GCSE COMBINED SCIENCE

Paper 1 + 2

CHEMISTRY

REVISION

FLASHCARD

POWERPOINT

Rainy_Violet

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TOPIC 1
ATOMS

MAIN MENU

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What did JJ Thompsons' discovery of the electron show?

MAIN MENU

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ANSWER

This showed that the atom contained smaller pieces, whereas Dalton had thought that atoms could not be broken down into anything simpler.

MAIN MENU

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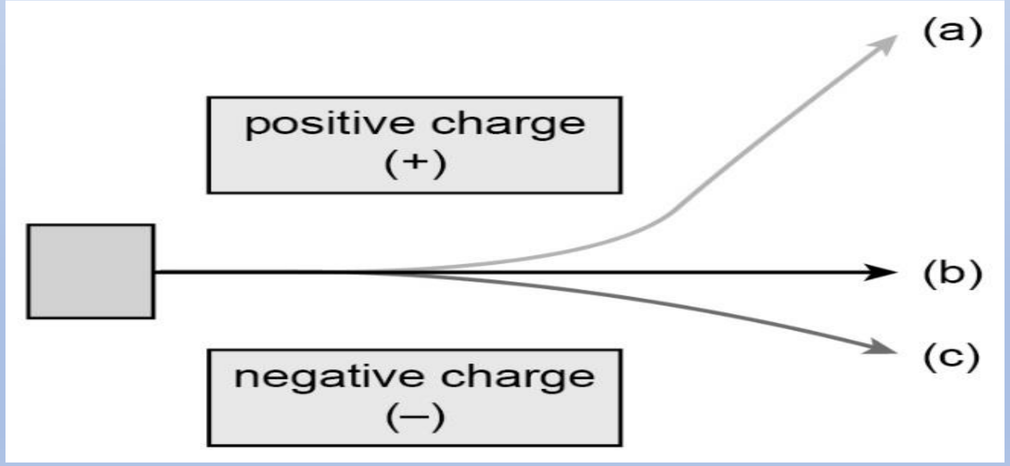
What would happen if the subatomic particles where fired through an electric field?



MAIN MENU

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Protons (C), Electrons (a) and Neutrons (b) . Electrons would deflect furthest due to them having no mass. Assuming they are all travelling at the same speed or with the same energies

Describe the structure of the atom.

ANSWER

Atoms are composed of a central core called the nucleus, with negatively charged particles called electrons, surrounding the nucleus.

MAIN MENU

Back to start of section

What does the nucleus of an atom consist of?

ANSWER

The nucleus is made up of protons that have a positive charge, and neutrons that have no charge.

Describe the relationship between the number of protons in an atom and the number of electrons

MAIN MENU

Back to start of section

ANSWER

Atoms have no overall charge. This is because each atom contain an equal number of positively charged protons and negatively charged electrons.

Where are the electrons found in the atom?

Electrons can only have certain energies when they surround the nucleus. We sometimes say that electrons that have the same energy are found in the same shell of an atom.

How does the size of the nucleus compare with the size of the atom?

MAIN MENU

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ANSWER

The nucleus of the atom is very small compared to the overall size of the atom (the nucleus is ~10^{-15} m across, whereas an atom is ~10^{-10} m across).

MAIN MENU

Back to start of section

Describe atoms of an element in terms of number of protons.

MAIN MENU

Back to start of section

ANSWER

Any atom of a given element will have the same number of protons in the nucleus, and that number is unique to the element.

What are the relative charges of protons, neutrons and electrons?

MAIN MENU

Back to start of section

ANSWER

+1, 0, and -1.

What are the relative masses of protons, neutrons and electrons?

MAIN MENU

Back to start of section

ANSWER

1, 1 and 1/1836.

MAIN MENU

Back to start of section

What is meant by the term 'atomic number'?

MAIN MENU

Back to start of section

ANSWER

The number of protons inside the nucleus of an atom (same as the proton number).

MAIN MENU

Back to start of section

What is meant by the term ‘mass number’?

MAIN MENU

Back to start of section

The total number of neutrons and protons within the nucleus of an atom (same as the nucleon number).

What is the definition of relative atomic mass ?

MAIN MENU

Back to start of section

ANSWER

Mass of an atom (1)

Relative to carbon-12 (1)

MAIN MENU

Back to start of section

What did Rutherford discover? How did he discover it?

MAIN MENU

Back to start of section

ANSWER

Fired a positively charged beam at gold foil, he expected them to go straight through. However some deflected back. Discovering the nucleus.

MAIN MENU

Back to start of section

Write the subatomic particles in order of discovery

MAIN MENU

Back to start of section

ANSWER

Electron, Proton and neutron

MAIN MENU

Back to start of section

What are the maximum number of electrons that occupy shells 1,2 and 3

MAIN MENU

Back to start of section

ANSWER

1st Shell = 2, 2nd Shell = 8 and 3rd Shell = 8

MAIN MENU

Back to start of section

Write the definition of an isotope

MAIN MENU

Back to start of section

ANSWER

(1) Nuclei of atoms with the same number of protons but a different number of neutrons; (2) Atoms with the same number of protons but different numbers of neutrons.

Topic 1 CC3

Q: Why do some elements have relative atomic masses that are not whole numbers?

MAIN MENU

Back to start of section

ANSWER

A: Because elements exist in different isotopic forms, which have different mass numbers (owing to different numbers of neutrons in the nucleus).

MAIN MENU

Back to start of section

Topic 1 CC3

Q: Carbon exists as 98.93% carbon-12, and 1.07% carbon-13.

What is its relative atomic mass?

MAIN MENU

Back to start of section

ANSWER

A:

$$\frac{(12 \times 98.93) + (13 \times 1.07)}{100}$$

$= 12.0107$

(rounded to 12.01)

MAIN MENU

Back to start of section

Topic 1 CC3

Q: Will isotopes of the same element have the same physical properties?

MAIN MENU

Back to start of section

ANSWER

A: No, they will have different physical properties i.e. densities, melting points etc

MAIN MENU

Back to start of section

Topic 1 CC3

Q: Will isotopes of the same element have the same chemical properties?

MAIN MENU

Back to start of section

ANSWER

A: Yes, they will have the same chemical properties, because they all have the same number of electrons

MAIN MENU

Back to start of section

Topic 1 CC3

Q: What makes isotopes the same element?

MAIN MENU

Back to start of section

ANSWER

A: They have the same atomic number

MAIN MENU

Back to start of section

Topic 1 CC3

Q: There are 2 isotopes of magnesium. 69% has a mass of 24 & 31% has a mass of 25. Calculate the relative atomic mass of magnesium.

MAIN MENU

Back to start of section

ANSWER

A:

$$\frac{(69 \times 24) + (31 \times 25)}{100}$$

$= 24.3$ (to 1 decimal place)

MAIN MENU

Back to start of section

Topic 1 CC3

Q: Chlorine exists as 75% chlorine-35, and 25% chlorine-37. What is its relative atomic mass?

ANSWER

A:

$$\frac{(35 \times 75) + (37 \times 25)}{100}$$

$= 35.5$ (to 1 decimal place)

MAIN MENU

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Topic 1 CC3 Q: What is the electronic configuration of carbon (atomic number = 6)?

MAIN MENU

Back to start of section

ANSWER

A:

2.4

MAIN MENU

Back to start of section

Topic 1 CC3

Q: What is the electronic configuration of sodium (atomic number = 23)?

MAIN MENU

Back to start of section

ANSWER

A:

2.8.1.

Topic 1 CC3

Q: What is the electronic configuration of argon (atomic number = 18)?

ANSWER

A:

2.8.8.

MAIN MENU

Back to start of section

Topic 1 CC3

Q: What did John Dalton say?

MAIN MENU

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ANSWER

A: Matter is made up of tiny particles called atoms. - Cannot be divided up and cannot be destroyed. - All atoms of the same element will be exactly the same. – All atoms of different elements can combine to form compounds

Topic 1 CC3

Q: What did JJ Thompson discover?

MAIN MENU

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ANSWER

A: The Electron

MAIN MENU

Back to start of section

Topic 1 CC3

Q: What is the equation used to calculate the relative atomic mass of isotopes of the same element?

ANSWER

A:

$$A_r = \frac{(\% \text{ of isotope 1} \times \text{mass of isotope 1}) + (\% \text{ of isotope 2} \times \text{mass of isotope 2})}{100}$$

Topic 1 CC3

Q: How many protons are there in an atom with an atomic number of 26?

MAIN MENU

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ANSWER

A: 26

MAIN MENU

Back to start of section

Topic 1 CC3

Q: What is the A_r?

MAIN MENU

Back to start of section

ANSWER

A: Relative atomic mass (found in the periodic table)

Topic 1 CC3

Q: What is the Ar of Lithium?

ANSWER

A: 7

MAIN MENU

Back to start of section

Formulas

9 in total

R_f value

MAIN MENU

Back to start of section

ANSWER

$$R_f \text{ value} = \frac{\text{distance moved by the spot}}{\text{distance moved by the solvent}}$$

MAIN MENU

Back to start of section

(H) Relative atomic mass (A_r)

HINT: Isotopes

MAIN MENU

Back to start of section

ANSWER

$$A_r = \frac{(\%\ \text{isotope 1} \times A_r\ \text{isotope 1}) + (\%\ \text{isotope 2} \times A_r\ \text{isotope 2})}{\text{Total abundance}}$$

MAIN MENU

Back to start of section

How do you calculate P, E, N ?

HINT: What does the top and bottom number tell us?

MAIN MENU

Back to start of section

ANSWER

P = atomic/proton number

E = atomic/proton number

N= Atomic mass – atomic/proton number

Concentration (g/dm^3 or gdm^{-3})

MAIN MENU

Back to start of section

ANSWER

$$\text{Concentration (g/dm}^3\text{)} = \frac{\text{mass of solute (g)}}{\text{Volume of solution (dm}^3\text{)}}$$

Relative formula mass (M_r)

ANSWER

M_r = Total sum of A_rs within a compound

MAIN MENU

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(H)

Number of moles of a substance (mol)

ANSWER

$$\text{Number of moles of a substance (mol)} = \frac{\text{mass of substance (g)}}{A_r \text{ or } M_r}$$

MAIN MENU

Back to start of section

Rate of reaction (cm^3/s) – *3 formulas*

MAIN MENU

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ANSWER

1. Rate (cm^3/s) = amount of product produced (cm^3) / time taken (s)
2. Rate (cm^3/s) = amount of reactant used up (cm^3) / time taken (s)
3. Rate (cm^3/s) = change in y axis (cm^3) /change in x axis (s)

Alkane general formula

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ANSWER

$$C_nH_{2n+2}$$

MAIN MENU

Back to start of section

Alkene general formula

MAIN MENU

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ANSWER

$$C_nH_{2n}$$

MAIN MENU

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TOPIC 2: STATES and SEPARATING MIXTURES

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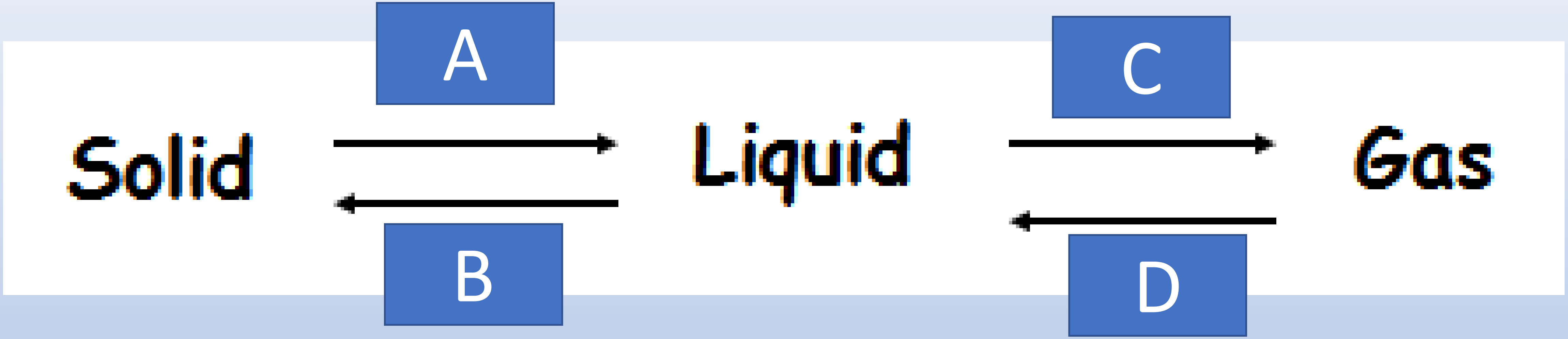

STRETCH: Can you get the solid to gas and gas to solid?

