

14–16 years

Key terms accessible glossary: organic compounds and reactions



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For how to use, metacognitive prompts, ideas for support and challenge, and linked resources, visit: rsc.li/4js7w2l

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Alcohol

an organic compound that contains an -OH functional group, such as methanol and ethanol

In other words ...

a family of organic compounds that contain an -OH group attached to a carbon atom

Sign it

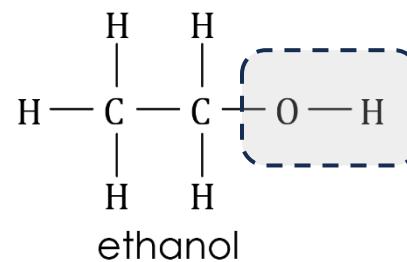
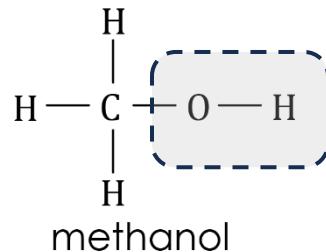
Watch a video:  bit.ly/4d4vUp2

Say it

Alc-a-hol

Break it down

Alk (derived from alkane, meaning hydrocarbon), -ol (shows the presence of an -OH group)



Example

Ethanol is an alcohol found in drinks, but is also a fuel and a disinfectant

Don't confuse with ...

alcoholic drink.
Alcohols are not just used in drinks; they have many uses

Similar words

Hydroxyl compound

Other contexts

Alcohol refers to alcoholic drinks

Anaerobic

takes place when oxygen is not present

In other words ...

a process that happens without using oxygen

Say it

Ana-rob-ic

Break it down

An (without), aerobic (relating to oxygen)

Example

When you exercise very hard, your muscles increase the rate of anaerobic respiration, which can make them sore due to the build up of lactic acid



Don't confuse with ...

not breathing. Anaerobic doesn't mean 'no breathing' – it just means the reaction doesn't use oxygen

Other contexts

'Aerobics' is a term often used to describe physical exercises

Enzyme

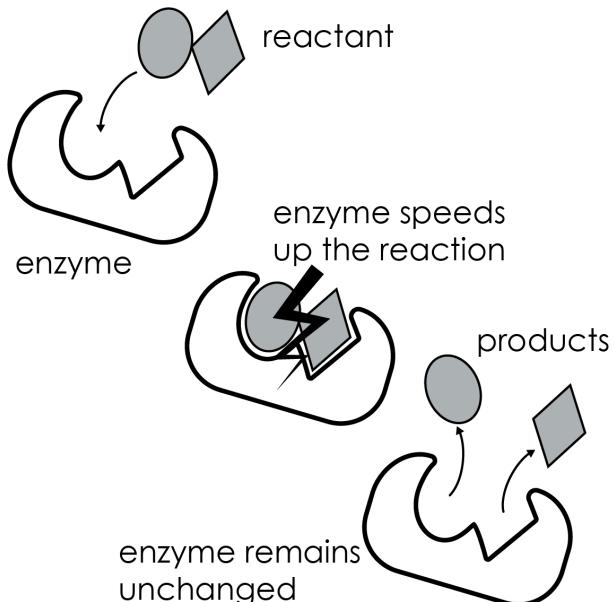
a naturally occurring catalyst made from protein that is produced by living cells to carry out the chemical reactions essential for life

In other words ...

a protein made by living things which can act as a catalyst (speeding up reactions)

Sign it

Watch a video: bit.ly/4jPFzCQ



Say it

En-z-eye-m

Break it down

En (inside), zyme
(from a Greek word meaning to ferment)

Similar words

Biological catalyst

Example

Enzymes in your liver break down toxins in your body

Don't confuse with ...

reactant or product. Remember that enzymes are catalysts; they do not get used up in chemical reactions and do not appear in the chemical equation

Other contexts

Enzymes are found in washing powders, helping to break down stains on our clothes, and in food production like making cheese

Fermentation

when glucose is converted to ethanol by microorganisms such as yeast

In other words ...

a process where microorganisms like yeast break down sugar to produce alcohol and carbon dioxide

Sign it

Watch a video:  bit.ly/4d1YtDD

Say it

Fir-men-tay-shen

Break it down

Ferment (to break down), ation (a process)



Example

Yeast carries out fermentation to turn sugar into ethanol, which can then be used in food, drink and biofuels

Don't confuse with ...

making alcoholic drinks. Fermentation doesn't always involve alcohol. Many other products can be produced in this way, such as bread, yoghurt, kimchi, kombucha and sauerkraut

Addition reaction

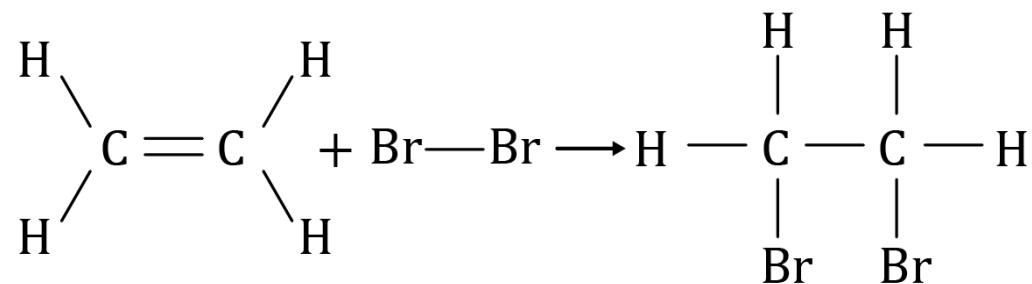
when two molecules combine to form a single product

In other words ...

a type of reaction where two substances 'add' together to form one single product

Example

When ethene reacts with bromine, they form one single compound in an addition reaction



Don't confuse with ...

condensation reactions. This is when a small molecule like water is also released

Break it down

Addition (putting things together), reaction (a chemical change)

Say it

A-di-shen ry-ac-shen

Similar words

Combination reaction

Other contexts

'Addition' is used in mathematics to mean putting numbers together

Alkene

a hydrocarbon with a C=C double bond which has the general formula C_nH_{2n} such as ethene and propene

In other words ...

a type of hydrocarbon that contains at least one carbon–carbon double bond

Sign it

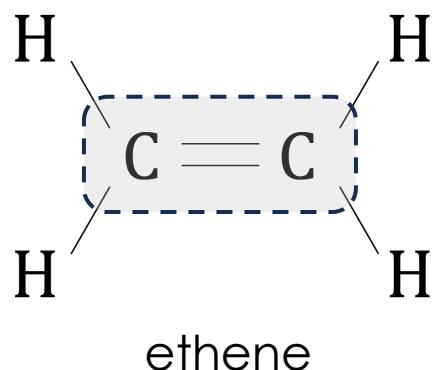
Watch a video:  bit.ly/4kqliCD

Say it

Al-ceen

Break it down

Alk (derived from alkane, meaning hydrocarbon), -ene (shows the presence of a double bond)



Similar words
Unsaturated hydrocarbon

Example

Ethene (C_2H_4) is an alkene used to make plastics like poly(ethene)

Don't confuse with ...

alkanes. Alkenes are more reactive due to their carbon–carbon double bond. A way to remember is that alkenes are 'keen' – some carbon atoms are 'keen' to double bond!

