Edexcel Chemistry GCSE

Topic 9 - Separate Chemistry 2

(Chemistry only)

Flashcards

What is an ion?

What is an ion?

A charged atom, molecule or particle.

Why must a test for a specific ion be unique?

Why must a test for a specific ion be unique?

Tests are used to identify ions and must be unique so that the test gives an easily observed result which is specific to the ion that is present.

Describe how you would carry out a flame test to test for ions

Describe how you would carry out a flame test to test for ions

- Clean a nichrome wire using hydrochloric acid.
- Turn the Bunsen burner onto the blue flame.
- Dip the wire in a solution of the substance being tested.
- Place the wire in the flame and record the colour.

What is the result of the flame test on lithium ions?

What is the result of the flame test on lithium ions?

Crimson flame

What is the result of the flame test on sodium ions?

What is the result of the flame test on sodium ions?

Yellow flame

What is the result of the flame test on potassium ions?

What is the result of the flame test on potassium ions?

Lilac flame

What is the result of the flame test on calcium ions?

What is the result of the flame test on calcium ions?

Orange-red flame

What is the result of the flame test on copper ions?

What is the result of the flame test on copper ions?

Blue-green flame

Why must the wire be cleaned before carrying out a flame test?

Why must the wire be cleaned before carrying out a flame test?

To remove any unwanted ions that might obscure the colour of the flame.

Why can a flame test not be used when a compound contains a mixture of metal ions?

Why can a flame test not be used when a compound contains a mixture of metal ions?

The flame colours of the ions will blend together so the individual flame colours won't be seen meaning the ions can't be identified.

What is a precipitate?

What is a precipitate?

An insoluble solid suspended in a liquid.

Without using the flame test, how can you test for aqueous metal ions?

Without using the flame test, how can you test for aqueous metal ions?

Add sodium hydroxide solution to the metal ions. Observe the colour of the precipitate.

What colour precipitate forms when sodium hydroxide reacts with calcium ions?

What colour precipitate forms when sodium hydroxide reacts with calcium ions?

White

What colour precipitate forms when sodium hydroxide reacts with copper(II) ions?

What colour precipitate forms when sodium hydroxide reacts with copper(II) ions?

Blue

What colour precipitate forms when sodium hydroxide reacts with iron(II) ions?

What colour precipitate forms when sodium hydroxide reacts with iron(II) ions?

Green

What colour precipitate forms when sodium hydroxide reacts with iron(III) ions?

What colour precipitate forms when sodium hydroxide reacts with iron(III) ions?

Brown

What colour precipitate forms when sodium hydroxide reacts with aluminium ions?

What colour precipitate forms when sodium hydroxide reacts with aluminium ions?

White (initially)

With excess NaOH, the precipitate re-dissolves to form a colourless solution.

What is observed when sodium hydroxide reacts with ammonium ions?

What is observed when sodium hydroxide reacts with ammonium ions?

A pungent smelling gas is produced (NH_3) which will turn damp red litmus paper blue.

How could you distinguish between two solutions containing aluminium ions and calcium ions?

How could you distinguish between two solutions containing aluminium ions and calcium ions?

Add excess sodium hydroxide.

Both will form white precipitates initially. The precipitate formed from aluminium ions will re-dissolve to form a colourless solution.

How can you test for carbonate ions?

How can you test for carbonate ions?

- Add a few drops of HCl to the sample in a test tube.
- Connect this test tube to a test tube of limewater.
- If carbonate ions are present, they will react with the acid to produce carbon dioxide which will turn the limewater cloudy when it is bubbled through limewater.

Write the chemical equation for the reaction between HCl and Na_2CO_3

Write the chemical equation for the reaction between HCl and Na_2CO_3

$$Na_2CO_3 + 2HCl \rightarrow CO_2 + 2NaCl + H_2O$$

How can you test for sulfate ions?

How can you test for sulfate ions?

- Add HCl to remove any CO_3^{2-} ions as these will obscure the results.
- Add a couple of drops of barium chloride.
- If sulfate ions are present a white precipitate of barium sulfate will form.

Write the chemical equation for the reaction between $BaCl_2$ and $MgSO_4$

Write the chemical equation for the reaction between $BaCl_2$ and $MgSO_4$

$$BaCl_2 + MgSO_4 \rightarrow BaSO_4 + MgCl_2$$

$BaSO_4$ is a white precipitate

How do you carry out a test for halide ions?

How do you carry out a test for halide ions?