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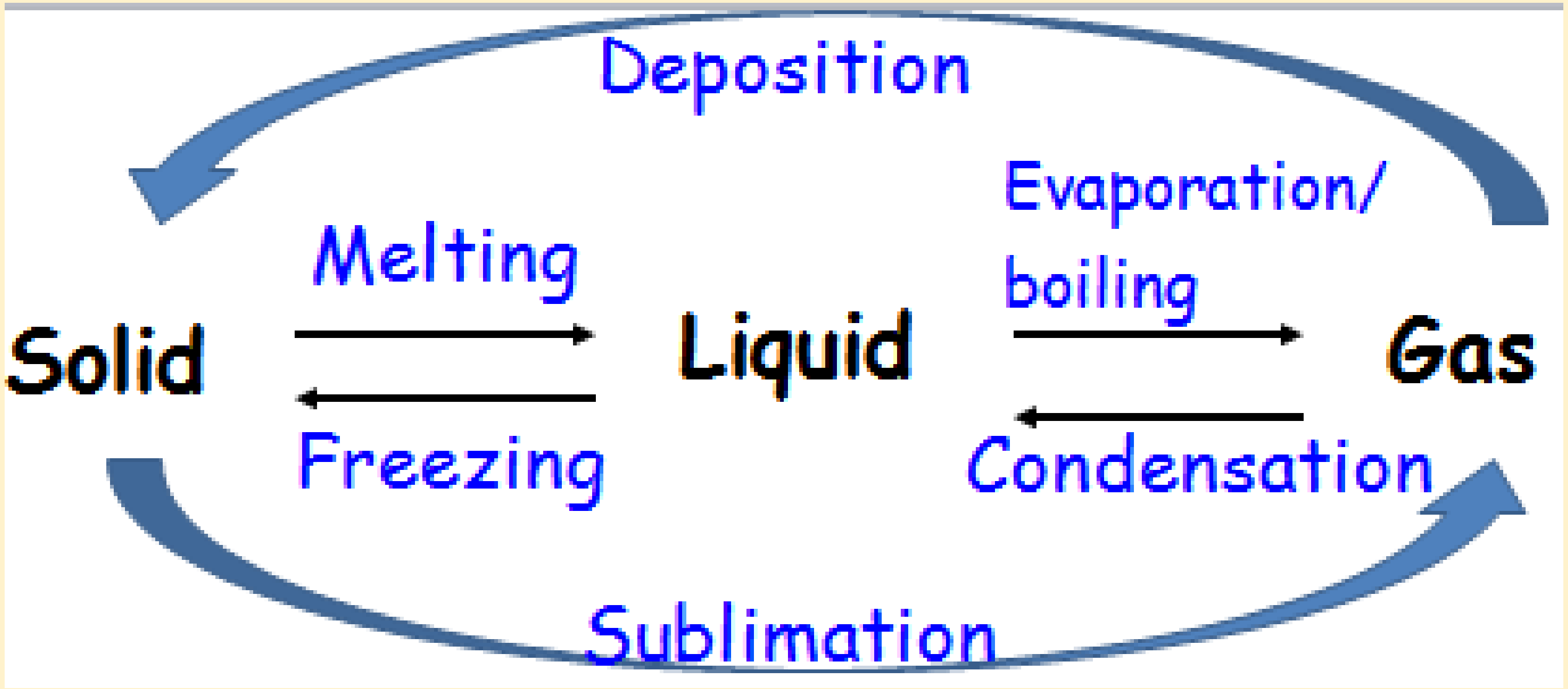
ANSWER



MAIN MENU

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The melting point of sodium is 97.7°C.

What is the state of sodium at 25.0°C?

MAIN MENU

Back to start of section

ANSWER

Solid

MAIN MENU

Back to start of section

In which state do particles move quickly in all directions?

MAIN MENU

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Gas

In general, which state of matter has particles with the highest energy?

MAIN MENU

Back to start of section

ANSWER

Gas

MAIN MENU

Back to start of section

When a substance is melted, is energy transferred to or from the surroundings?

ANSWER

From

A _____ substance cannot be changed and it is the same in all parts

MAIN MENU

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ANSWER

Pure

MAIN MENU

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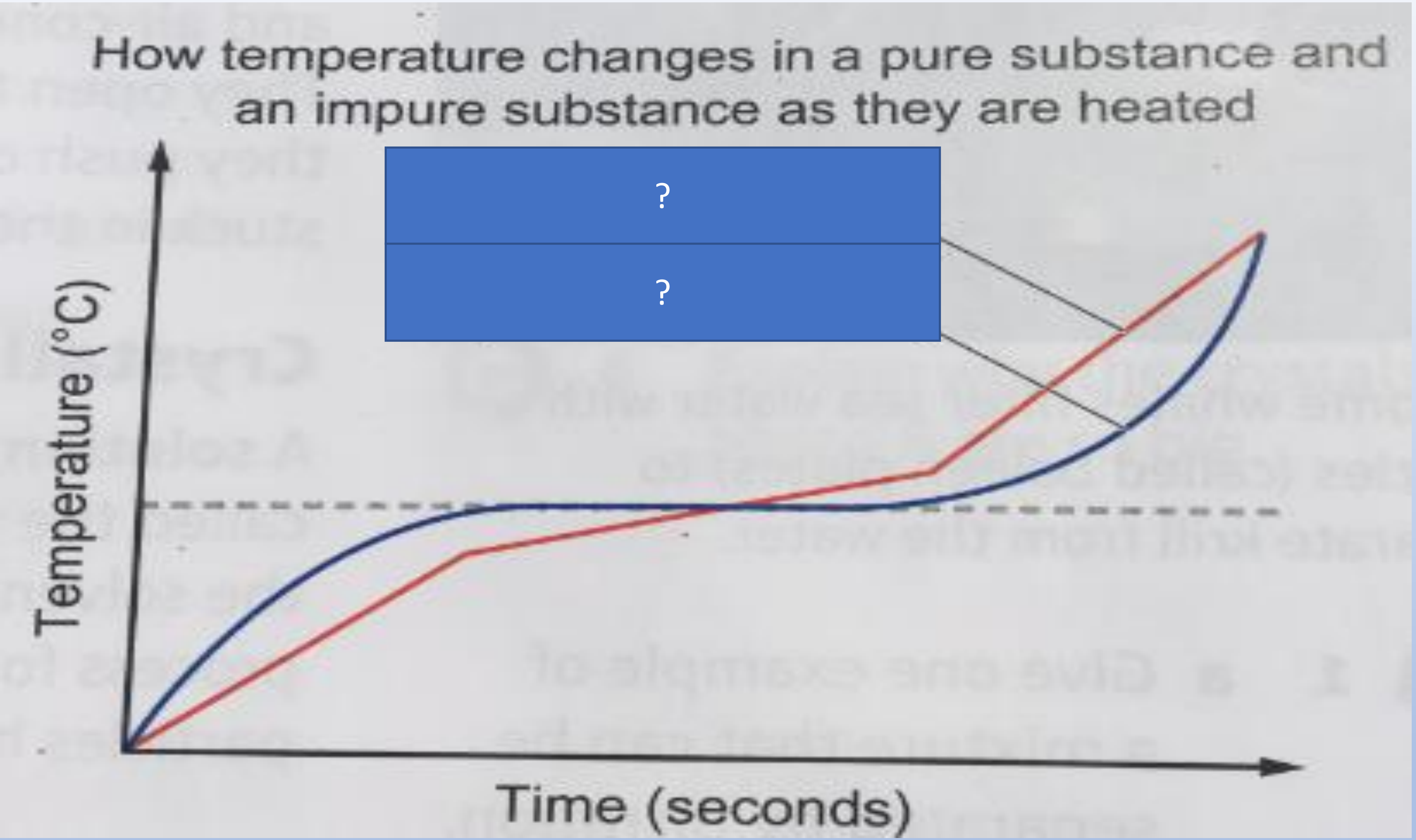