Unsaturated hydrocarbon

a hydrocarbon with a double or triple bond between one or more of the carbon atoms, such as an alkene

In other words ...

a hydrocarbon with at least one carbon–carbon double (or triple) bond

Sign it

Watch a video:  bit.ly/4iMlrzW

Say it

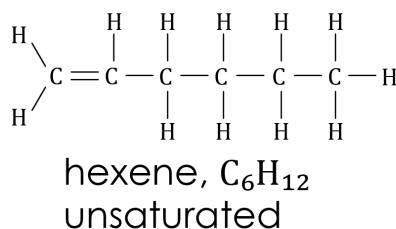
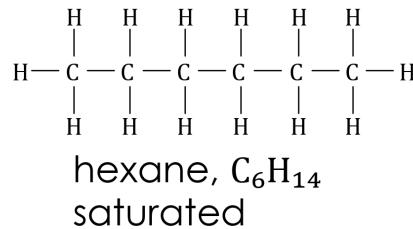
Un-sach-ar-ay-tid
h-eye-dro-ca-ben

Break it down

Un (not), saturated (completely full), hydrocarbon (a compound made of hydrogen and carbon only)

Example

Hexane is a saturated hydrocarbon, whereas hexene is unsaturated



Don't confuse with ...

saturated hydrocarbons. They only have carbon–carbon single bonds

Other contexts

Unsaturated is used in cooking to describe fats that have double bonds and are usually liquids at room temperature, e.g. olive oil

Carboxylic acid

an organic compound that contains a -COOH functional group, such as methanoic acid and ethanoic acid

In other words ...

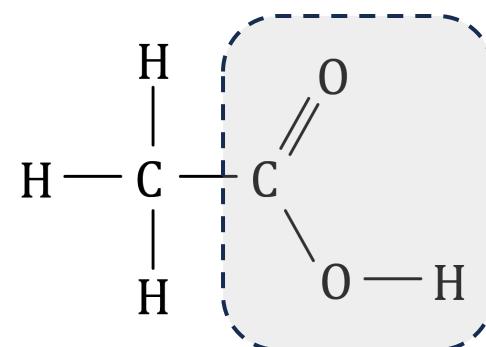
a type of organic compound that contains a -COOH group. It has acidic properties. Most of the names of these compounds end in 'oic acid'

Say it

Ca-boc-si-lic a-sid

Break it down

Carb (carbon), oxy (oxygen), -ic acid (shows it is an acidic compound)



ethanoic acid

Example

Vinegar contains ethanoic acid

Similar words

Organic acid

Don't confuse with ...

strong acids like hydrochloric acid, sulfuric acid and nitric acid

Other contexts

Carboxylic acids react with alcohols to form esters which give the flavour and scent of many familiar foods and cosmetics

Condensation

a chemical reaction between two functional groups that joins molecules together, while also producing a small molecule such as water

In other words ...

a chemical reaction where two molecules join together and a small molecule (like water) is released

Sign it

Watch a video:  bit.ly/3Y2ECxX

Say it

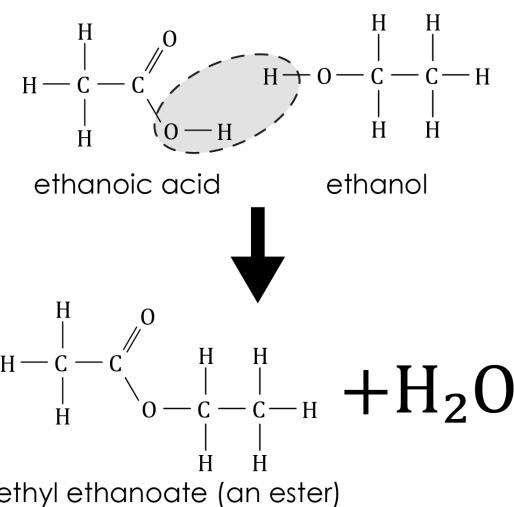
Con-den-say-shen

Break it down

Con (together),
dense (making
something thicker or
heavier)

Example

When glucose molecules join together to form starch, water is lost in the condensation reaction



Don't confuse with ...

change of state. When a gas cools and forms a liquid the change is physical

Similar words

Dehydration reaction (relating to the way water is removed)

Other contexts

When a gas cools and forms a liquid this is also called condensation, but this is a physical change not a chemical reaction

Ester

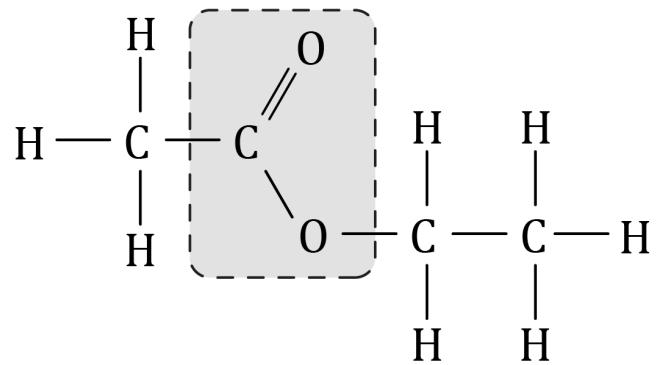
an organic compound that contains a -COO- functional group, formed by reaction of a carboxylic acid with an alcohol, such as ethyl ethanoate

In other words ...

a type of organic compound with a -COO- group. They often have fruity smells and are used in perfumes and flavourings

Say it

Es-ta



ethyl ethanoate
(an ester)

Example

Ethyl ethanoate is an ester that smells like pears

Don't confuse with ...

scents. Although esters are often used as scents and flavourings, the functional group is also found in fats and oils, and in polyesters

Other contexts

Polyesters are a group of synthetic polymers which are durable and versatile. They are often used in synthetic fabrics due to their resistance to shrinking and stretching, and quick-drying properties

Amine

an organic compound that contains an -NH_2 functional group, such as ethylamine

In other words ...