- Add a few drops of nitric acid to react with any carbonate ions which might obscure the result.
- Add a couple of drops of silver nitrate.
- Observe the colour of the precipitate.

What colour precipitate is formed when silver nitrate is added to a chloride solution?

What colour precipitate is formed when silver nitrate is added to a chloride solution?

White precipitate of silver chloride.

What colour precipitate is formed when silver nitrate is added to a bromide solution?

What colour precipitate is formed when silver nitrate is added to a bromide solution?

Cream precipitate of silver bromide.

What colour precipitate is formed when silver nitrate is added to an iodide solution?

What colour precipitate is formed when silver nitrate is added to an iodide solution?

Yellow precipitate of silver iodide.

What is meant by the phrase instrumental methods of analysis? Give an example of an instrumental method used for the analysis of elements or compounds

What is meant by the phrase instrumental methods of analysis? Give an example of an instrumental method used for the analysis of elements or compounds

Methods of analysis that use machinery such as mass spectrometry and gas chromatography.

What are the benefits of using instrumental methods for analysis?

What are the benefits of using instrumental methods for analysis?

- Accurate
- Sensitive
- Quick to carry out

What is a flame photometer?

What is a flame photometer?

A device used in inorganic analysis. It can be used to identify or determine the concentration of metal ions.

How can a flame photometry be used to identify metal ions?

How can a flame photometry be used to identify metal ions?

An emission spectrum is produced by the flame photometer. Each metal ion produces a unique spectrum so comparing the unknown spectrum to reference spectra can identify the ion.

How can a flame photometry be used to determine the concentration of metal ions?

How can a flame photometry be used to determine the concentration of metal ions?

Take readings using a flame photometer of the metal ions at different concentrations. Plot a calibration curve. Take a reading of the unknown sample and compare to the curve.

What is the major advantage of flame photometry compared to simple flame testing?

What is the major advantage of flame photometry compared to simple flame testing?

Flame photometry can be used to analyse a mixture of ions whereas flame tests can only be used to identify one ion at a time.

What is the general formula for alkanes?

What is the general formula for alkanes?

C_nH_{2n+2}

Name the first four alkanes and write their molecular formulae

Name the first four alkanes and write their molecular formulae

Methane - CH_4

Ethane - C_2H_6

Propane - C_3H_8

Butane - C_4H_{10}

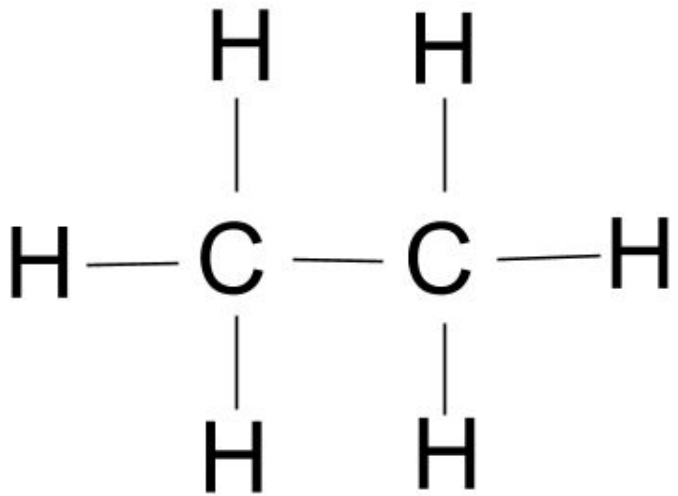
What type of bond are formed between carbon and hydrogen atoms in alkanes?

What type of bond are formed between carbon and hydrogen atoms in alkanes?

Covalent bonds

What is the displayed formula of ethane?

What is the displayed formula of ethane?



Why are alkanes saturated hydrocarbons?

Why are alkanes saturated hydrocarbons?

Saturated - all C-C bonds are single bonds.

Hydrocarbon - only contain carbon and hydrogen atoms.

What is the general formula for alkenes?

What is the general formula for alkenes?

C_nH_{2n}

Name the first four alkenes and write their molecular formulae

Name the first four alkenes and write their molecular formulae

Ethene - C_2H_4

Propene - C_3H_6

Butene - C_4H_8

Pentene - C_5H_{10}

Why are alkenes unsaturated hydrocarbons?

Why are alkenes unsaturated hydrocarbons?

They are compounds made up of only carbon and hydrogen atoms and they contain double carbon bonds, C=C.

What is a functional group?

What is a functional group?

The group of atoms responsible for the main chemical properties of a compound.

What functional group do alkenes contain?