MAIN MENU

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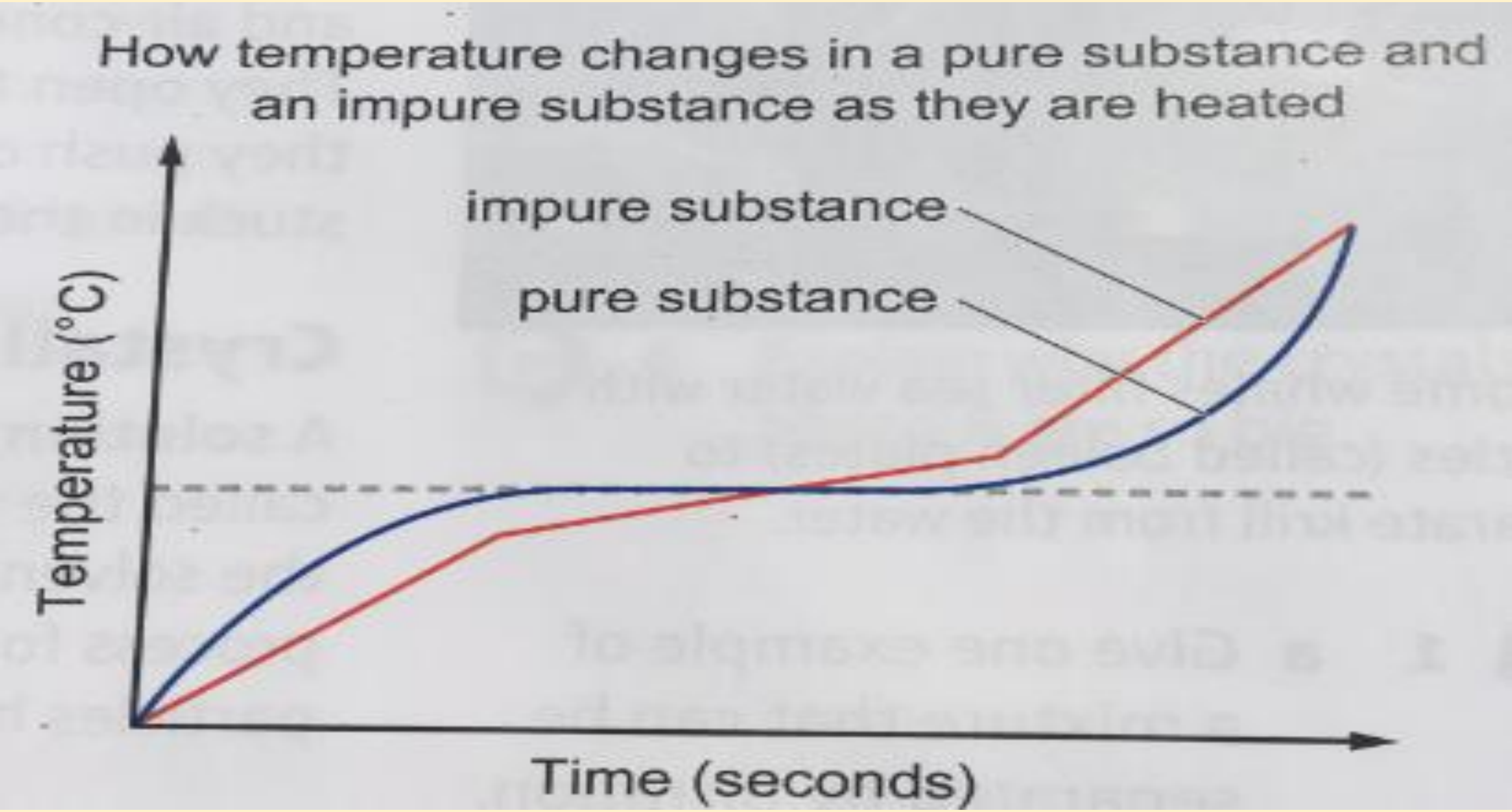
ANSWER


How temperature changes in a pure substance and an impure substance as they are heated
impure substance
pure substance
Temperature (°C)
Time (seconds)

What is the definition of a mixture?

MAIN MENU

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ANSWER

A mixture is 2 or more substances that are not chemically joined together.

MAIN MENU

Back to start of section

TRUE OR FALSE –
Pure substances only have one type of atom present.

ANSWER

Pure substances only have one type of atom present.

FALSE - They are the same in all parts but compounds can be pure.

TRUE OR FALSE - Crystallisation is when the solute evaporates and leaves the solvent behind

MAIN MENU

Back to start of section

ANSWER

Crystallisation is when the <u>solute</u> evaporates and leaves the <u>solvent</u> behind

FALSE - <u>Solvent</u> evaporates;

<u>solute</u> left behind

MAIN MENU

Back to start of section

What do the terms ‘soluble’ and ‘insoluble’ mean?

MAIN MENU

Back to start of section

ANSWER

Soluble – it can dissolve.

Insoluble – it cannot dissolve

MAIN MENU

Back to start of section

What does the term ‘Solute’ mean?

MAIN MENU

Back to start of section

The substance that dissolves in a liquid to form a solution

What is chromatography?

ANSWER

A method of separating substances using solvent passing through paper or similar medium.

MAIN MENU

Back to start of section

What is a chromatogram?

MAIN MENU

Back to start of section

ANSWER

The final result of chromatography: the chromatography paper with the result on.

MAIN MENU

Back to start of section

How do you carry out chromatography?

Put spots of each mixture being tested on a pencil baseline on filter paper. Roll up the paper and put it in a beaker containing a solvent, *e.g.* ethanol or water. The baseline must be kept above the level of the solvent. The solvent seeps up the paper, taking the samples with it. The different chemicals in the sample form separate spots on the paper.

In chromatography, why is it important to draw the line and the labels in pencil and not ink?

ANSWER

Pencil is insoluble in the solvent

In chromatography, why should the spots of mixture on the baseline be above the level of the solvent?

ANSWER

Ink is soluble in the solvent and the ink would bleed out

MAIN MENU

Back to start of section

In chromatography, which is the mobile phase and which is the stationary phase?

MAIN MENU

Back to start of section

ANSWER

Mobile phase is the solvent and the stationary phase is the paper

MAIN MENU

Back to start of section

In chromatography, what is the solvent front?

MAIN MENU

Back to start of section

ANSWER

The solvent front is how far the solvent has moved up the paper. A pencil line is drawn and it is used to work out the R_f value of the substance

State two contexts in which chromatography could be used.

ANSWER

To separate the colouring agents in foodstuffs, or drugs in forensic science.

What is an R_f value?

R_f =

distance travelled by the spot ÷ distance travelled by the solvent

How can we calculate the R_f value of a substance?

ANSWER

R_f

= distance travelled by the spot ÷ distance travelled by the solvent

TRUE OR FALSE : The higher the boiling point, the quicker the liquid will evaporate

MAIN MENU

Back to start of section

ANSWER

The higher the boiling point, the quicker the liquid will evaporate

FALSE - It should be lower

MAIN MENU

Back to start of section

In fractional distillation, what will liquid will be collected first, Liquid A 100ºC or Liquid B at 65ºC?

ANSWER

Liquid B at 65°C

MAIN MENU

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How can mixtures be separated?

MAIN MENU

Back to start of section

ANSWER

Any physical method – filtration, evaporation, distillation, chromatography, sieving

MAIN MENU

Back to start of section

What is the temperature on the thermometer if water is distilling off?

MAIN MENU

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ANSWER

100°C

MAIN MENU

Back to start of section

What is the difference between simple distillation and fractional distillation?

MAIN MENU

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ANSWER

Fractional distillation is used if there are more than two liquids. A temperature gradient can be achieved which allowed better separation between liquids.

MAIN MENU

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What is a temperature gradient?

MAIN MENU

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ANSWER

First, the vapour condenses when it hits the cool glass and drips back down into the flask. As the column will gradually heats back up there will be a **temperature gradient** – it will be hottest at the bottom and cooler at the top. The fraction with the lowest boiling point will reach the top first, condense and collect as a fraction. Keep heating and the next fraction can be collected.

MAIN MENU

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How would you separate crude oil?

MAIN MENU

Back to start of section

Fractional distillation

How could you separate ***sand*** from saltwater ?

MAIN MENU

Back to start of section

ANSWER

Filtration. Sand is insoluble

MAIN MENU

Back to start of section

What are the main errors using simple distillation?

How could it be improved?

MAIN MENU

Back to start of section

ANSWER

Main error is the gas escaping from the boiling tube after it has condensed.

Improvement: use a (Liebig) condenser

MAIN MENU

Back to start of section

Getting pure water from sea water is called........

MAIN MENU

Back to start of section

ANSWER

Getting pure water from sea water is called **desalination**.

MAIN MENU

Back to start of section

Explain why the simple distillation of sea water may be used to provide drinking water in oil-rich coastal countries?

MAIN MENU

Back to start of section

ANSWER

Oil is used to heat up the water to start the distillation process – used in countries where oil supplies are cheap and plentiful and there is an abundant supply of sea water

MAIN MENU

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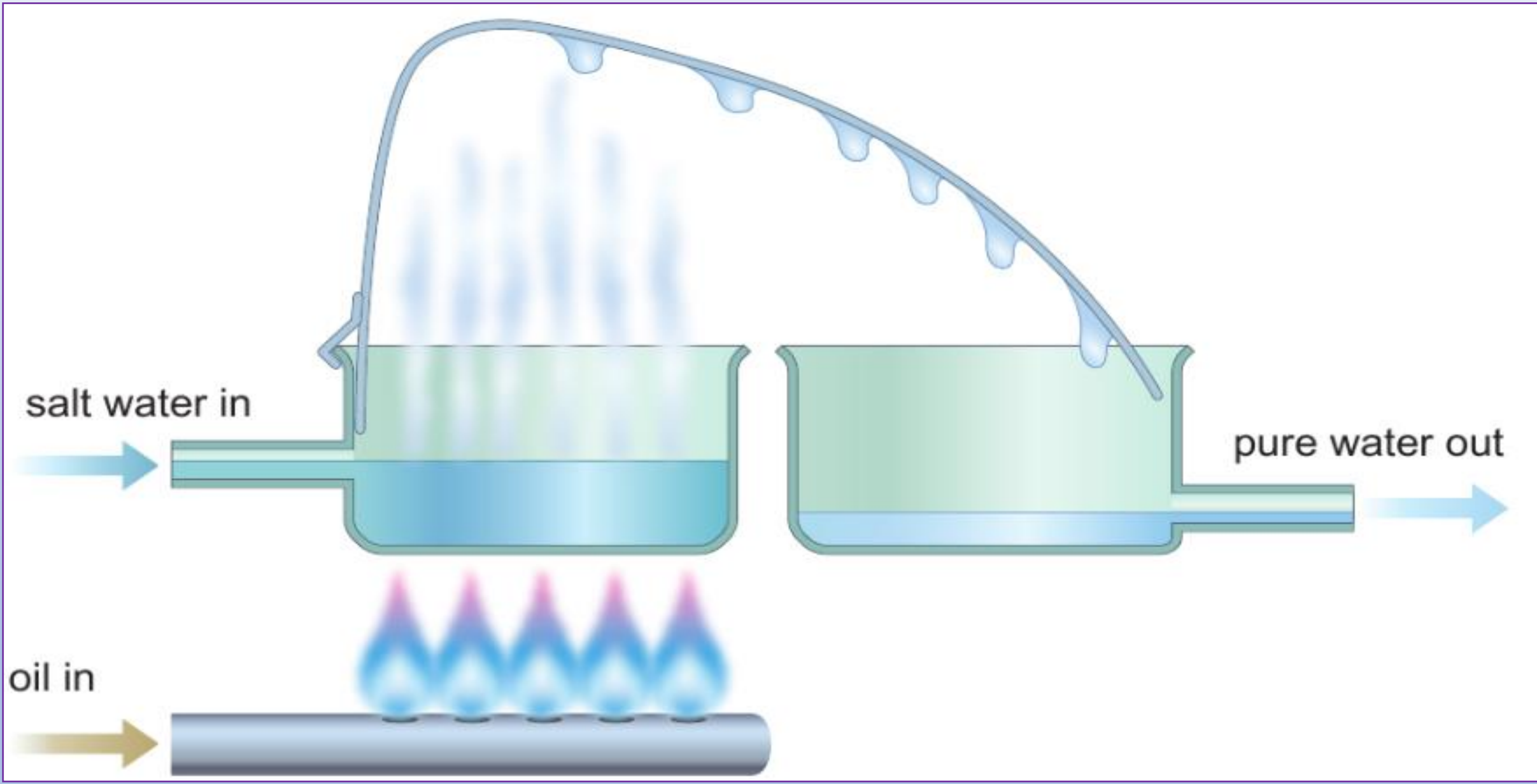
Explain