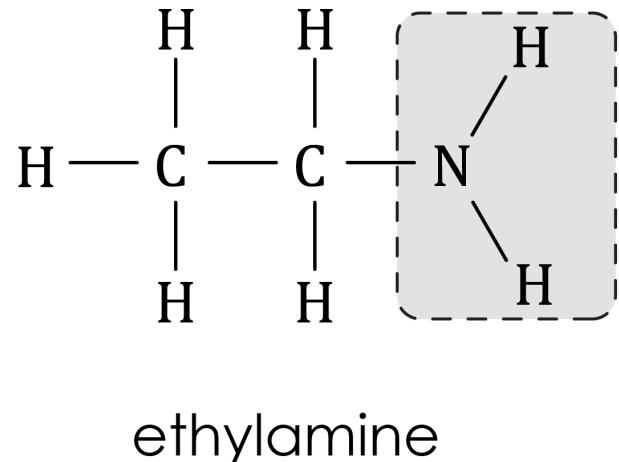
a type of compound that contains an -NH_2 group. They often smell like fish!

Say it

Ay-meen

Break it down

Am (from ammonia a compound with nitrogen), ine (a common ending for chemical compounds)



Example

Methylamine is an amine that smells like rotten fish

Don't confuse with ...

amino acids. These contain an amine functional group, but also a carboxylic acid group

Amino acid

a molecule with both amine and carboxylic acid functional groups that is the monomer for polypeptides; there are 20 different naturally occurring amino acids

In other words ...

the building blocks of proteins, containing both an amine ($-\text{NH}_2$) and a carboxylic acid ($-\text{COOH}$) group

Sign it

Watch a video:  bit.ly/4k5Uybm

Say it

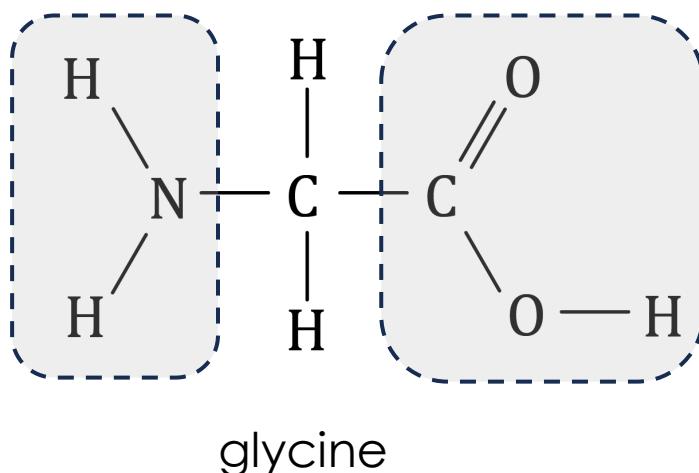
A-meen-o a-sid

Break it down

Amino (containing an amine group), acid

Example

Glycine is the simplest naturally occurring amino acid



Don't confuse with ...

Amines, which contain only an $-\text{NH}_2$ group

Similar words

Protein building block

Biodegradable

able to be broken down by living organisms in the natural environment

In other words ...

a material that can be broken down naturally by bacteria and other living things

Sign it

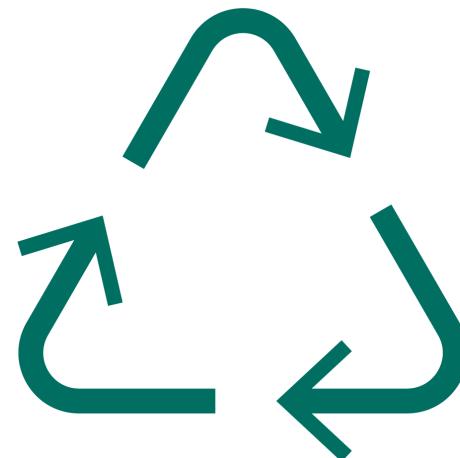
Watch a video:  bit.ly/4m2UStd

Say it

B-eye-o-di-gray-da-bel

Break it down

Bio (living organisms),
degrade (to break down)



Similar words
Compostable

Example

Banana peels are biodegradable, but most plastics are not

Don't confuse with ...

quickly degradable. Even if something is biodegradable, it can still take years to fully degrade

Other contexts

Biodegradable is used a lot in everyday life when referring to waste

Carbohydrate

a natural organic compound such as glucose or starch, with molecules containing carbon, and also hydrogen and oxygen in a 2:1 ratio

In other words ...

a molecule made of carbon, hydrogen and oxygen, often providing energy for living organisms

Sign it

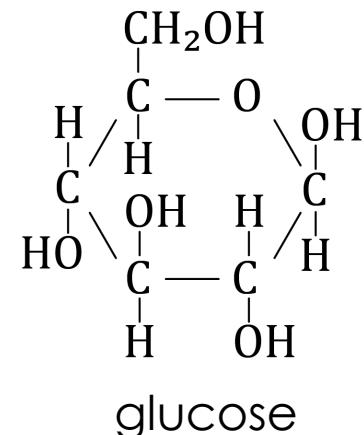
Watch a video:  bit.ly/3Z2WCZq

Say it

Car-bo-h-eye-dray-t

Break it down

Carbo (carbon), hydr (hydrogen), ate (contains oxygen)

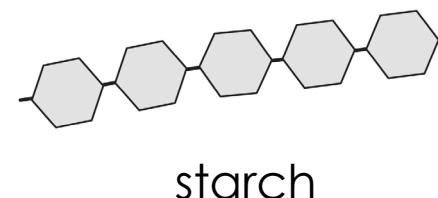


Similar words

Sugars and starch

Example

Bread and pasta contain carbohydrates that are broken down to release energy



Don't confuse with ...

sugars.
Carbohydrates are not just sugars, but also include starches and fibres

Other contexts

Carbohydrates are a food group, including things like pasta, rice and potatoes

Condensation polymerisation

when many monomers, each with two functional groups, join together by a condensation reaction to form a polymer

In other words ...

a type of reaction where lots of starting molecules (monomers) join together to form a large molecule (polymer), while releasing a small molecule like water

Example

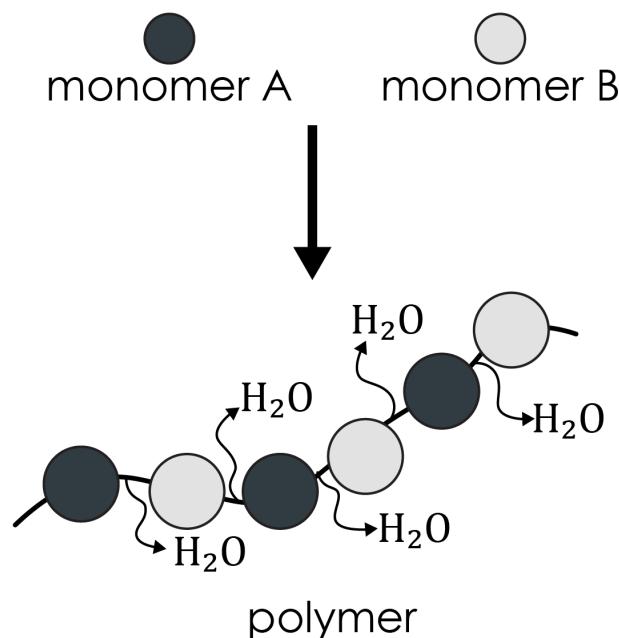
Nylon is made by condensation polymerisation of monomers that release water as they join

