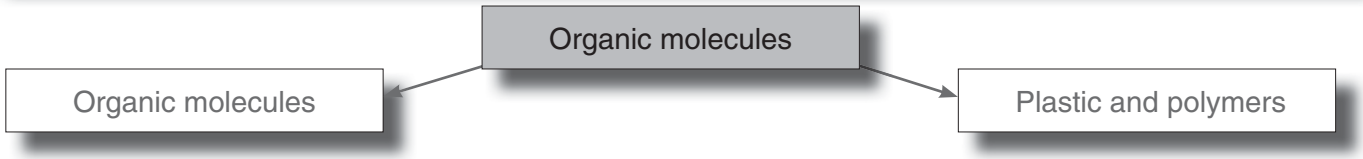
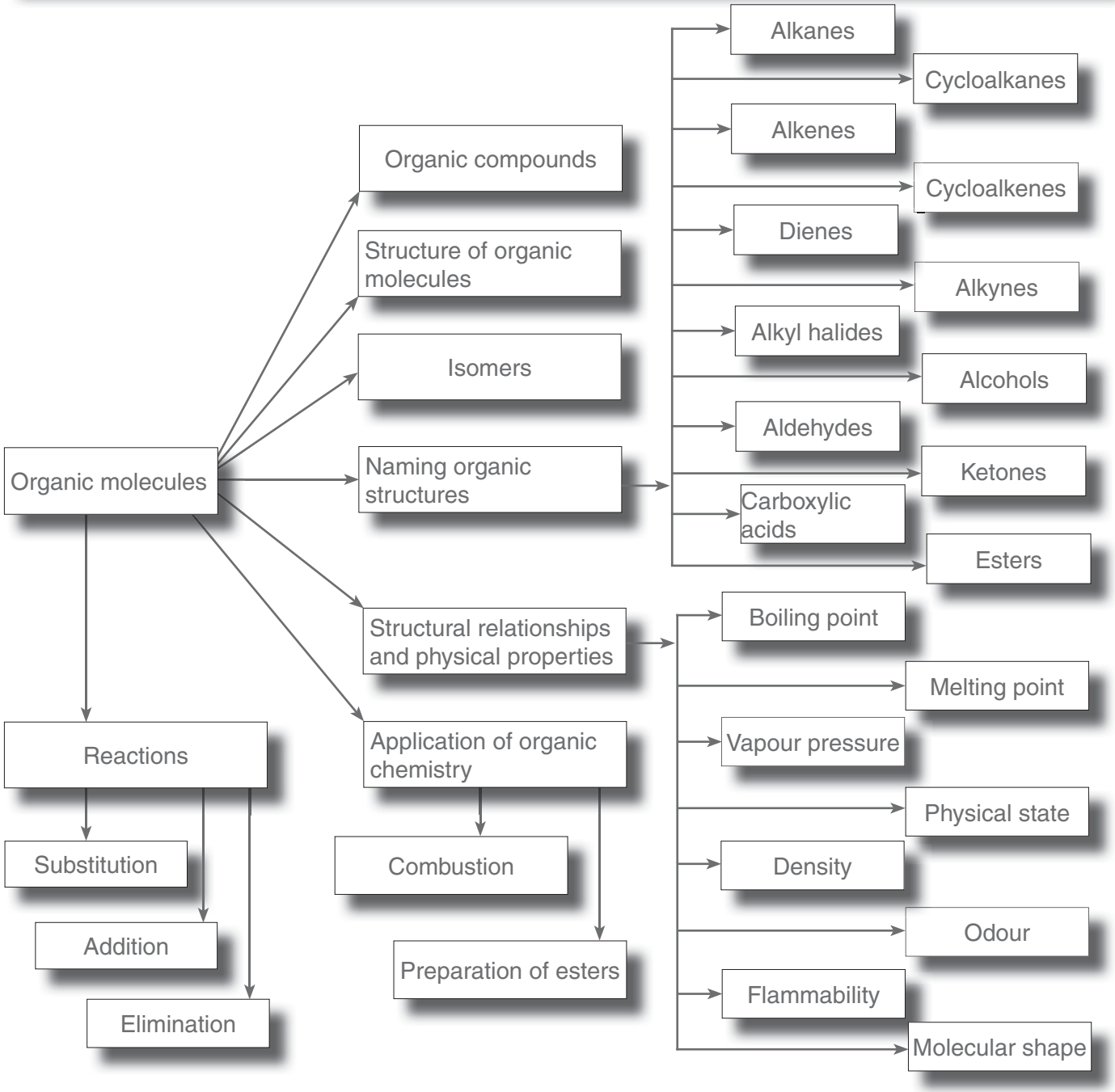
Masters for transparencies

5.1
Matter and materials

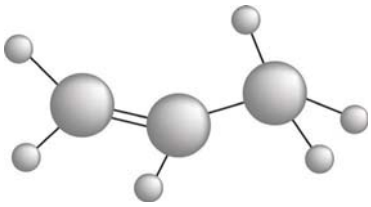
KNOWLEDGE AREA: MATTER AND MATERIALS



UNIT 1 ORGANIC MOLECULES



1.1 Organic compounds



An organic molecule is a compound that contains carbon atoms.