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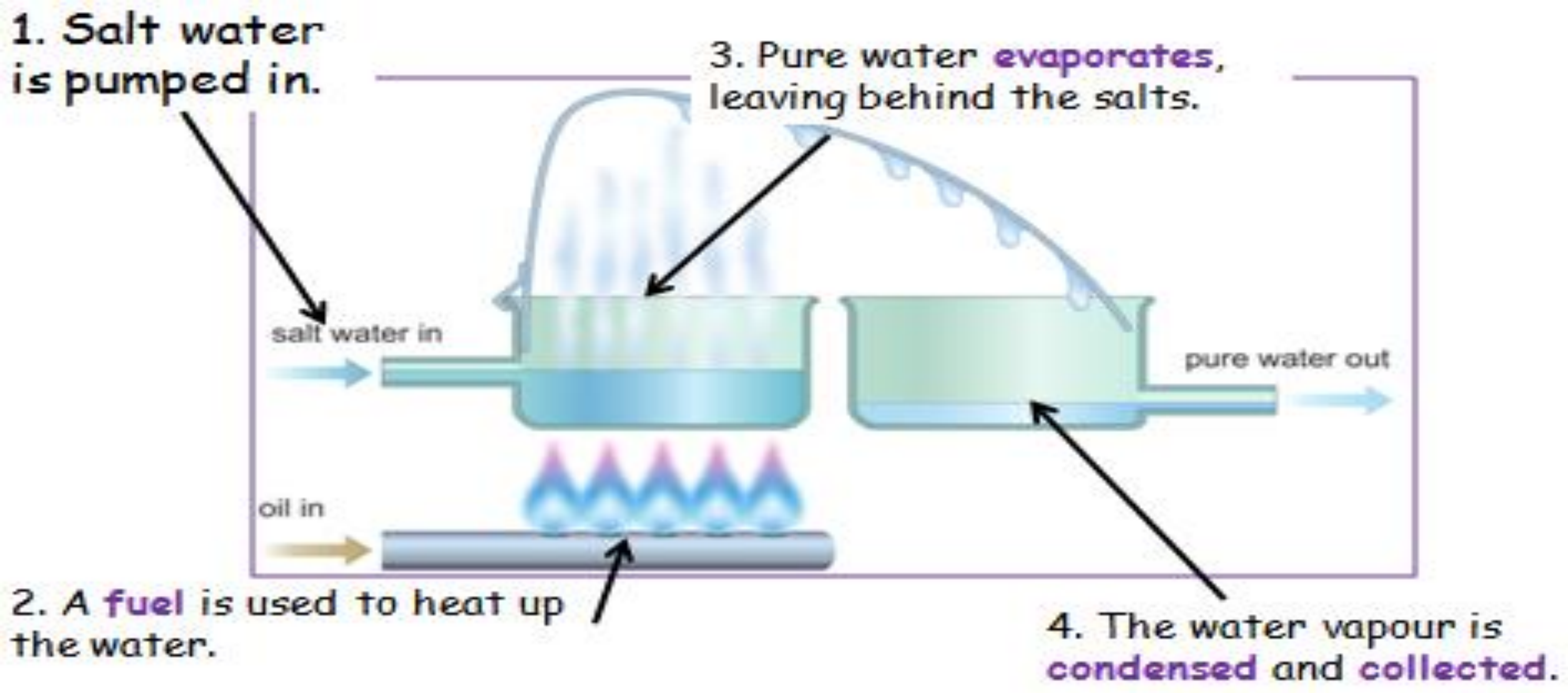

MAIN MENU

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Sewage in the rivers is called .....

MAIN MENU

Back to start of section

ANSWER

Sewage in the rivers is called effluent

MAIN MENU

Back to start of section

What impurities might freshwater from these sources contain?

MAIN MENU

Back to start of section

ANSWER

Leaves, pesticides, bacteria, fertilisers, twigs, grit, salt, silt

Is the water from a tap the same as water used in a laboratory for chemical analysis?

MAIN MENU

Back to start of section

ANSWER

Tap-water must be free from substances harmful to health.

Laboratory water must from free from ALL impurities.

MAIN MENU

Back to start of section

What are the 3 stages in the treatment of water to obtain pure water?

MAIN MENU

Back to start of section

ANSWER

Sedimentation, Filtration and Chlorination

MAIN MENU

Back to start of section

Describe what happens at each stage for the treatment of water.

ANSWER

Sedimentation: Small particles are allowed to settle out eg silt and grit.

Filtration: Beds of sand and gravel filter out objects such as leaves and twigs.

Chlorination: Chlorine is added in the process, which kills microorganisms in the treated water.

Name some soluble, insoluble and biological impurities found in water.

MAIN MENU

Back to start of section

ANSWER

Insoluble impurities such as … grit, silt, mud and the remains of plants and animals. **Soluble impurities** such as … minerals, fertilisers, pesticides or salt. **Biological impurities**: microorganisms such as … bacteria and other impurities harmful to health.

MAIN MENU

Back to start of section

The Periodic Table

Topic 1 CC4

Q: How did Mendeleev organise his Periodic Table in 1869?

MAIN MENU

Back to start of section

ANSWER

A: He arranged the elements in order of increasing atomic weight (later replaced by atomic number); he arranged elements with similar chemical properties in the same group; he left gaps for undiscovered elements and predicted their properties.

MAIN MENU

Back to start of section

Topic 1 CC4

Q: How are elements divided between metals and non-metals within the Periodic Table?

MAIN MENU

Back to start of section

ANSWER

A: There is a "staircase line" starting at boron and finishing at polonium, with metals to the left of the line and non-metals to the right of the line.

MAIN MENU

Back to start of section

Topic 1 CC4

Q: What atom is used as the standard for comparing masses and working out relative atomic masses of elements?

ANSWER

A: Carbon-12

Topic 1 CC4

Q: What group in known as the 'Halogens'?

ANSWER

A: Group 7

MAIN MENU

Back to start of section

Topic 1 CC4

Q: How many shells do period 3 elements have?

MAIN MENU

Back to start of section

ANSWER

A: 3

MAIN MENU

Back to start of section

Topic 1 CC4

Q: Which group has the most reactive elements?

ANSWER

A: Group 1 – The Alkali metals

Topic 1 CC4

Q: Which group contain the least reactive elements and why?

MAIN MENU

Back to start of section

ANSWER

A: Group 0 – The Noble Gases. They have a full outer shell of electrons

Topic 1 CC4

Q: How is the modern day Periodic Table arranged?

MAIN MENU

Back to start of section

ANSWER

A: Atomic number

Topic 1 CC4

Q: Name the element in group 5 period 2?

MAIN MENU

Back to start of section

ANSWER

A: Nitrogen

MAIN MENU

Back to start of section

Topic 1 CC4 Q: What did Mendeleev occasionally do with the elements. Give an example of this.

ANSWER

A: Swap the positions of the elements if he thought he better suited their chemical properties. He swapped iodine and tellurium because iodine has similar chemical properties to fluorine, chlorine and bromine as they do not easily react with oxygen

MAIN MENU

Back to start of section

Topic 1 CC4

Q: What is meant by the term ‘atomic number’?

MAIN MENU

Back to start of section

ANSWER

A: The number of protons inside the nucleus of an atom (same as the proton number).

MAIN MENU

Back to start of section

Topic 1 CC4

Q: What is meant by the term ‘mass number’?

MAIN MENU

Back to start of section

ANSWER

A: The total number of neutrons and protons within the nucleus of an atom (same as the nucleon number).

Topic 1 CC4

Q: What is meant by the term 'relative atomic mass'?

MAIN MENU

Back to start of section

A: The average atomic mass of an element taking into account the relative abundance of the isotopes of the element.

Topic 1 CC4

Q: In terms of the Periodic Table, what is meant by a ‘period’?

ANSWER

A: A horizontal row in the Periodic Table, arranged in increasing atomic number.

Topic 1 CC4

Q: Mendeleev assumed that other elements would be discovered, what did he do as a precaution?

MAIN MENU

Back to start of section

ANSWER

A: He left gaps in the periodic table for them

MAIN MENU

Back to start of section

Topic 1 CC4

Q: In terms of the Periodic Table, what is meant by a ‘group’?

MAIN MENU

Back to start of section

ANSWER

A: A vertical column in the Periodic Table, consisting of elements with similar chemical properties.

MAIN MENU

Back to start of section

Topic 1 CC4

Q: What do we use to compare the masses of atoms of different elements?

MAIN MENU

Back to start of section

ANSWER

A: Relative atomic masses

Topic 1 CC4

Q: Which type of substance is found in the Periodic Table – elements, compounds or mixtures?

MAIN MENU

Back to start of section

ANSWER

A: Elements

MAIN MENU

Back to start of section

Topic 1 CC4

Q: Mendeleev thought he had arranged elements in order of increasing relative atomic mass but why was this not always true?

MAIN MENU

Back to start of section

ANSWER

A: This was not always true because of the relative abundance of isotopes of some pairs of elements in the periodic table

MAIN MENU

Back to start of section

Topic 1 CC4

Q: How is the Periodic Table arranged?

ANSWER

A: a) elements are arranged in order of increasing atomic number, in rows called periods

b) elements with similar properties are placed in the same vertical columns called groups

Topic 1 CC4

Q: What does the term ‘valency’ mean?

MAIN MENU

Back to start of section

ANSWER

A: A **valence electron** is an **electron** that is associated with an atom, and that can participate in the formation of a chemical bond

MAIN MENU

Back to start of section

Topic 1 CC4

Q:The number of outer electrons equals the _______

The number of shells equals the _______

MAIN MENU

Back to start of section

ANSWER

A: The number of outer electrons equals the group number

The number of shells equals the period number

MAIN MENU

Back to start of section

Topic 1 CC4

Q: How many outermost electrons are found in atoms of Group 1?

MAIN MENU

Back to start of section

ANSWER

A: 1.

Topic 1 CC4

Q: How many outermost electrons are found in atoms of Group 7?

MAIN MENU

Back to start of section

ANSWER

A: 7.

MAIN MENU

Back to start of section

Ionic bonding

Topic 1 CC5

Q: How do atoms of different elements combine to form compounds?

MAIN MENU

Back to start of section

ANSWER

A: By the formation of new chemical bonds.

Topic 1 CC5

Q: How are ionic bonds formed?

MAIN MENU

Back to start of section

ANSWER

A: By the transfer of electrons to form cations and anions.

MAIN MENU

Back to start of section

Topic 1 CC5

Q: What is an ion?

MAIN MENU

Back to start of section

ANSWER

A: Atoms or groups of atoms with a positive or negative charge.

Topic 1 CC5

Q: How is a sodium ion, Na^+, form from a sodium atom, Na?

MAIN MENU

Back to start of section

ANSWER

A: By the loss of one (the outer) electron.

MAIN MENU

Back to start of section

Topic 1 CC5

Q: How is a chloride ion, Cl^-, formed from a chlorine atom, Cl?