Say it

Can-den-say-shen
pol-i-mar-eye-zay-shen

Break it down

Condensation (joining molecules),
polymerisation
(forming a polymer)



Don't confuse with ...

polymerisation. Not all polymers form in this way – some form by addition polymerisation

Double helix

a structure which consists of two strands that twist around each other, such as the polynucleotides in DNA

In other words ...

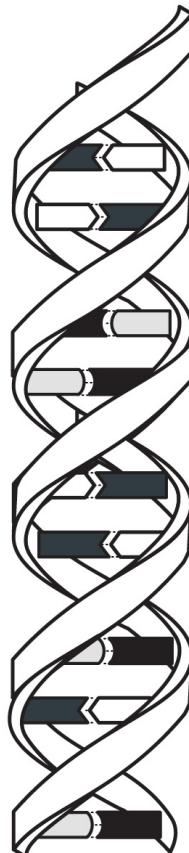
a twisted ladder-like structure, such as the shape of DNA

Say it

Du-bel h-ee-lics

Break it down

Double (two), helix (spiral shape)



Example

DNA has a double helix structure

Don't confuse with ...

helix. Not all helices are double, some proteins have a single helix shape

Similar words

Spiral structure

Monomer

a small molecule that can react with many other small molecules to form a polymer

In other words ...

a small molecule that can join together with other small molecules, forming new bonds and one large molecule (a polymer)

Sign it

Watch a video:  bit.ly/3Z5j18t

Say it

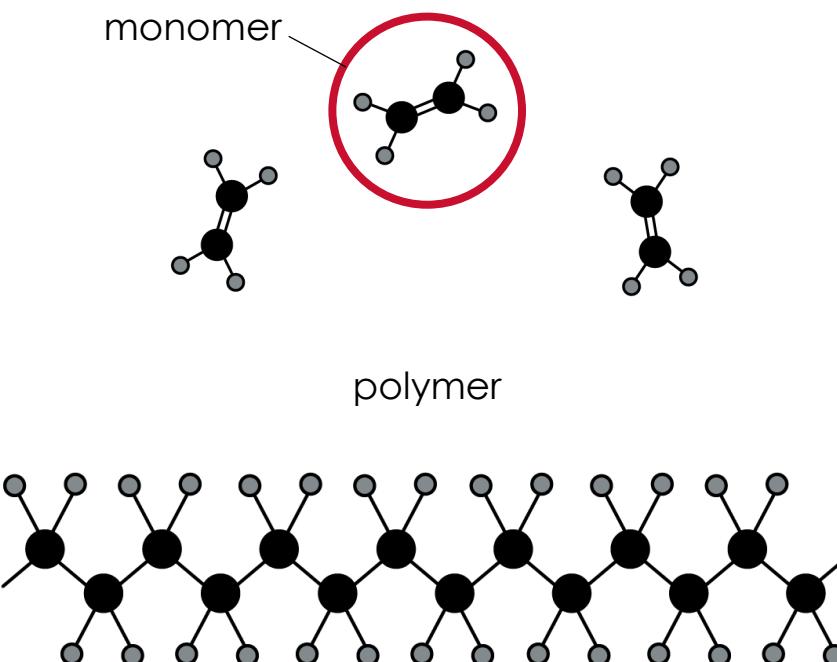
Mon-a-ma

Break it down

Mono (one), mer (part of a unit)

Example

Ethene is the monomer which joins with other ethene molecules to form the polymer poly(ethene)



Don't confuse with ...
polymer. A monomer is a single unit which forms the polymer

Similar words
Building block

Monosaccharide

a carbohydrate molecule such as glucose, that is the monomer for polysaccharides

In other words ...

the simplest type of carbohydrate, consisting of a single sugar unit, such as glucose and fructose

Sign it

Watch a video: bit.ly/4d8hTH9



Say it

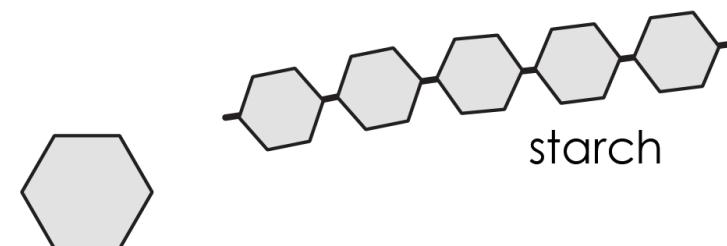
Mono-sac-ar-eye-d

Break it down

Mono (one),
saccharide (sugar)

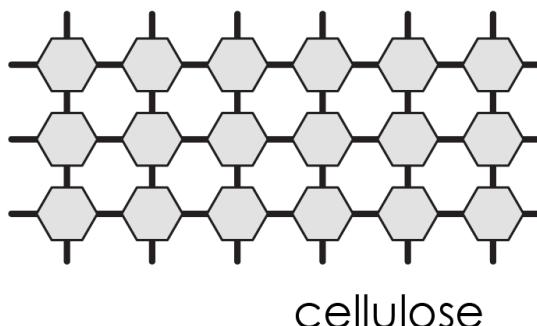
Example

Glucose is a monosaccharide that provides energy for cells in living organisms



monosaccharide
(monomer)
e.g. glucose

→ polysaccharide
(polymer)



Similar words
Simple sugar

Don't confuse with ...
polysaccharides.
These contain many monosaccharides joined in a polymer chain

Nucleotide

the monomer for polynucleotides, such as the four types found in DNA; abbreviated A, T, G and C

In other words ...