What functional group do alkenes contain?

C=C double bond.

What is the difference between but-1-ene and but-2-ene?

What is the difference between but-1-ene and but-2-ene?

But-1-ene and but-2-ene are both alkenes with 4 carbons but the C=C bond is found between different carbons in the chain. In but-1-ene, the double bond is between the first and second carbon whereas in but-2-ene, it is between the second and third carbon in the chain.

What is the word and balanced symbol equation for the addition reaction between ethene and bromine?

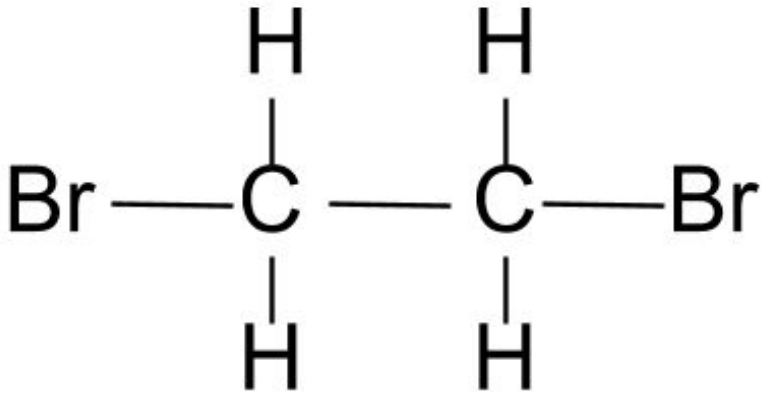
What is the word and balanced symbol equation for the addition reaction between ethene and bromine?

Ethene + Bromine → 1,2-dibromoethane

$C_2H_4 + Br_2 \rightarrow C_2H_4Br_2$

Draw the displayed formula of 1,2-dibromoethane

Draw the displayed formula of 1,2-dibromoethane



How can bromine water be used to distinguish between alkanes and alkenes?

How can bromine water be used to distinguish between alkanes and alkenes?

When bromine water is added to an alkane, the solution remains orange. When bromine water is added to an alkene, the solution changes from orange to colourless.

Why do alkenes decolourise bromine water?

Why do alkenes decolourise bromine water?

Alkenes are unsaturated. The double bond allows alkenes to react with bromine to form a bromoalkane.

What is produced when a hydrocarbon is completely combusted? Describe what happens to the carbon and hydrogen

What is produced when a hydrocarbon is completely combusted? Describe what happens to the carbon and hydrogen

Water and carbon dioxide are produced.

Carbon and hydrogen are oxidised.

Write a balanced symbol equation for the complete combustion of propane

Write a balanced symbol equation for the complete combustion of propane

$$C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$$

Energy is released when hydrocarbons undergo complete combustion. What type of reaction is occurring?

Energy is released when hydrocarbons undergo complete combustion. What type of reaction is occurring?

An exothermic reaction.

What is a polymer?

What is a polymer?

A substance of high average relative molecular mass made up of small repeating units.

How are polymers made?

How are polymers made?

By linking together lots of small molecules (monomers) to form a long chain.

What is the name of the process in which ethene molecules join together to form a polymer?

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Addition polymerisation.

How can ethene molecules undergo polymerisation to form the polymer poly(ethene)?

How can ethene molecules undergo polymerisation to form the polymer poly(ethene)?

One of bonds in each C=C double bond breaks and forms a bond with an adjacent monomer, forming a long chain polymer. This requires many ethene monomers.

What is the displayed formula of the product formed from the addition polymerisation of ethene?

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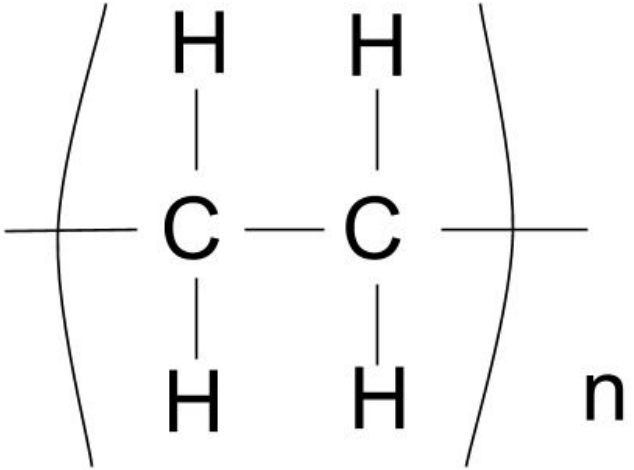