MAIN MENU

Back to start of section

ANSWER

A: By the gain of one electron into its outermost shell.

Topic 1 CC5

Q: How do atoms of Group 1 elements form ions?

MAIN MENU

Back to start of section

ANSWER

A: By the loss of the one electron in their outermost electron shell, to give a 1+ ion.

Topic 1 CC5

Q: How do atoms of Group 2 elements form ions?

MAIN MENU

Back to start of section

ANSWER

A: By the loss of the two electrons in their outermost electron shell, to give a 2+ ion.

Topic 1 CC5

Q: How do atoms of Group 6 elements form ions?

ANSWER

A: By the addition of two electrons to their outermost electron shell, to give a 2- ion.

Topic 1 CC5

Q: How do atoms of Group 7 form ions?

MAIN MENU

Back to start of section

ANSWER

A: By the addition of one electron to their outermost electron shell, to give 1- ions.

Topic 1 CC5

Q: What does the ending "ide" mean in the name of an ionic compound?

MAIN MENU

Back to start of section

ANSWER

A: The anion contains only one type of atom (except for hydroxides).

MAIN MENU

Back to start of section

Topic 1 CC5

Q: What does the ending “ate” mean in the name of an ionic compound?

MAIN MENU

Back to start of section

ANSWER

A: The anion contains two or more different elements and one of them is oxygen (except for hydroxides).

MAIN MENU

Back to start of section

Topic 1 CC5

Q: What is the chemical formulae for sodium chloride?

MAIN MENU

Back to start of section

ANSWER

A: $NaCl$

MAIN MENU

Back to start of section

Topic 1 CC5

Q: What is the chemical formulae for calcium nitrate?

MAIN MENU

Back to start of section

ANSWER

A: $Ca(NO_3)_2$

Topic 1 CC5

Q: What is the chemical formulae for aluminum chloride?

MAIN MENU

Back to start of section

ANSWER

A: $AlCl_3$

MAIN MENU

Back to start of section

Topic 1 CC5

Q: Describe **and explain** the melting points of sodium chloride and magnesium oxide.

MAIN MENU

Back to start of section

ANSWER

A: High melting and boiling points **due to the very strong bonds between the ions – it takes a lot of energy to break these bonds.**

MAIN MENU

Back to start of section

Topic 1 CC5

Q: What is meant by the term ‘lattice structure’?

MAIN MENU

Back to start of section

A: A structure consisting of a regular arrangement of ions, held together by strong electrostatic forces (ionic bonds) between oppositely-charged ions.

Topic 1 CC5

Q: Describe **and explain** the electrical conductivity of ionic compounds.

MAIN MENU

Back to start of section

A: They conduct electricity when aqueous or molten, **as in these states the ions are free to move so they can carry electric current.** They do not conduct electricity when solid, **as the ions are not free to move.**

Topic 1 CC5

Q: What is the chemical formulae for calcium sulfate?

MAIN MENU

Back to start of section

ANSWER

A: $CaSO_4$

MAIN MENU

Back to start of section

Topic 1 CC5

Q: What is the chemical formulae for calcium carbonate ?

MAIN MENU

Back to start of section

ANSWER

A: $CaCO_3$

Topic 1 CC5

Q: What is the chemical formulae for ammonium sulfate?

MAIN MENU

Back to start of section

ANSWER

A: $(NH_4)_2SO_4$

MAIN MENU

Back to start of section

Topic 1 CC5

Q: What ion will fluorine form? Why?

MAIN MENU

Back to start of section

ANSWER

A: F^-

Gaining 1 electron

Topic 1 CC5

Q: What is the chemical formulae for iron(III) oxide?

MAIN MENU

Back to start of section

ANSWER

A: Fe_2O_3

MAIN MENU

Back to start of section

Topic 1 CC5

Q: What is a positive ion called?

MAIN MENU

Back to start of section

A: Cation

- **Cat**ions are **paws**-itive
- Ca+ions ‘t’ looks like a ‘+’

MAIN MENU

Back to start of section

Topic 1 CC5

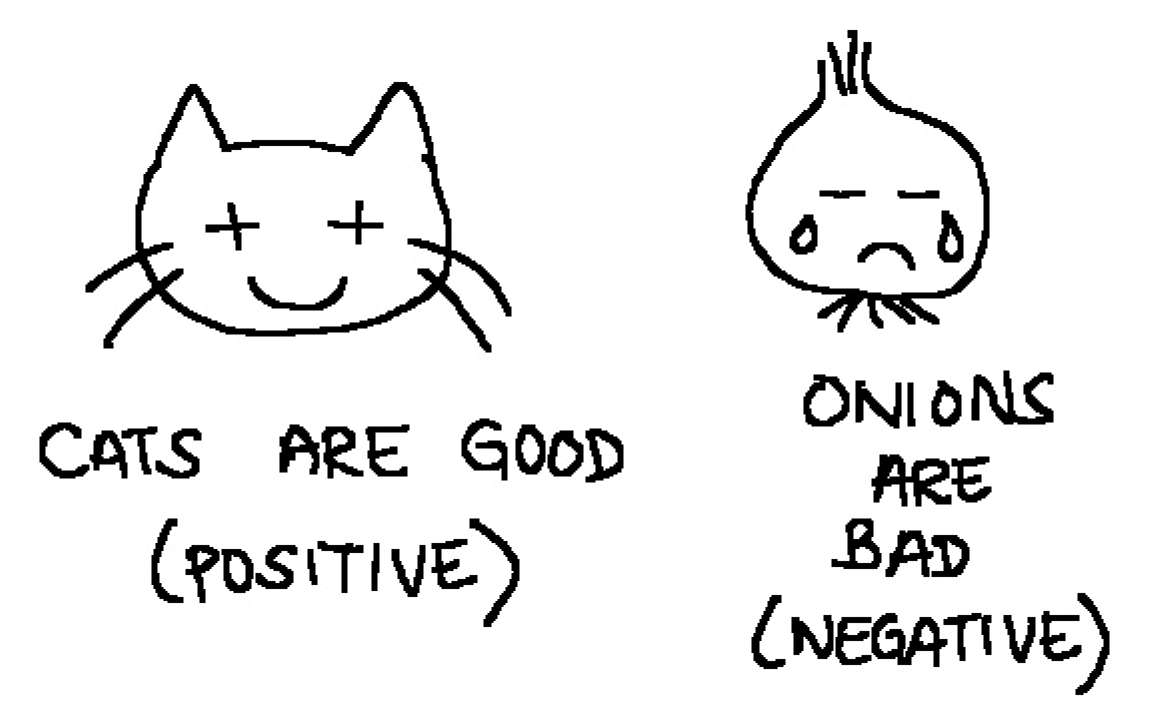
Q: What is a negative ion called?

MAIN MENU

Back to start of section

ANSWER

A: Anion



MAIN MENU

Back to start of section

Topic 1 CC5

Q: What is the chemical formulae for:

sodium oxide

and

sodium hydroxide?

ANSWER

A:, Na_2O, NaOH.

Topic 1 CC5

Q: Why are bonds formed?

MAIN MENU

Back to start of section

ANSWER

A: So atoms gain a full outer shell of electrons and become stable

MAIN MENU

Back to start of section

Topic 1 CC5

Q: What ion will oxygen form?

MAIN MENU

Back to start of section

ANSWER

A: O^{2-}

MAIN MENU

Back to start of section

Topic 1 CC5

Q: Describe an ‘ionic bond’

