in household, health, environmental, and industrial contexts.

Alkanes and alkenes (limited to unbranched chains)

- properties include
 - solubility
 - insolubility in water (polar solvent)
 - solubility in non-polar solvents
 - solubility in soap / detergent solutions
 - melting and boiling point
 - length of hydrocarbon chains and forces of attraction between them
 - relationship between chain length and melting and boiling points
 - effect on properties of increasing carbon chain length
 - how boiling point is used to separate the fractions in crude oil
 - degree of saturation
- reactions are limited to
 - combustion
 - complete & incomplete combustion
 - balanced symbol equations for complete & incomplete combustion
 - relative energies of complete & incomplete combustion
 - need for good ventilation (linked to health)
 - relationship between size of the alkanes and amount of energy released when combusted
 - addition reactions with hydrogen
 - the addition polymerisation of ethene
 - monomers & polymer
 - polymer structure
- uses
 - fuels
 - polymer production

Alcohols (limited to unbranched, primary alcohols)

- properties include
 - solubility
 - why ethanol is soluble in water
 - effect of size of molecule on its solubility in water
 - melting and boiling points
- reactions limited to
 - complete oxidation of alcohols
 - use of $\text{H}^+/\text{Cr}_2\text{O}_7^{2-}$ & colour change (from orange $\text{Cr}_2\text{O}_7^{2-}$ to green Cr^{3+})
 - esterification – laboratory preparation
 - identifying the ester functional group in structural formulae
 - equations for esterification, naming and drawing esters

- conditions chosen to favour ester production, e.g. use of conc. H_2SO_4
 - as catalyst
 - as dehydrating agent, to alter equilibrium position of the reaction
 - esters as fragrances (linked to their volatility)
 - esters as flavourings
- uses could include alcohols
- as solvents e.g. why alcohol is used as a solvent in perfumes and aftershaves
 - as fuels

Carboxylic acids (limited to mono carboxylic acids)

- properties include
- pH
 - solubility
 - odour (e.g. ethanoic acid “vinegary” and butanoic acid “sharp, rancid butter”)
- reactions are limited to esterification
- uses could include
- formation of esters including triglycerides

Fats and oils (fats, oils and their constituent fatty acids)

- structure of fats and oils
- fatty acid notation e.g. 18:0 and 18:3
 - the differences between fats (solid) and oils (liquids)
 - fats/oils as triesters; esters of long chain carboxylic acids (fatty acids) & glycerol backbone
- properties include
- melting point
 - shape of molecules
 - degree of saturation
 - testing for unsaturation using bromine or iodine
 - significance of “iodine number” of a fat/oil (no. of g of I_2 that react with 100 g of fat/oil)
 - effect on melting point of
 - increasing fatty acid chain length & degree of saturation (linked to shape)
- reactions will be limited to the tests for unsaturation using bromine or iodine
- uses could include
- fats and oils as foods and their effect on human health
 - effects of consumption of excess fats / oils
 - the effect of
 - degree of saturation
 - cis and trans structures
 - “good” and “bad” fatty acids
 - action of the soap and detergent anion on triglycerides and hydrocarbons
 - structure of soap
 - structure of anionic detergent molecule e.g. sodium lauryl sulfate
 - identifying cationic, anionic and non-ionic detergents
 - how soaps / detergents work to remove grease
 - polarity of molecule
 - micelle formation