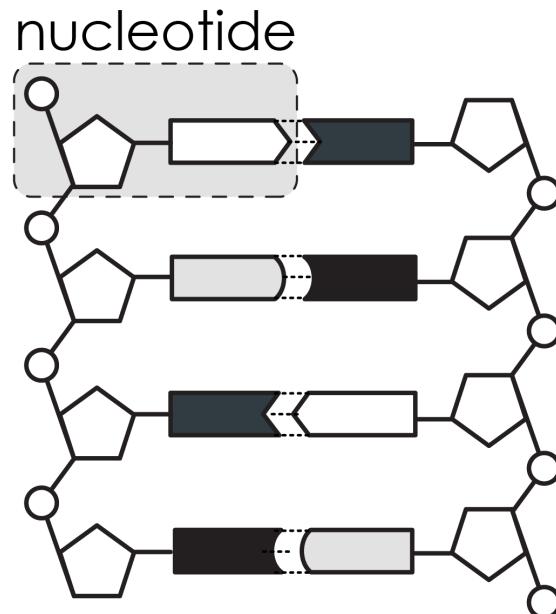
the basic unit (monomer) of nucleic acids like DNA and RNA, consisting of a sugar, a phosphate group and a nitrogenous base (C, G, A, and T or U in RNA)

Say it

Ny-ue-cly-at-eye-d

Break it down

Nucleo (nucleus), tide (related to chemical components)



Example

Adenine is one of the four types of nucleotides found in DNA

Don't confuse with ...

amino acids.
Nucleotides build DNA and RNA, but amino acids build proteins

Similar words

DNA building block

Polyamide

a condensation polymer such as nylon, formed by combining monomers containing amine and carboxylic acid functional groups

In other words ...

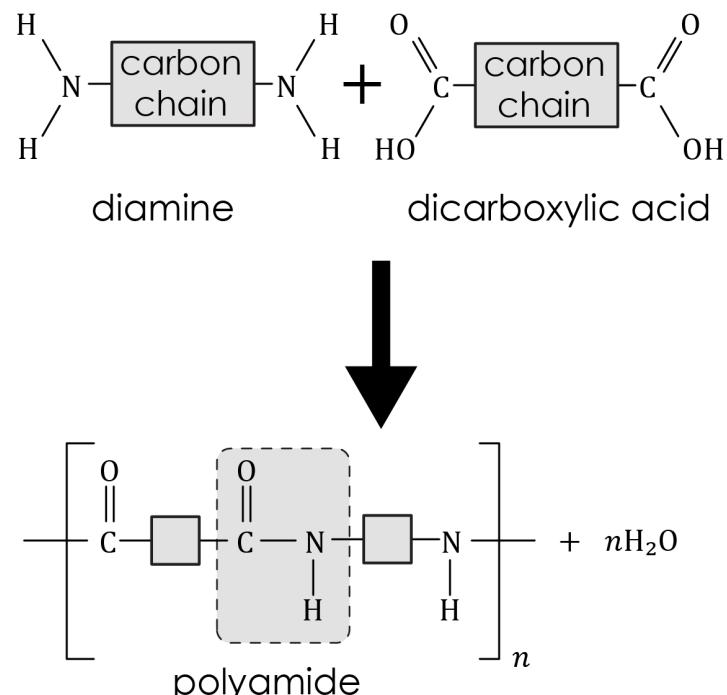
a type of polymer made by condensation polymerisation that contains an amide -CONH- bond

Say it

Pol-y-am-eye-d

Break it down

Poly (many), amide
(a chemical group
containing nitrogen)



Example

Nylon is a polyamide made by condensation polymerisation.



Don't confuse with ...

condensation polymers.
Not all are polyamides, only
those containing a -CONH- bond

Similar words

Condensation polymer

Polyester

a condensation polymer such as terylene®, formed by combining monomers containing alcohol and carboxylic acid functional groups

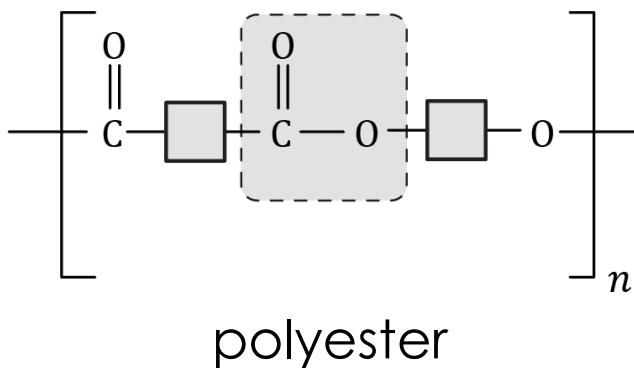
In other words ...

a type of polymer made by condensation polymerisation. They contain ester -COO- bonds. They are often used in clothing and plastic bottles

Say it
Pol-y-est-a

Break it down

Poly (many), ester (a type of organic compound containing -COO- groups)



Example

Polyester fabrics are made from plastic fibres formed by condensation polymerisation

Don't confuse with ...
condensation polymers. Not all are polyesters, only those containing a -COO- bond

Similar words
Condensation polymer

Polymer

a very large molecule made by joining together lots of small molecules

In other words ...

a very large molecule made by joining many small molecules (monomers) together

Sign it

Watch a video: bit.ly/4d5jRYQ

Say it

Pol-i-ma

Similar words

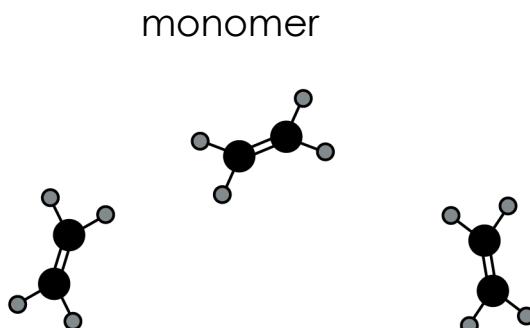
Chain

Break it down

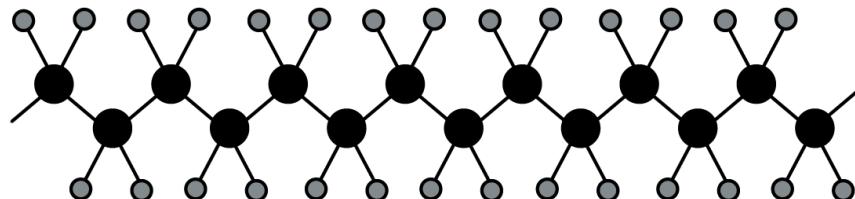
Poly (many), mer (part of a unit)

Example

Poly(ethene) is a polymer made from repeating units of ethene molecules



polymer



Don't confuse with ...

plastics. While many polymers are plastics, this is a type of material, rather than a type of molecule