MAIN MENU

Back to start of section

A: An electrostatic force of attraction between oppositely charged ions

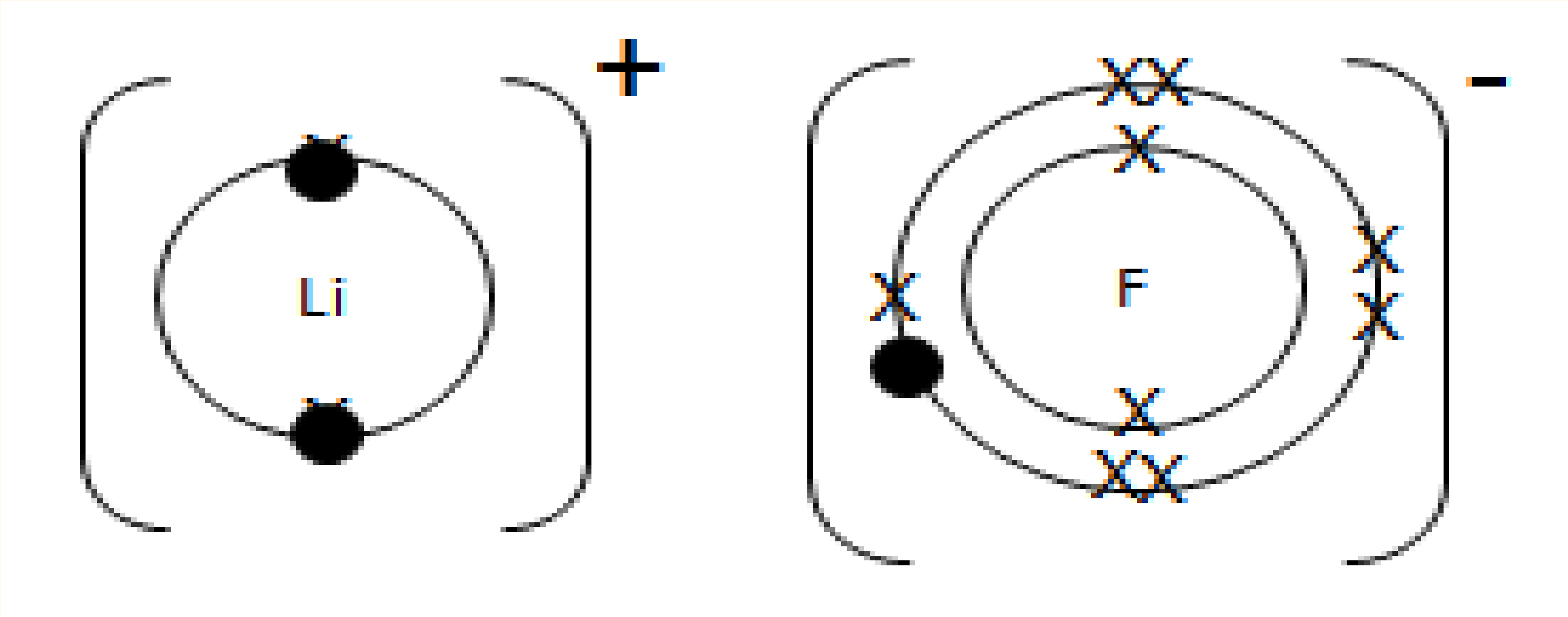
Topic 1 CC5

Q: Draw a dot and cross diagram to show the bonding between lithium and fluorine

MAIN MENU

Back to start of section

ANSWER



MAIN MENU

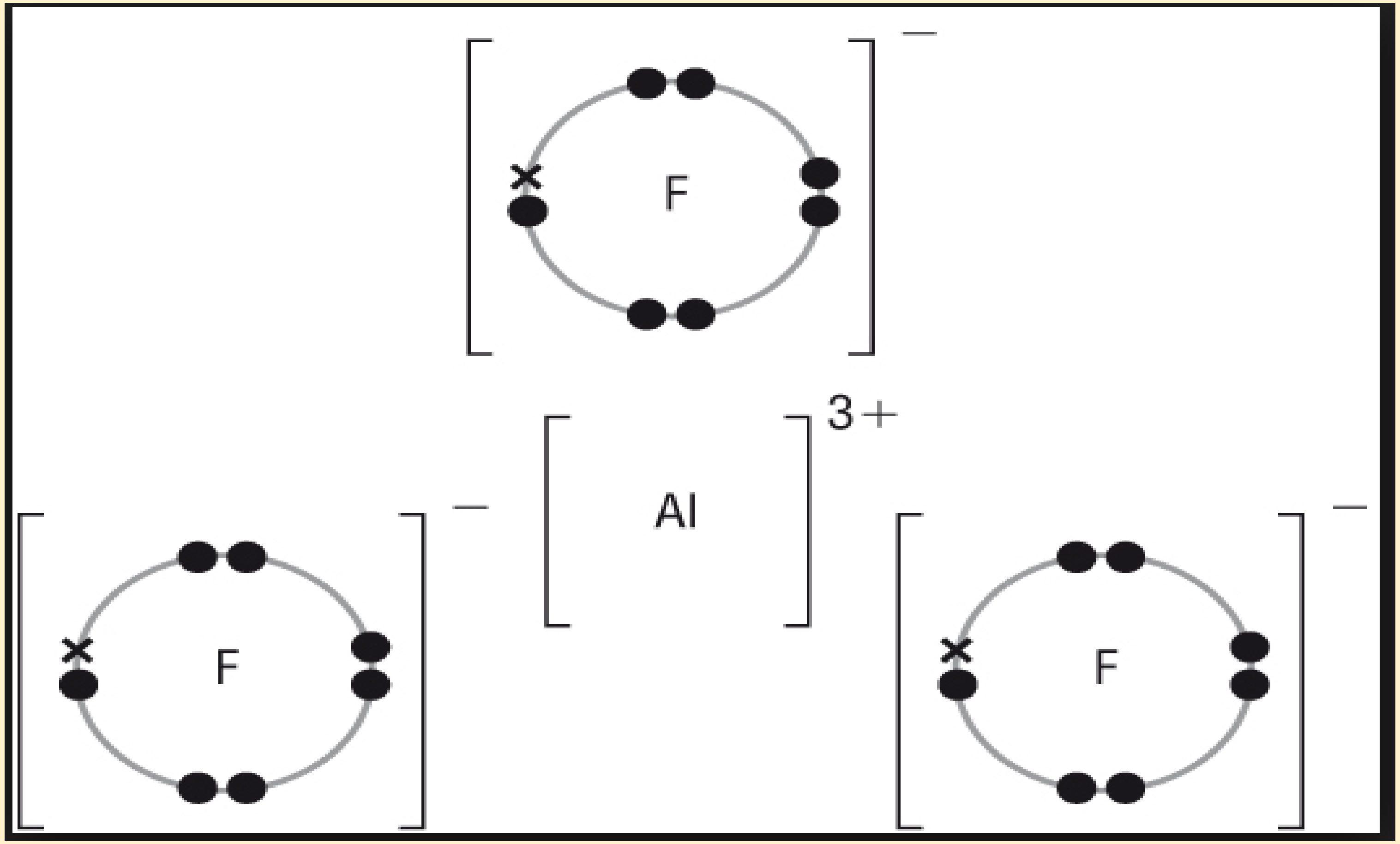
Back to start of section

Topic 1 CC5 Q: Draw a dot and cross diagram to show the bonding between
aluminum and fluorine

MAIN MENU

Back to start of section

ANSWER



MAIN MENU

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Topic 1 CC5

Q: How are the ions in ionic compounds arranged?

What do ionic compound form as a result?

ANSWER

A: The oppositely-charged ions are arranged in a regular way to form a **giant ionic lattice**.

Ionic compounds often form crystals as a result.

MAIN MENU

Back to start of section

Topic 1 CC5

Q: Name the following compound

NaF

MAIN MENU

Back to start of section

ANSWER

A:, Sodium fluoride

MAIN MENU

Back to start of section

Topic 1 CC5

Q: Name the following compound

Na_2S

MAIN MENU

Back to start of section

ANSWER

A: Sodium sulfide

Topic 1 CC5

Q: Name the following compound

$(NH_4)_2SO_4$

MAIN MENU

Back to start of section

ANSWER

A: Ammonium Sulfate

MAIN MENU

Back to start of section

Topic 1 CC5

Q: Name the following compound

Na_2CO_3

MAIN MENU

Back to start of section

ANSWER

A:Sodium carbonate

MAIN MENU

Back to start of section

Topic 1 CC5 Q:

The carbonate ion is a **polyatomic** ion.

What is the formula for a carbonate ion?

MAIN MENU

Back to start of section

ANSWER

A: CO_3^{2-}

Topic 1 CC5

Q: Why do ionic substances conduct when they are molten or dissolved in water?

But not as solids?

MAIN MENU

Back to start of section

ANSWER

A: In liquids the ions can move, allowing charge to flow through the substance.

In solids the ions are in fixed positions and cannot move through the substance.

MAIN MENU

Back to start of section

Topic 1 CC5

Q: Write the number of protons, electrons and neutrons for Na^+, Mg^{2+} and O^{2-} ions.

MAIN MENU

Back to start of section

ANSWER

A:

Sodium – 10e, 11p, 12n

Magnesium – 10e, 12p, 12n

Oxygen – 10e, 8p, 8n

MAIN MENU

Back to start of section

Topic 1 CC5

Q: What is symbol for a hydroxide ion?

MAIN MENU

Back to start of section

ANSWER

A: OH^-

MAIN MENU

Back to start of section

Covalent bonding

MAIN MENU

Back to start of section

Topic 1 CC6/7

Q: What is a covalent bond?

ANSWER

A: A pair of electrons shared between two atoms.

Topic 1 CC6/7

Q: What is formed when atoms join by covalent bonding?

MAIN MENU

Back to start of section

ANSWER

A: A molecule.

MAIN MENU

Back to start of section

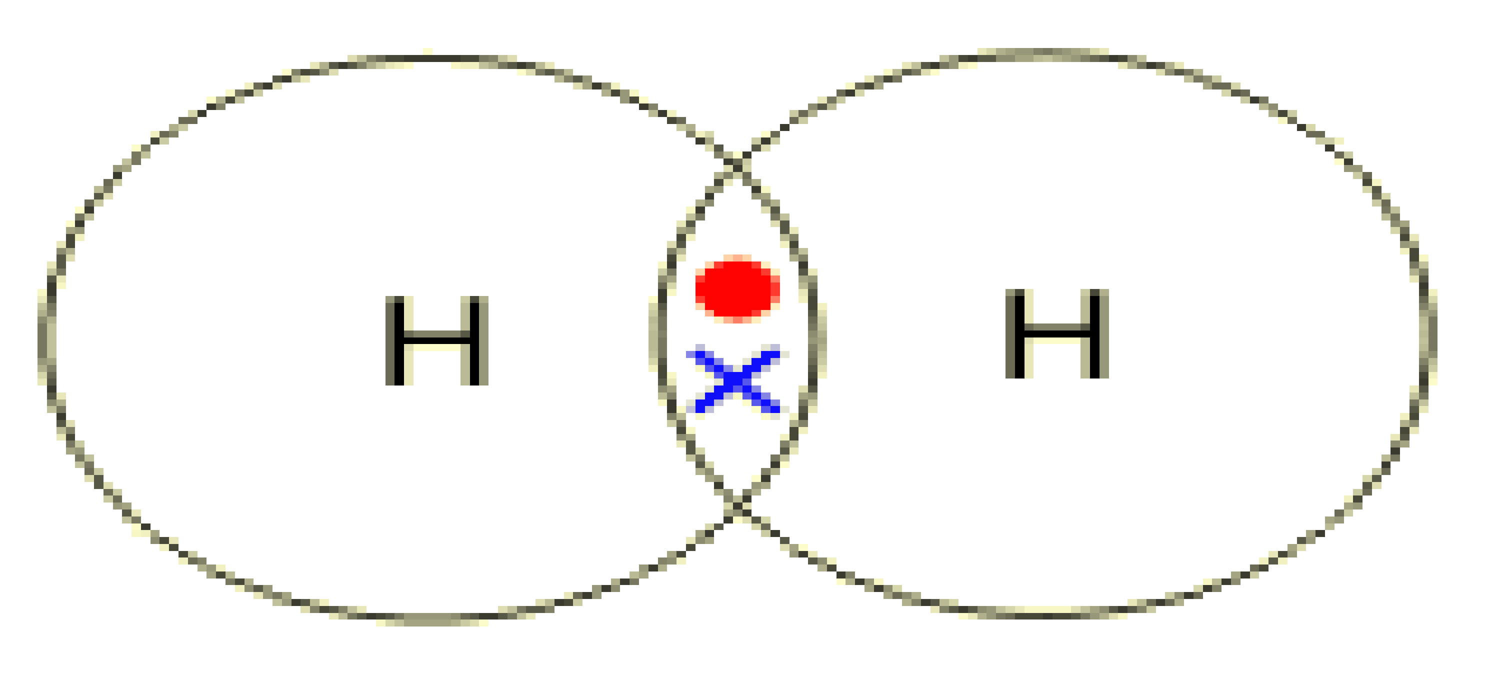
Topic 1 CC6/7

Q: Draw a dot and cross diagram to show the formation of a H_2 molecule.