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Poly(ethene)

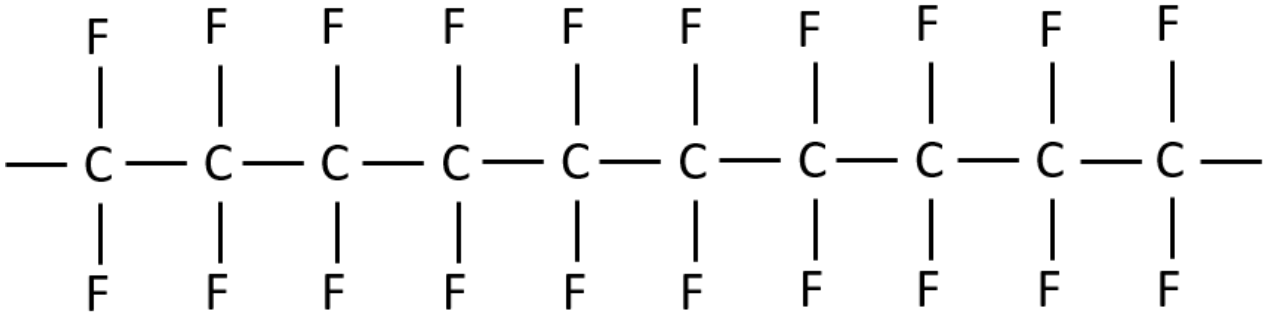
Can chloroethene undergo addition polymerisation? If so, what is the product?

Can chloroethene undergo addition polymerisation? If so, what is the product?

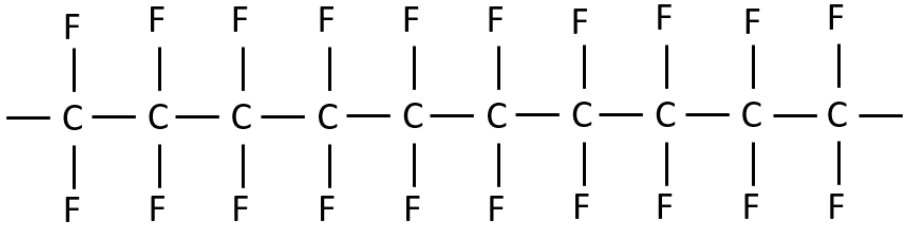
Yes because it contains a C=C double bond.

The product is poly(chloroethene) or PVC.

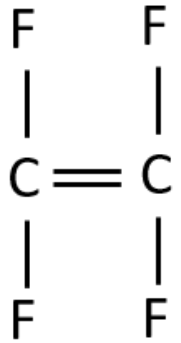
Name the polymer below and draw the structure of the monomer:



Name the polymer below and draw the structure of the monomer:



Poly(tetrafluoroethene) or PTFE



What properties of poly(propene) makes it suitable for making buckets and crates?

What properties of poly(propene) makes it suitable for making buckets and crates?

- Flexible
- Strong

Poly(ethene) is commonly used to make plastic bags, bottles and coating of electrical wires. Why?

Poly(ethene) is commonly used to make plastic bags, bottles and coating of electrical wires. Why?

- Inexpensive
- Electrical insulator
- Flexible

What is a common use of poly(chloroethane) and what properties make it suitable for this use?

What is a common use of poly(chloroethane), PVC, and what properties make it suitable for this use?

Use for window frame because it is tough, cheap and a long product life.

What is a common use of poly(tetrafluoroethene), PTFE, and what properties make it suitable for this use?

What is a common use of poly(tetrafluoroethene), PTFE, and what properties make it suitable for this use?

Coating for non-stick pans because it is tough and non-stick.

By what process are polyesters formed?

(higher only)

By what process are polyesters formed? (higher only)

Condensation polymerisation.

Why are polyesters condensation polymers? (higher only)

Why are polyesters condensation polymers? (higher only)

Because a small molecule (water) is released when the bond is formed between two monomers.

What reactants are required to form an polyester? (higher only)

What reactants are required to form an polyester? (higher only)

Molecules with two carboxylic acid groups (-COOH) and molecules with two alcohol groups (-OH).

Describe the formation of a ester bond (higher only)

Describe the formation of a ester bond (higher only)

The carboxylic acid loses an OH from the COOH group. The alcohol loses a H from the -OH group. The two larger molecules combine, forming an ester bond.

The OH^- and H^+ molecules lost during the bond formation combine to make water.