Other contexts

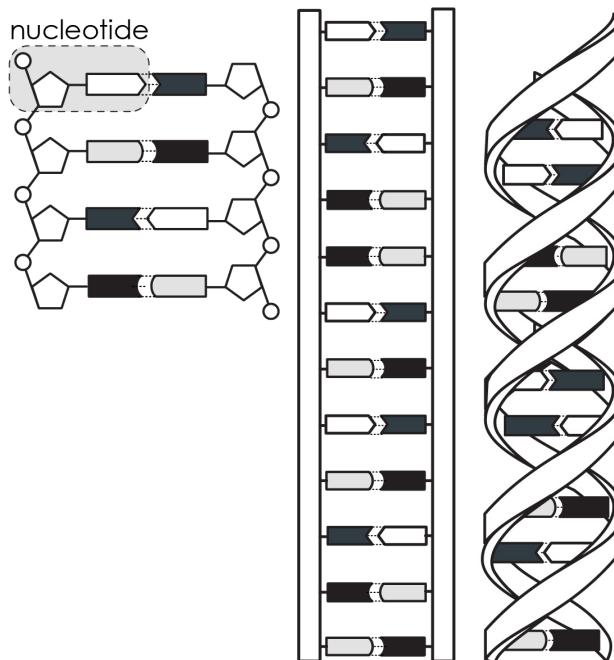
In everyday life, 'polymer' refers to many materials like plastic, rubber or synthetic fabrics

Polynucleotide

a natural condensation polymer formed from nucleotides

In other words ...

a long chain of nucleotide molecules, forming essential structures like DNA and RNA



Say it

Pol-y-nj-ue-cl-yat-eye-d

Break it down

Poly (many), nucleotide
(building blocks of DNA and RNA)

Example

DNA is a polynucleotide that carries genetic information

Don't confuse with ...

DNA. DNA is a specific type of polynucleotide

Similar words

Nucleic acid

Polypeptide

a condensation polymer formed from amino acids

In other words ...

a long chain of amino acids linked together by peptide bonds, forming the basis of proteins

Say it

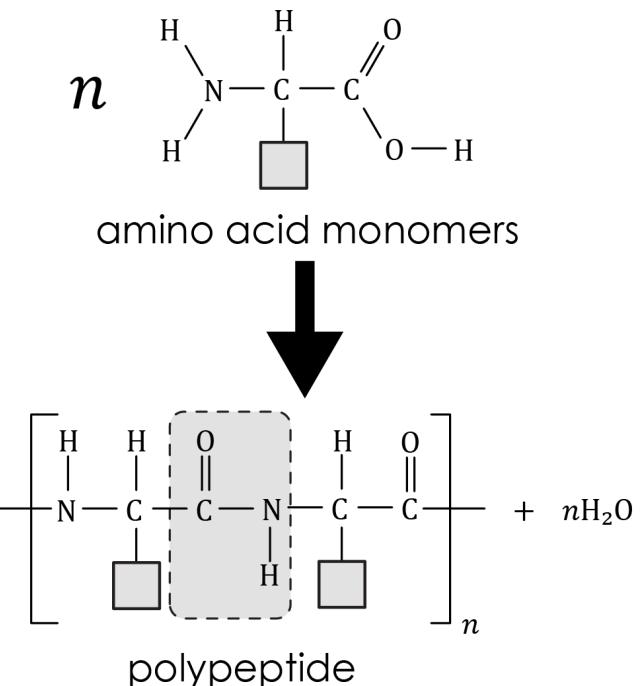
Pol-y-pep-t-eye-d

Break it down

Poly (many), peptide (a bond between amino acids)

Example

Insulin is a polypeptide that helps regulate blood sugar levels



Don't confuse with ...

proteins. These can be made up of multiple polypeptides

Similar words

Protein chain

Polysaccharide

a natural condensation polymer such as starch or cellulose, formed from monosaccharides

In other words ...

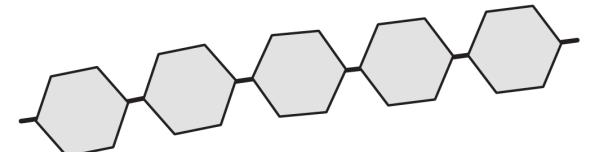
a large carbohydrate made of many sugar units joined together, such as starch or cellulose

Say it

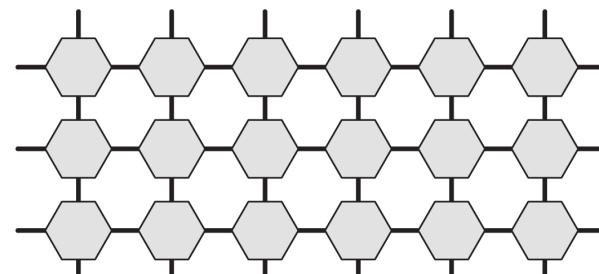
Pol-i-sac-ar-eye-d

Break it down

Poly (many),
saccharide (sugars)



starch



cellulose

Example

Starch is a polysaccharide made from the monosaccharide glucose

Don't confuse with ...

sugars. These are monosaccharides. Polysaccharides are complex carbohydrates made of long chains of sugars linked together

Similar words

Complex carbohydrate

Protein

a large natural molecule made up of one or more polypeptide chains that has an important role in living cells

In other words ...

a large molecule made up of one or more polypeptide chains, essential for cell structure and function

Sign it

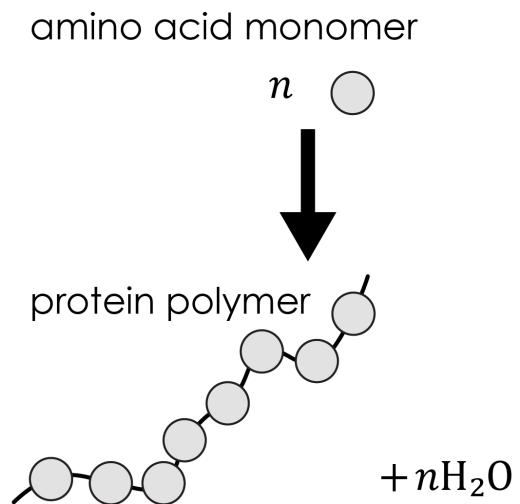
Watch a video:
bit.ly/44vWXaV

Say it

Pro-teen

Break it down

Derived from a Greek word meaning 'primary, first importance'



Example

Haemoglobin is a protein that carries oxygen in the blood

Don't confuse with ...

muscle. Protein is not only for muscles, but for many biological substances like enzymes, hormones and antibodies

Other contexts

Protein is a food group containing things like meat, fish and tofu

Displayed formula

In other words ...

a diagram that shows all the bonds between the atoms in a molecule

Say it

Dis-pl-ay-ed form-ya-la

Break it down

Displayed (shown clearly), formula (a way to show information with symbols)

a type of structural formula that shows all the bonds between the atoms in the molecule, such as shown here for propane

