

AS91391

Demonstrate understanding of the properties of organic compounds

Level 3, Credits 5

This achievement standard involves demonstrating understanding of the properties of organic compounds.

| Achievement | Achievement with Merit | Achievement with Excellence |
|---|--|---|
| Demonstrate understanding of the properties of organic compounds. | Demonstrate in-depth understanding of the properties of organic compounds. | Demonstrate comprehensive understanding of the properties of organic compounds. |

Organic compounds are limited to those containing one or more of the following functional groups:

- | | | | |
|-------------------------------------|-----------------------------------|--|--|
| <input type="checkbox"/> alkene | <input type="checkbox"/> alcohol | <input type="checkbox"/> carboxylic acid | <input type="checkbox"/> acyl chloride |
| <input type="checkbox"/> haloalkane | <input type="checkbox"/> aldehyde | <input type="checkbox"/> ester (including triglycerides) | <input type="checkbox"/> amide |
| <input type="checkbox"/> amine | <input type="checkbox"/> ketone | | |

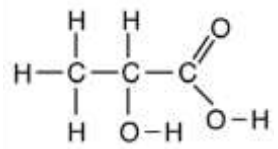
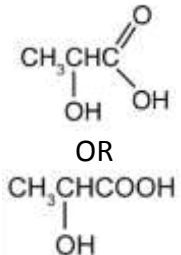
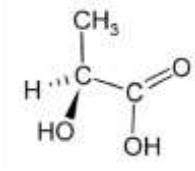
Naming using IUPAC conventions

- ☐ no more than eight carbons in the longest chain
- ☐ systematic naming of amines is restricted to primary amines

Structure

- ☐ functional groups
- ☐ isomerism
 - constitutional isomers (those that have the same molecular formula but a different structural formula)
 - stereoisomers / enantiomers

Structures may be drawn – e.g. 2-hydroxypropanoic acid / lactic acid

| All atoms and bonds shown | Condensed structural formula | | Stereochemistry (3D) |
|---|---|-------------------------------|---|
| | Bonds to hydrogen not shown OR only bonds to substituents shown | Structure reduced to one line | |
|  |  | <chem>CH3CH(OH)COOH</chem> |  |

Reactivity of organic compounds:

- ☐ substitution reactions using the following reagents:
(*Substitution reactions include esterification, condensation, hydrolysis, and polymerisation.*)
 - concentrated HCl and/or HBr
 - SOCl_2
 - NaOH or KOH (in aqueous solution)
 - concentrated NH_3
 - primary amines
 - primary alcohols/ H^+
 - hydrolysis:
 - acid hydrolysis: $\text{H}_2\text{O}/\text{H}^+$
 - alkaline hydrolysis: $\text{H}_2\text{O}/\text{OH}^-$
- ☐ oxidation reactions using the following reagents:
 - $\text{MnO}_4^-/\text{H}^+$ & heat, $\text{Cr}_2\text{O}_7^{2-}/\text{H}^+$ & heat
 - Tollens' reagent (silver mirror test): Ag^+/NH_3 warm
 - Fehling's and Benedict's solution: Cu^{2+} , warm
- ☐ reduction of aldehydes and ketones with NaBH_4
- ☐ elimination reactions using the following reagents:
 - NaOH or KOH in alcohol (includes major and minor products from asymmetric haloalkanes)
 - concentrated H_2SO_4 (includes major and minor products from asymmetric alcohols): dehydration
- ☐ polymerisation reactions involving formation of :
 - polyesters
 - polyamides including proteins (names of amino acids not needed)
- ☐ addition reactions of alkenes (used for the identification of the products of elimination reactions).

Physical properties of organic compounds limited to:

- | | | |
|-------------------------------------|--|--|
| <input type="checkbox"/> solubility | <input type="checkbox"/> melting points and boiling points | <input type="checkbox"/> rotation of plane-polarised light |
|-------------------------------------|--|--|

Terms:

Demonstrate understanding involves naming using IUPAC conventions (no more than eight carbons in the longest chain) and/or drawing structural formulae of organic compounds and giving an account of their physical properties and/or reactivity. This requires the use of chemistry vocabulary, symbols, and conventions.

Demonstrate in-depth understanding involves making and explaining links between structure, functional groups, physical properties, and reactivity of organic compounds. This requires explanations that use chemistry vocabulary, symbols, and conventions.

Demonstrate comprehensive understanding involves elaborating, justifying, relating, evaluating or comparing and contrasting the links between the structure, functional groups, physical properties and/or reactivity of organic compounds. This requires the consistent use of chemistry vocabulary, symbols, and conventions.

Knowledge of principles of organic chemistry covered in AS 91165 will be assumed