What are some of problems associated with polymers?

What are some of problems associated with polymers?

- Crude oil (starting material) is a finite resource.
- Not biodegradable so take up space in landfill and end up in the oceans, causing problems for marine life.
- Produce carbon dioxide if incinerated (and HCl is the polymer contain chlorine).
- Production process requires a lot of energy.
- Recycling requires careful sorting which is time-consuming.

What are the advantages associated with recycling polymers?

What are the advantages associated with recycling polymers?

- Provides employment.
- Less crude oil used.
- Less energy used in recycling than in processing new materials.
- Reduces the amount of space needed for landfill and fewer polymers end up in the ocean.

What are the disadvantages associated with recycling polymers?

What are the disadvantages associated with recycling polymers?

- Labour intensive and expensive to first separate the polymer into different recycling categories.
- Melting polymers produces toxic gases which are harmful for animals and plants.
- Polymers can only be recycled a certain number of times before losing their properties and becoming unusable.

What is starch?

What is starch?

A polymer based on sugars.

In terms of polymers, what is DNA?

In terms of polymers, what is DNA?

A polymer made from four different monomers called nucleotides.

What are proteins?

What are proteins?

Polymers based on amino acids.

What functional group do alcohols contain?

What functional group do alcohols contain?

-OH

What are the names and formulae of the first four alcohols?

What are the names and formulae of the first four alcohols?

Methanol (CH_3OH)

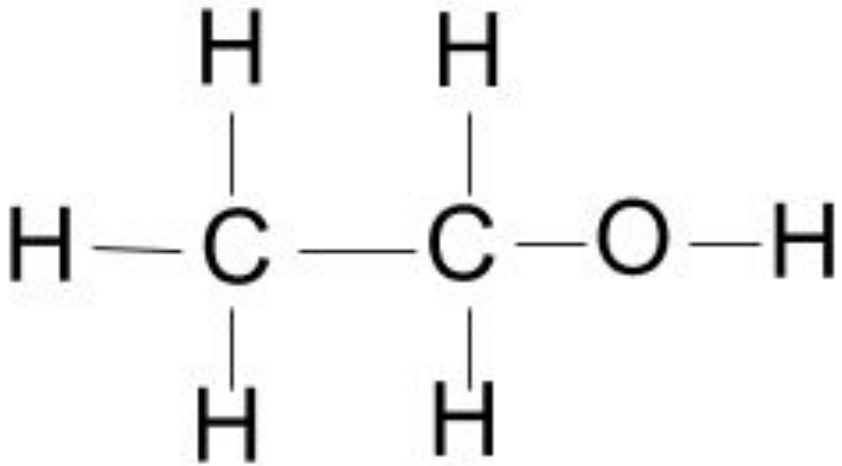
Ethanol (C_2H_5OH)

Propanol (C_3H_7OH)

Butanol (C_4H_9OH)

Draw the displayed formula of ethanol

Draw the displayed formula of ethanol



How is boiling point affected by an alcohol's chain length?

How is boiling point affected by an alcohol's chain length?

As the chain length of an alcohol increases, boiling point increases.

How can an alkene be produced from an alcohol?

How can an alkene be produced from an alcohol?

During a dehydration reaction with sulfuric acid. Water is also produced.

What functional group do carboxylic acids contain?

What functional group do carboxylic acids contain?

-COOH

What are the names and formulae of the first four carboxylic acids?

What are the names and formulae of the first four carboxylic acids?

Methanoic acid ($HCOOH$)

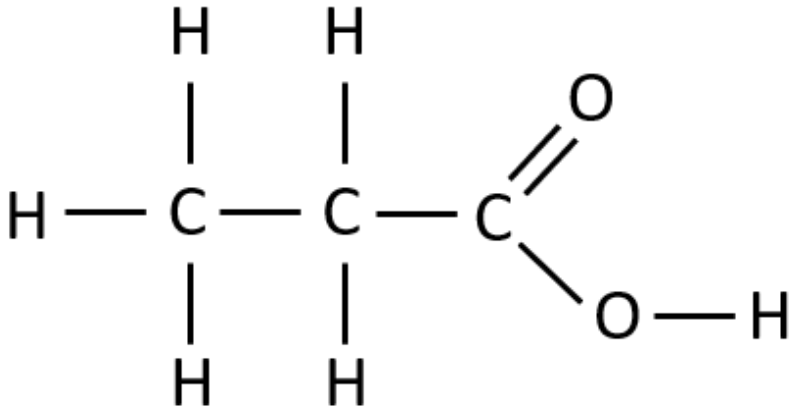
Ethanoic acid (CH_3COOH)

Propanoic acid (C_2H_5COOH)

Butanoic acid (C_3H_7COOH)

Draw the displayed formula of propanoic acid

Draw the displayed formula of propanoic acid



Fill in the blank: ‘Solutions of carboxylic acids have typical _____ properties’

Fill in the blank: ‘Solutions of carboxylic acids have typical _____ properties’

Acidic

How can ethanol be converted into ethanoic acid?