MAIN MENU

Back to start of section

ANSWER



MAIN MENU

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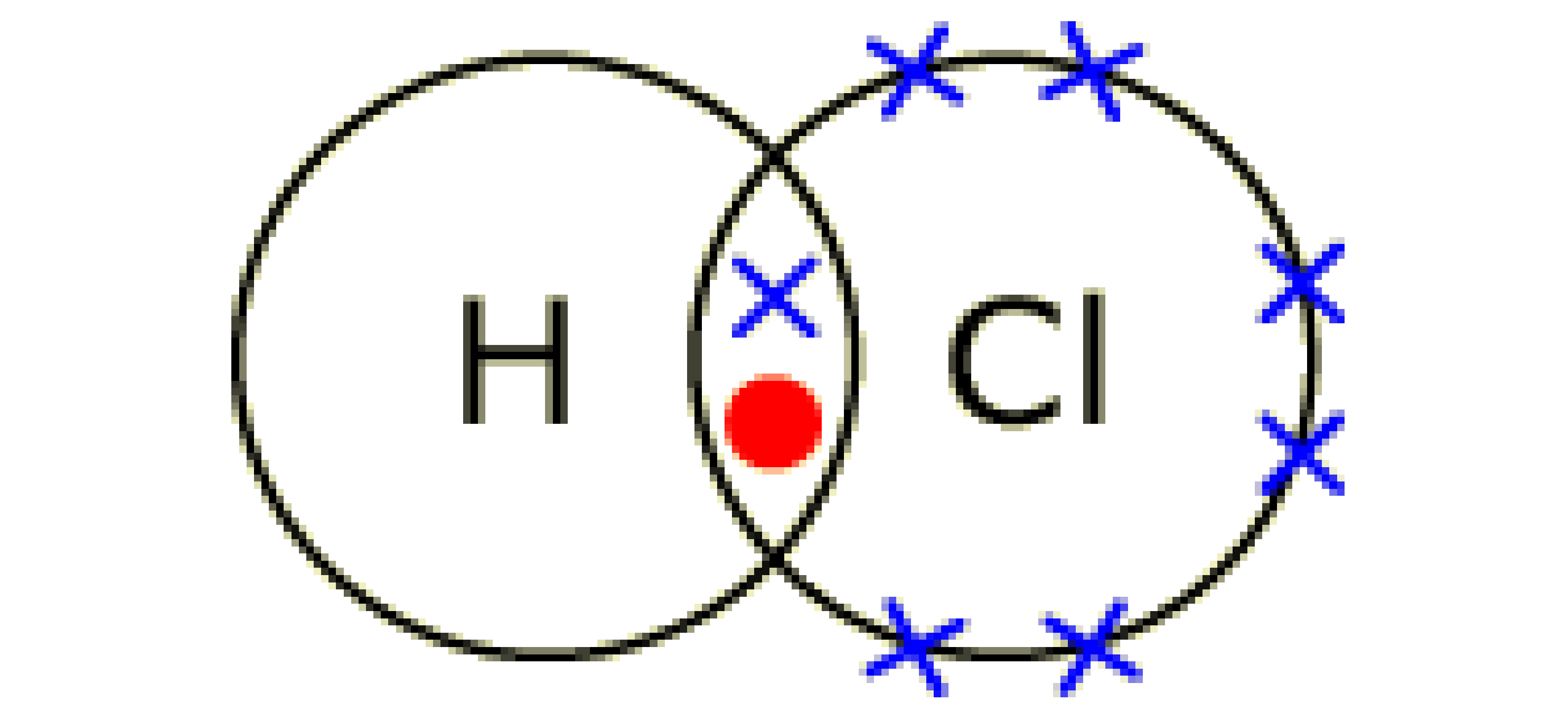
Topic 1 CC6/7

Q: Draw a dot and cross diagram to show the formation of an HCl molecule.

ANSWER



MAIN MENU

Back to start of section

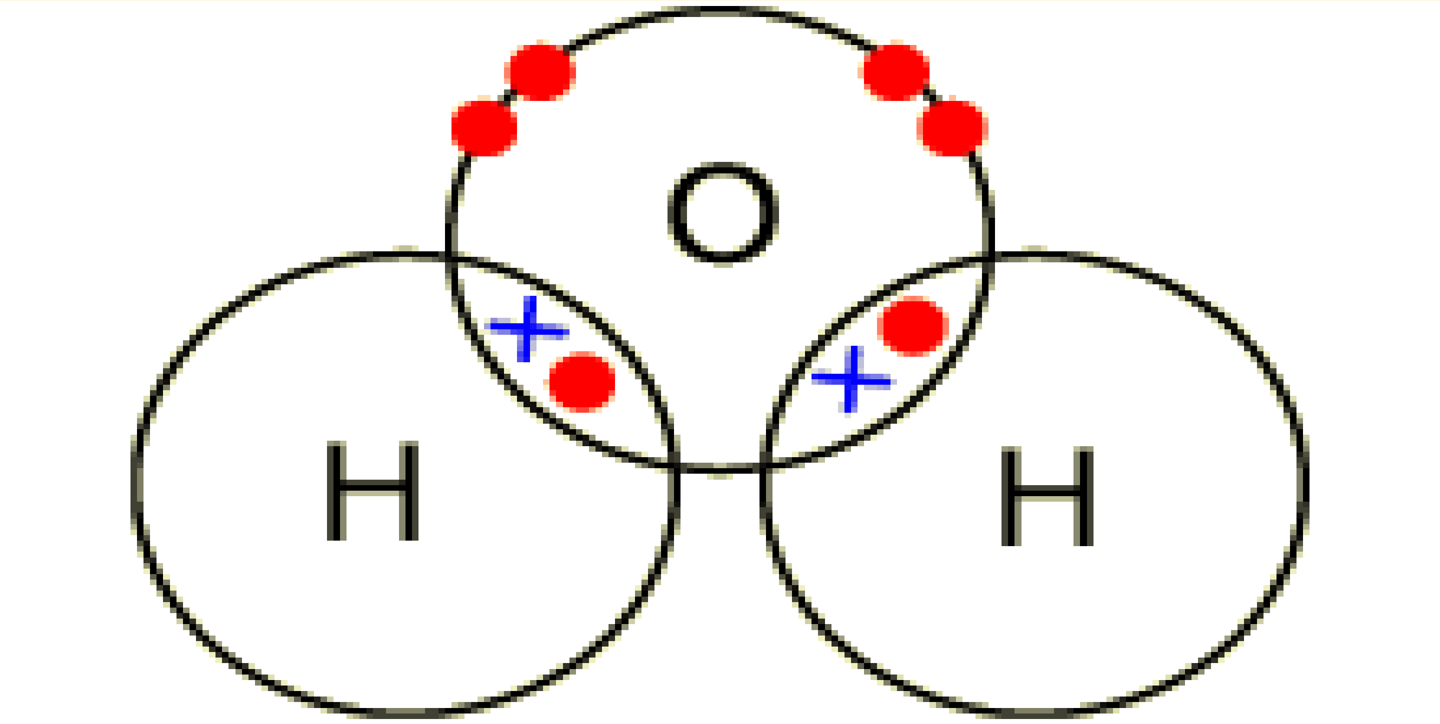
Topic 1 CC6/7

Q: Draw a dot and cross diagram to show the formation of a water, H_2O, molecule.

MAIN MENU

Back to start of section

ANSWER



MAIN MENU

Back to start of section

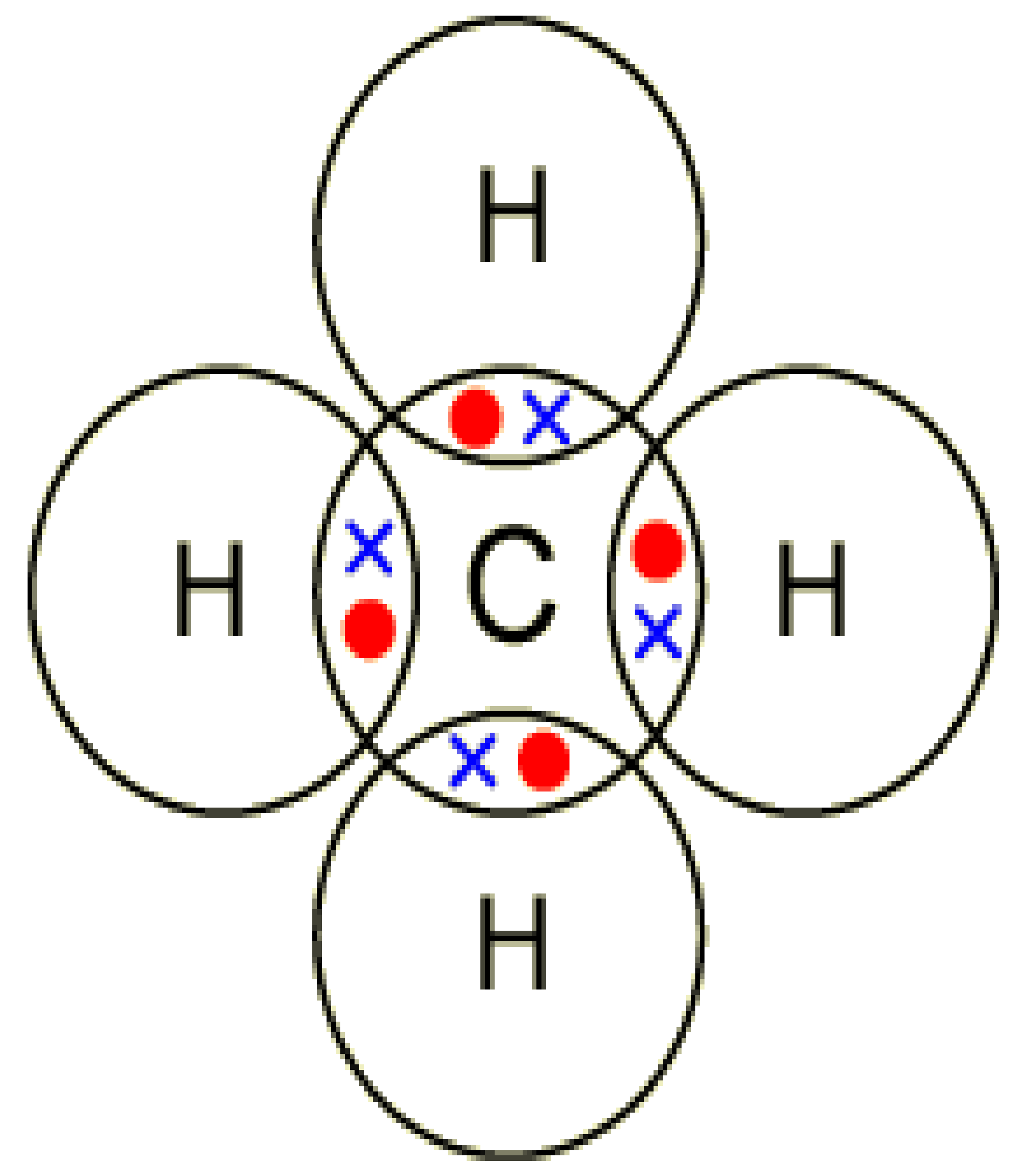
Topic 1 CC6/7 Q:

Draw a dot and cross diagram to show the formation of a CH_4 molecule.