Quick facts

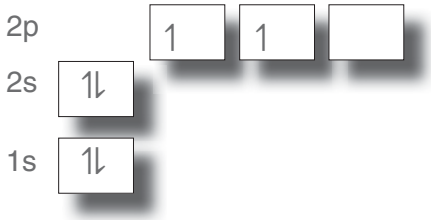
The following carbon compounds are exceptions and are regarded as inorganic compounds:

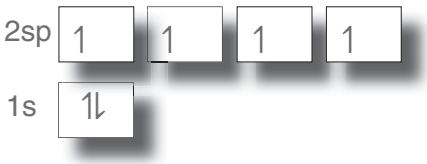
- Carbon monoxide (CO)
- Carbon dioxide (CO_2)
- Carbonates (CO_3^{2-})
- Cyanides (CN^-)

Carbon is the basic building block of living organic compounds that recycle through the earth's air, water, soil and living organisms.

What makes carbon so unique that it is responsible for such a great number of compounds?
Carbon's electron distribution:

1. Carbon is found in group IV of the Periodic Table and has four valence electrons.





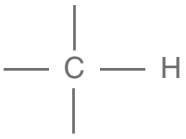
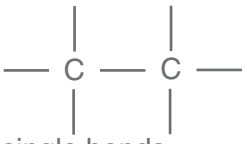
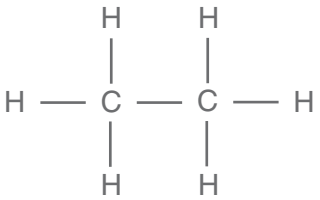
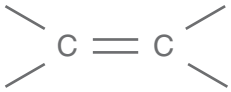
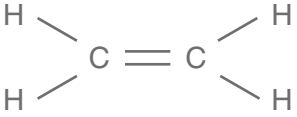
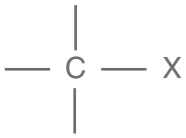
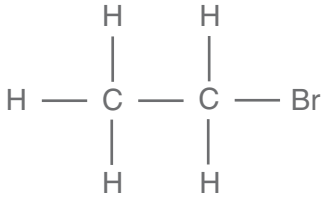
2. Carbon forms a maximum of four covalent compounds with other carbon atoms.
   - These compounds can be single, double or triple.
   - Long carbon chains or chains with branches, and even ring structures can be formed this way.
3. Carbon forms covalent compounds with other atoms like hydrogen, oxygen, nitrogen, halogens, etc.

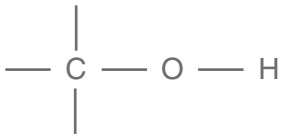
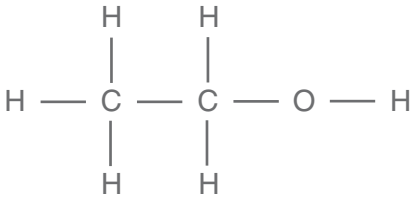
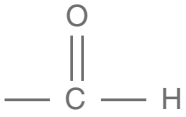
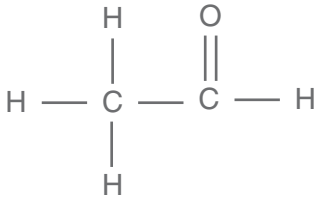
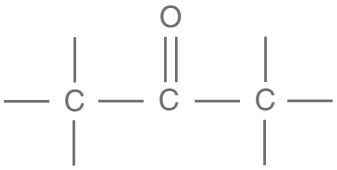
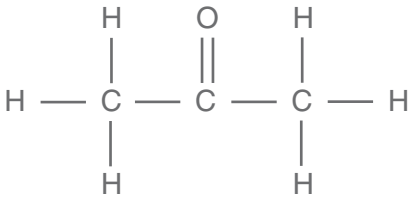
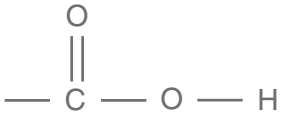
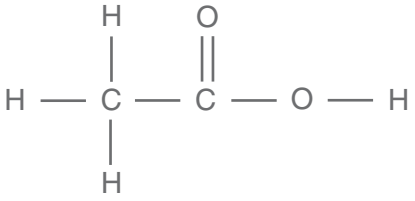
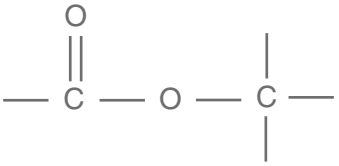
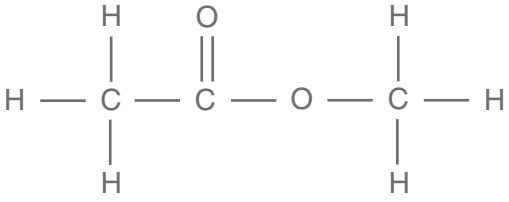
1.2 Structure of organic molecules

A homologous series is a series of compounds with the same functional group and is described by the same general formula. The members in the series differ, but have a common group of atoms, or structure.