Example

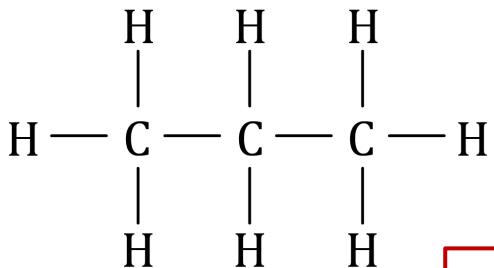
The displayed formula below for propane shows the central three carbon atoms with four bonds each, and hydrogen atoms bonded to them

molecular formula C_3H_8

structural formula



displayed formula



Don't confuse with ...

structural formulas, which simplify the bonds instead of showing all of them

Similar words

Full structural formula

Other contexts

'Displayed' means something shown, like a display of artwork

Empirical formula

gives the simplest ratio of atoms of each element in a substance, such as CH_2 for ethene, which has molecular formula C_2H_4

In other words ...

a way to show the simplest ratio of atoms in a compound, but not the actual number present in total

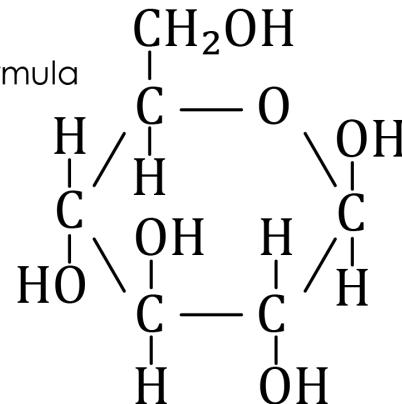
Say it

Im-piri-cel for-myu-la

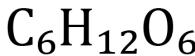
Break it down

Empirical (based on observation), formula (a way of representing something)

displayed formula



molecular formula



empirical formula



Example

Ionic substances have empirical formulas, such as NaCl , but we can also use empirical formulas to simplify very large molecules. Glucose, for example, has the molecular formula $\text{C}_6\text{H}_{12}\text{O}_6$, and the empirical formula CH_2O

Similar words

Simplest whole number ratio

Don't confuse with ...

molecular formula

Functional group

a group of atoms that are responsible for the chemical properties of a compound, such as the -OH group in an alcohol

In other words ...

a special part of a molecule that decides how it reacts in chemical reactions

Break it down

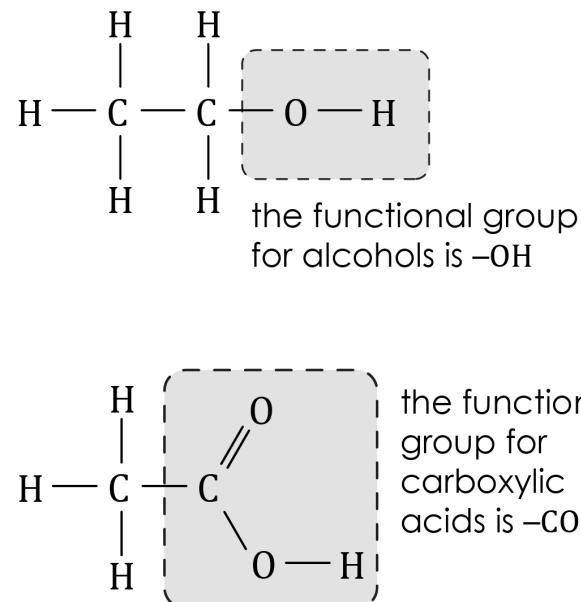
Functional (related to a purpose), group (set of things together)

Say it

Fung-shen-el gr-ue-p

Example

The -OH group in an alcohol is its functional group. Carboxylic acids have the functional group -COOH



Don't confuse with ...

important part of the molecule. The functional group is not the only part of the molecule which matters. The rest of the molecule can also impact the properties of the substance

Similar words

Reactive part of the molecule

General formula

a formula that represents every member of a particular homologous series, such as C_nH_{2n+2} for alkanes

In other words ...

a formula that can describe every compound in a certain family of compounds, like all of the alkanes or all of the alkenes

Sign it

Watch a video:  bit.ly/4k6llyT

Say it

J-en-ar-el form-ya-la

Break it down

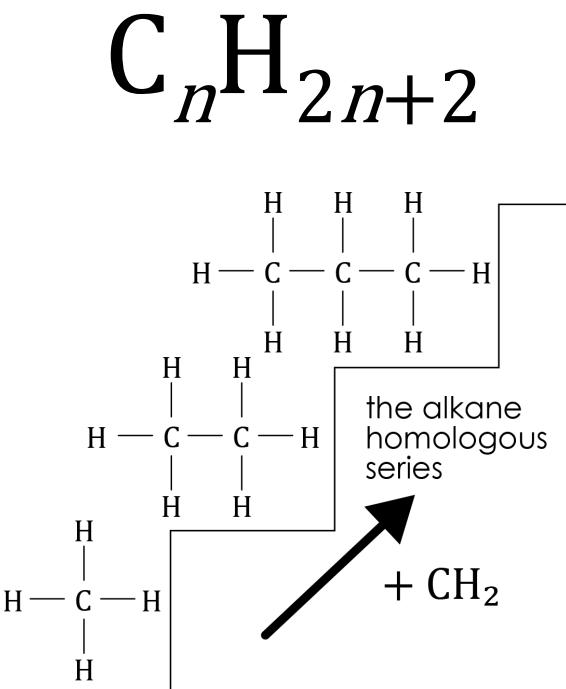
General (applies to many things), formula (a way of representing things with symbols)

Example

The general formula for alkanes is C_nH_{2n+2} which works for all the straight-chained alkanes

Don't confuse with ...

molecular formula.
General formulas apply to the whole group, or homologous series, of compounds



Homologous series

a series of organic compounds with the same general formula, which react in a similar way, such as alkanes

In other words ...

a group of compounds that have the same general formula and react in similar ways

Example

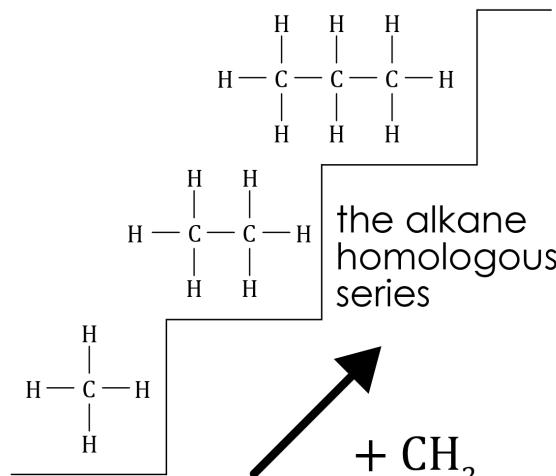
Alkanes form a homologous series because they all have the same formula and similar chemical properties