How can ethanol be converted into ethanoic acid?

Oxidation

Butanol is oxidised. What is the product?

Butanol is oxidised. What is the product?

Butanoic acid

Why do members of the same homologous series undergo similar reactions?

Why do members of the same homologous series undergo similar reactions?

The molecules have the same functional group so have similar chemical properties.

Which renewable process can be used to produce ethanol?

Which renewable process can be used to produce ethanol?

By fermentation of carbohydrates in aqueous solution with yeast (provides enzymes).

What conditions are required for the fermentation of glucose to form ethanol?

What conditions are required for the fermentation of glucose to form ethanol?

- Anaerobic conditions (no oxygen).
- Warm to increase rate of reaction without denaturing enzymes in the yeast.

What is the word and balanced chemical equation for the fermentation of glucose?

What is the word and balanced chemical equation for the fermentation of glucose?

Glucose → ethanol + carbon dioxide

$C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2$

How can concentrated ethanol be extracted from the fermentation mixture?

How can pure concentrated ethanol be extracted from the fermentation mixture?

Fractional distillation.

Ethanol has a lower boiling point than water so will evaporate first.

Compare the size of nanoparticles to atoms and molecules

Compare the size of nanoparticles to atoms and molecules

Nanoparticles contain a few hundred atoms and are between 1-100 nm (nanometres) across.

What are some of the risks associated with nanoparticulate materials?

What are some of the risks associated with nanoparticulate materials?

- Little is known about the effects of nanoparticles.
- May be harmful to health (they could enter the bloodstream or be breathed in).
- May catalyse harmful reactions inside the body.
- Large surface area to volume ratio may allow toxic substances to bind to them and enter the body.

Why would nanoparticles be useful catalysts?

Why would nanoparticles be useful catalysts?

Nanoparticles have a very high surface area to volume ratio.

What is the equation to calculate the surface area to volume ratio?

What is the equation to calculate the surface area to volume ratio?

Surface area to volume ratio =

Surface area ÷ Volume

Why might nanotubes be used to make electrical circuits for computers?

Why might nanotubes be used to make electrical circuits for computers?

- Can conduct electricity.
- Are very small so take up little space.
- Lightweight.

Why might nanoparticles be used in sunscreen?

Why might nanoparticles be used in sunscreen?

Some nanoparticles block UV light.

Nanoparticles don't leave white marks on skin.

What are the general properties of glass ceramics?

What are the general properties of glass ceramics?

- Transparent.
- Strong but brittle.
- Easily moulded into shapes.
- Poor conductors.

What are the general properties of clay ceramics?

What are the general properties of clay ceramics?

- Opaque.
- Soft and malleable.
- Hardened with heat.
- Brittle once hardened.
- Poor conductors.

What are the general properties of polymers?

What are the general properties of polymers?

- Properties can be adapted to suit the purpose.
- Usually tough and flexible.
- Can be transparent or opaque.
- Poor conductors.

What are the general properties of metals?

What are the general properties of metals?

- Shiny
- Malleable
- Ductile
- Good conductors
- Can form alloys to produce more desirable properties.

What is a composite material?

What is a composite material?

Contains two or more materials with different properties.

Typically, there are two components: the reinforcement (makes up the bulk of the material) and the matrix (binds the reinforcement together).

Why do composite materials have a wide range of different properties?

Why do composite materials have a wide range of different properties?

As composite materials are made of several materials, the properties can be tailored to suit the need of the composite. Different composite materials contain different reinforcements and matrixes so the properties vary.

What should be used to construct large buildings: reinforced concrete or fibreglass? Why?

What should be used to construct large buildings: reinforced concrete or fibreglass? Why?

Reinforced concrete because it is strong in compression and tension and slightly flexible.

What should be used to make tennis rackets: timber or fibre reinforced plastic? Why?

What should be used to make tennis rackets: timber or fibre reinforced plastic? Why?

Fibre reinforced plastic because it has a low density so is lightweight and is flexible and strong in tension.