A **functional group** is a compound, an atom or a group of atoms that determines the distinctive properties and reactions of the compound. The functional group is used with the naming and classification of a compound.

Functional groups of organic compounds are:

Homologous series	Structure or functional group	Example of compound	
		Name	Structural formula
Alkanes	only  and  single bonds	Ethane	
Alkenes		Ethene	
Alkynes		Ethyne	
Alkyle halides (haloalkanes)	 (X = F, Cℓ, Br, I)	Bromoethane	

Homologous series	Structure or functional group	Example of compound	
		Name	Structural formula
Alcohols		Ethanol	
Aldehydes		Ethanal	
Ketones		Propanon	
Carboxylic acids		Ethanoic acid	
Esters		Methyl ethanoate	

To identify or name a compound, the following is used:

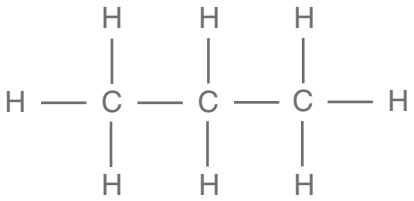
Root name → Indication of number of C atoms

Number of C atoms	Root name
1	meth-
2	eth-
3	prop-
4	but-
5	pent-
6	hex-
7	hept-
8	oct-

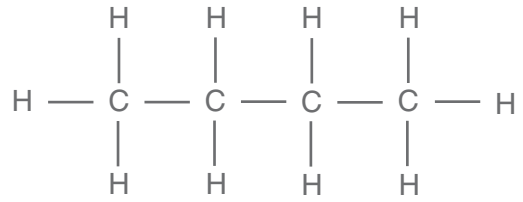
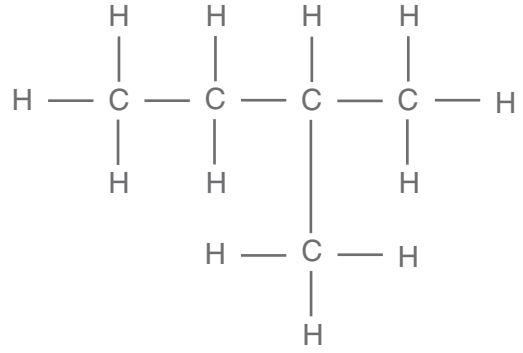
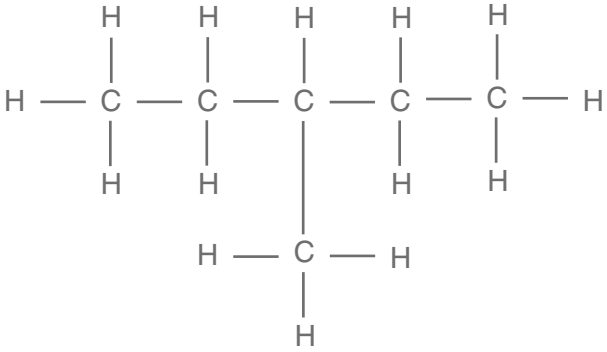
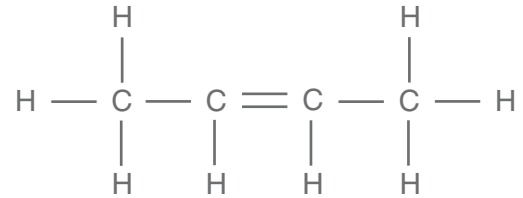
Suffix → Indication of homologous series

Homologous series	Suffix
Alkanes	-ane
Alkenes	-ene
Alkynes	-yne
Alcohols	-ol
Aldehydes	-al
Ketones	-one
Carboxylic acids	-anoic acid
Esters	-yl ... -anoate

The formulae for organic compounds that will be used in Grade 12 are:

Type of formula	Example	
	Name	Formula
Molecular formula	Propane	C_3H_8
Condensed formula	Propane	$CH_3CH_2CH_3$
Structural formula	Propane	

Examples of structural and condensed formulae:

Structural formula	Condensed formulae
	$CH_3CH_2CH_2CH_3$ **or** $CH_3(CH_2)_2CH_3$ NOTE: groups that repeat may be written in brackets with the amount of times it repeats after it.
	$CH_3CH(CH_3)CH_2CH_3$ **or** $CH_3CHCH_2CH_3$ (CH_3 branch) NOTE: branches are written in brackets after the carbon to which it is bonded.
	$CH_3CH_2CHCH_2CH_3$ (CH_3 branch) **or** $CH_3CH_2CH(CH_3)CH_2CH_3$ NOTE: Brackets indicate that CH_3 is a branch and bonded to the previous C.
	$CH_3CH{=}CHCH_3$ NOTE: Keep the double bond.