Say it

Ha-mol-ag-as s-ear-ee-z

Break it down

Homologous (having the same structure), series (a group of related things)



Similar words

Family (as in the 'alkane family' or 'alkene family')

Don't confuse with ...

hydrocarbon. Compounds which contain hydrogen and carbon only, but is an umbrella term for all the hydrocarbon homologous series

Other contexts

'Series' is a term used in an everyday context, such as a TV series or book series

Isomers

compounds which have the same molecular formula but their atoms are bonded in a different arrangement

In other words ...

molecules with the same number and type of atoms, but arranged differently in space

Say it

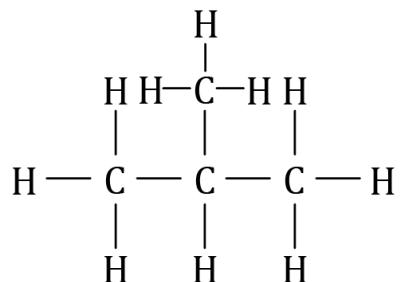
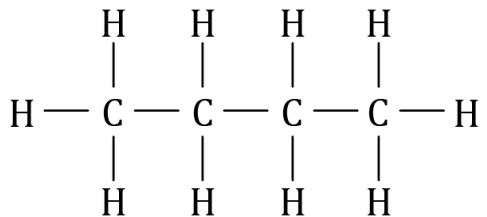
Eye-s-a-ma-z

Break it down

Iso (same), mer (part of a unit)

Example

The two structures below both represent butane molecules, as they both have the molecular formula C_4H_{10} . The atoms are arranged differently in space, so they are isomers



Don't confuse with ...

different compounds.
Isomers are different forms of the same compound

Other contexts

'Iso' means 'same' in many words, like an 'isosceles triangle' with two equal sides

Molecular formula

uses chemical symbols to give the number of atoms of each element in one molecule of the substance, such as N_2 for nitrogen or H_2O for water

In other words ...

a way to show how many atoms of each element are in one molecule of a substance, such as H_2O for water

Say it

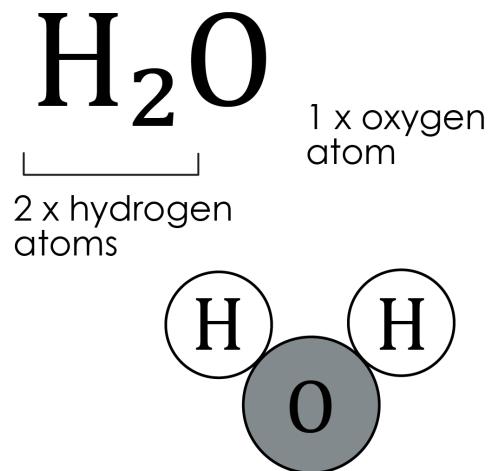
Mal-ec-ya-la
form-ya-la

Break it down

Molec (small unit),
ular (related to)
formula (a way of
representing
something)

Example

The molecular formula of carbon dioxide – CO_2 – shows that each molecule contains one carbon atom and two oxygen atoms



Don't confuse with ...

empirical formula – used for non-molecular substances, such as sodium chloride, $NaCl$, and graphite, C . These are not molecular formulas, as there are many more atoms present than shown in the formulas

Similar words

Chemical formula (but this can relate to single atoms, too)

Organic compound

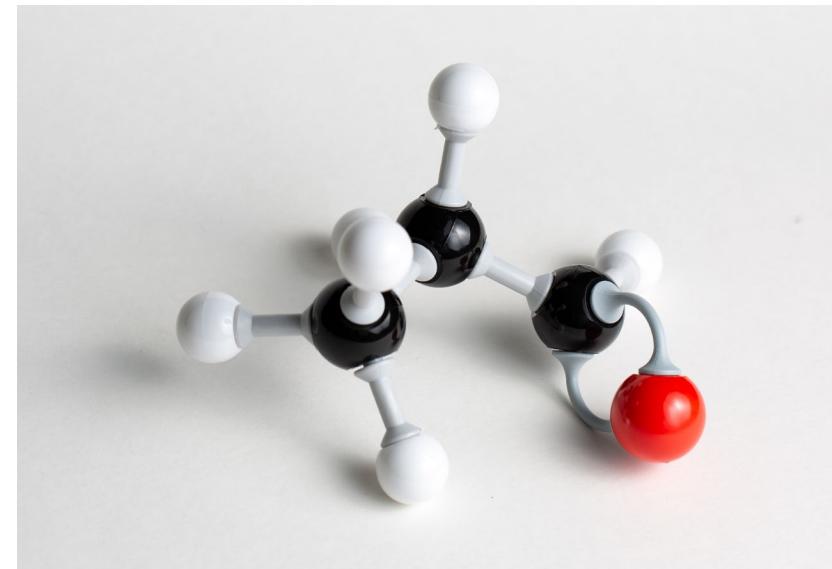
In other words ...

a substance that contains carbon atoms (but not substances like carbon dioxide or carbonates)

Break it down

Organic (relating to carbon-based molecules), compound (a substance made of different types of atoms bonded together)

a compound that contains carbon atoms (excluding the oxides of carbon or carbonates)



Similar words
Carbon compounds

Example

Glucose is an organic compound

Say it

Org-an-ic com-pound

Other contexts

'Organic' in daily life often refers to natural products or food grown without chemicals

Structural formula

shows the number and arrangement of the atoms of each element in one molecule, such as $\text{CH}_3\text{CH}_2\text{CH}_3$ for propane

In other words ...

a way of drawing a molecule to show how the atoms are all arranged and connected

Sign it

Watch a video:  bit.ly/4jRCoKH

Say it

St-ruc-ch-ar-el form-ya-la

Break it down

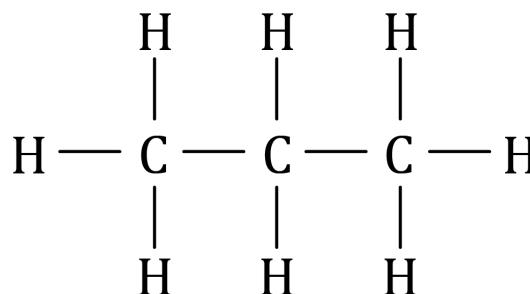
Structural (relating to structure or shape), formula (a way of representing information using symbols)

molecular formula C_3H_8

structural formula



displayed formula



Example

The structural formula shows how many hydrogen atoms are attached to each carbon atom in the molecule

Don't confuse with ...

molecular formulas or other types of representations

Other contexts

'Structural' in everyday life is used to describe buildings or frameworks, like 'structural engineering'

Acknowledgements

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