MAIN MENU

Back to start of section

ANSWER



MAIN MENU

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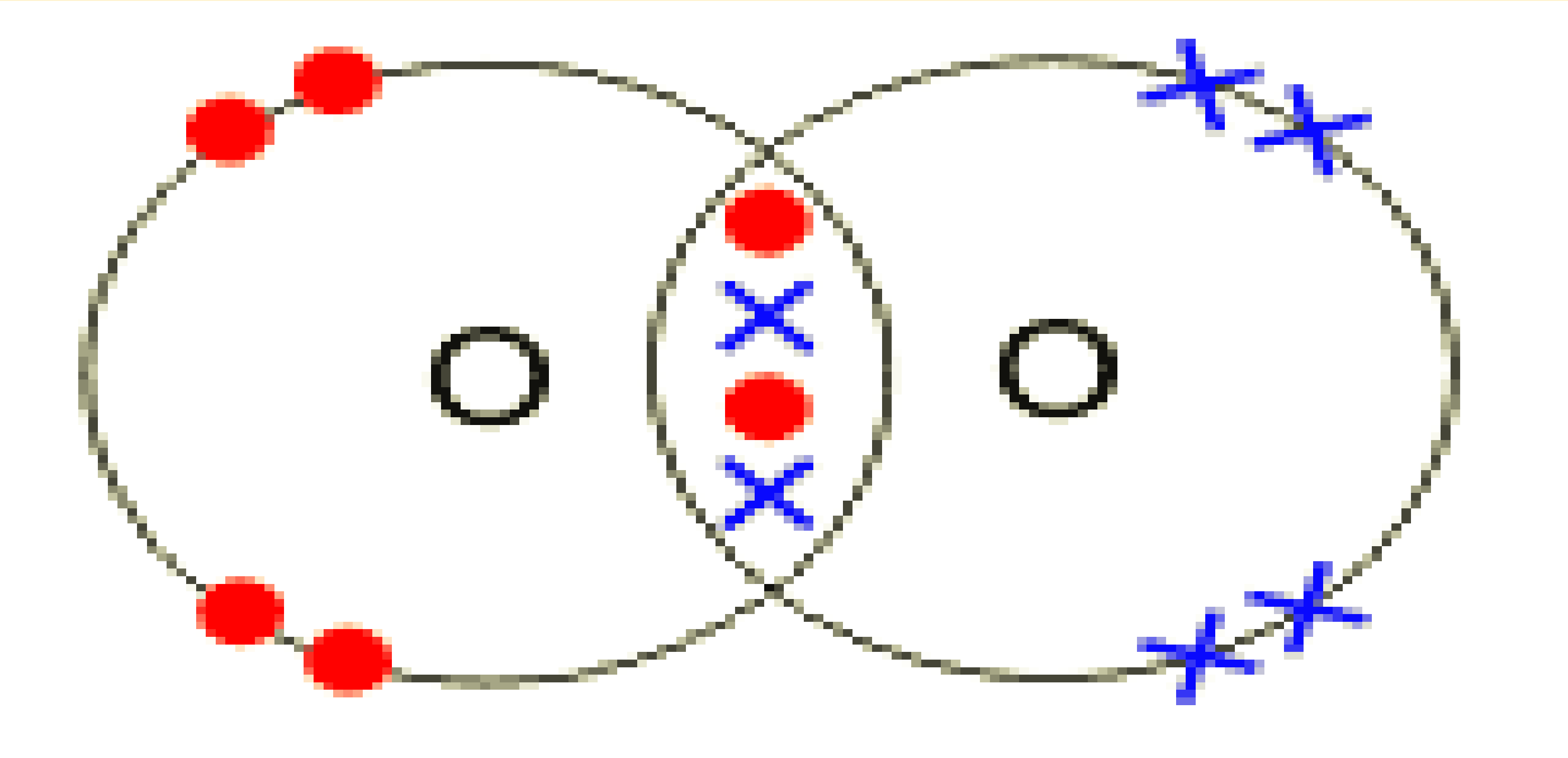
Topic 1 CC6/7

Q: Draw a dot and cross diagram to show the formation of an O_2 molecule.

ANSWER



MAIN MENU

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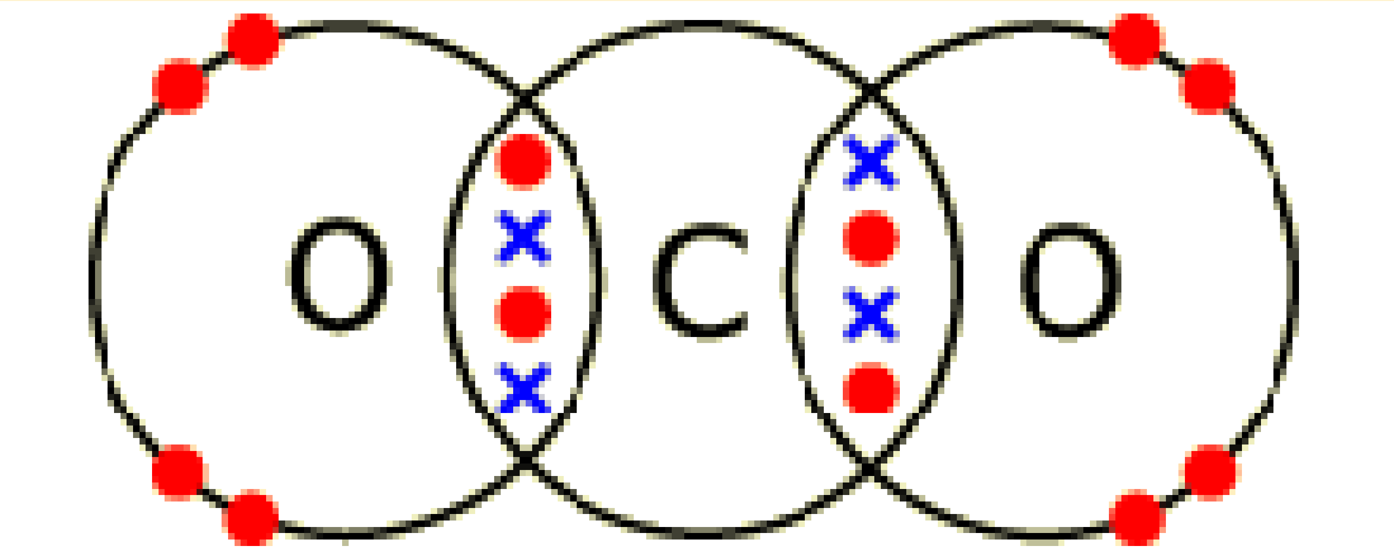
Topic 1 CC6/7

Q: Draw a dot and cross diagram to show the formation of a CO_2 molecule.

MAIN MENU

Back to start of section

ANSWER



MAIN MENU

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Topic 1 CC6/7

Q: Describe the electrical conductivity of typical simple molecular covalent compounds

MAIN MENU

Back to start of section

ANSWER

A: Poor conductors of electricity

MAIN MENU

Back to start of section

Topic 1 CC6/7 Q:

Describe and **explain** the melting and boiling points of typical simple molecular covalent compounds.

MAIN MENU

Back to start of section

ANSWER

A: Low melting and boiling points, **due to weak forces between molecules.**

MAIN MENU

Back to start of section

Topic 1 CC6/7

Q: Name two examples of giant molecular covalent compounds.

MAIN MENU

Back to start of section

ANSWER

A: Diamond, graphite.

Topic 1 CC6/7

Q: Describe the difference in properties between giant molecular covalent compounds and simple molecular covalent compounds.

MAIN MENU

Back to start of section

ANSWER

A: Giant molecular covalent compounds have extremely high melting points; graphite can conduct electricity.

Topic 1 CC6/7

Q: Diamond and graphite are both forms of carbon.

Why is graphite used for making electrodes, but diamond is not?

ANSWER

A: Each carbon atom in diamond is covalently bonded to 4 others, so has no delocalised electrons. Each carbon in graphite is only bonded to 3 others, so its fourth electron (between layers of atoms) is delocalised and free to move, so can conduct electricity.

Topic 1 CC6/7

Q: Diamond and graphite are both forms of carbon.

Why is graphite used as a lubricant, but diamond is used for cutting tools?

ANSWER

A: The 3-D network of **many strong covalent bonds** in diamond make it the hardest known naturally occurring material. Graphite has a layered structure with **weak forces between the layers** so the layers can slide over each other.

MAIN MENU

Back to start of section

Topic 1 CC6/7

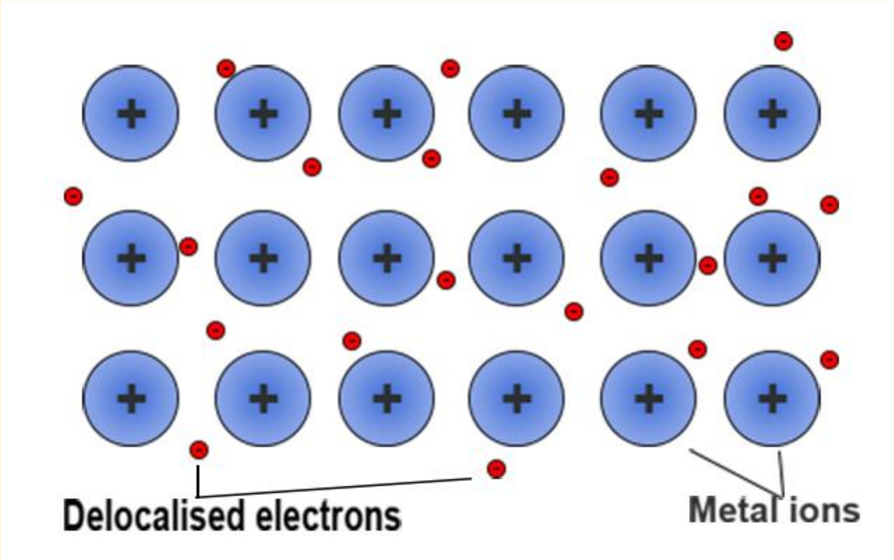
Q: Describe the structure of metals.

MAIN MENU

Back to start of section

ANSWER

A: : A regular arrangement of positive metal ions surrounded by a sea of delocalised electrons.



MAIN MENU

Back to start of section

Topic 1 CC6/7

Q: Describe and **explain** the malleability of metals.

ANSWER

A: Metals can be hammered into thin sheets.
This is because the layers of ions can slide over each other, but still be held together by electrons;
this means they can bend and stretch without breaking.

Topic 1 CC6/7

Q: Describe and **explain** the electrical conductivity of metals.

MAIN MENU

Back to start of section

ANSWER

A: Metals are good conductors of electricity.

The delocalised electrons can move & carry a charge through the metal structure, so metals conduct electricity well.

Topic 1 CC6/7

Q: What do we call the elements between Group 2 and Group 3 in the Periodic Table?

MAIN MENU

Back to start of section

ANSWER

A: Transition metals

Topic 1 CC6/7

Q: Describe the physical properties of ionic structures.

ANSWER

A:High relative melting and boiling points, generally relatively soluble in water, good conductors of electricity when molten or in aqueous solutions.

MAIN MENU

Back to start of section

Topic 1 CC6/7

Q: Describe the physical properties of simple molecular covalent structures

MAIN MENU

Back to start of section

ANSWER

A: Low relative melting and boiling points, generally insoluble in water, non-conductors of electricity as solids, liquids or in solutions.

MAIN MENU

Back to start of section

Topic 1 CC6/7

Q: Describe the physical properties of giant molecular covalent structures.

MAIN MENU

Back to start of section

ANSWER

A: : Very high relative melting and boiling points, insoluble in water, non-conductors of electricity (except graphite).

Topic 1 CC6/7

Q: Describe the physical properties of metals.

ANSWER

A: High relative melting and boiling points, shiny, high density, malleable, good conductors of electricity and heat, ductile, sonorous.

MAIN MENU

Back to start of section

Topic 1 CC6/7

Q: Hexane is not soluble in water, does not conduct electricity and has a low melting and boiling point.

What type of compound is it?

ANSWER

A: Simple molecular covalent.

MAIN MENU

Back to start of section

Topic 1 CC6/7

Q: Silicon(IV) oxide is not soluble in water, does not conduct electricity and has a very high melting and boiling point. What type of compound is it?

MAIN MENU

Back to start of section

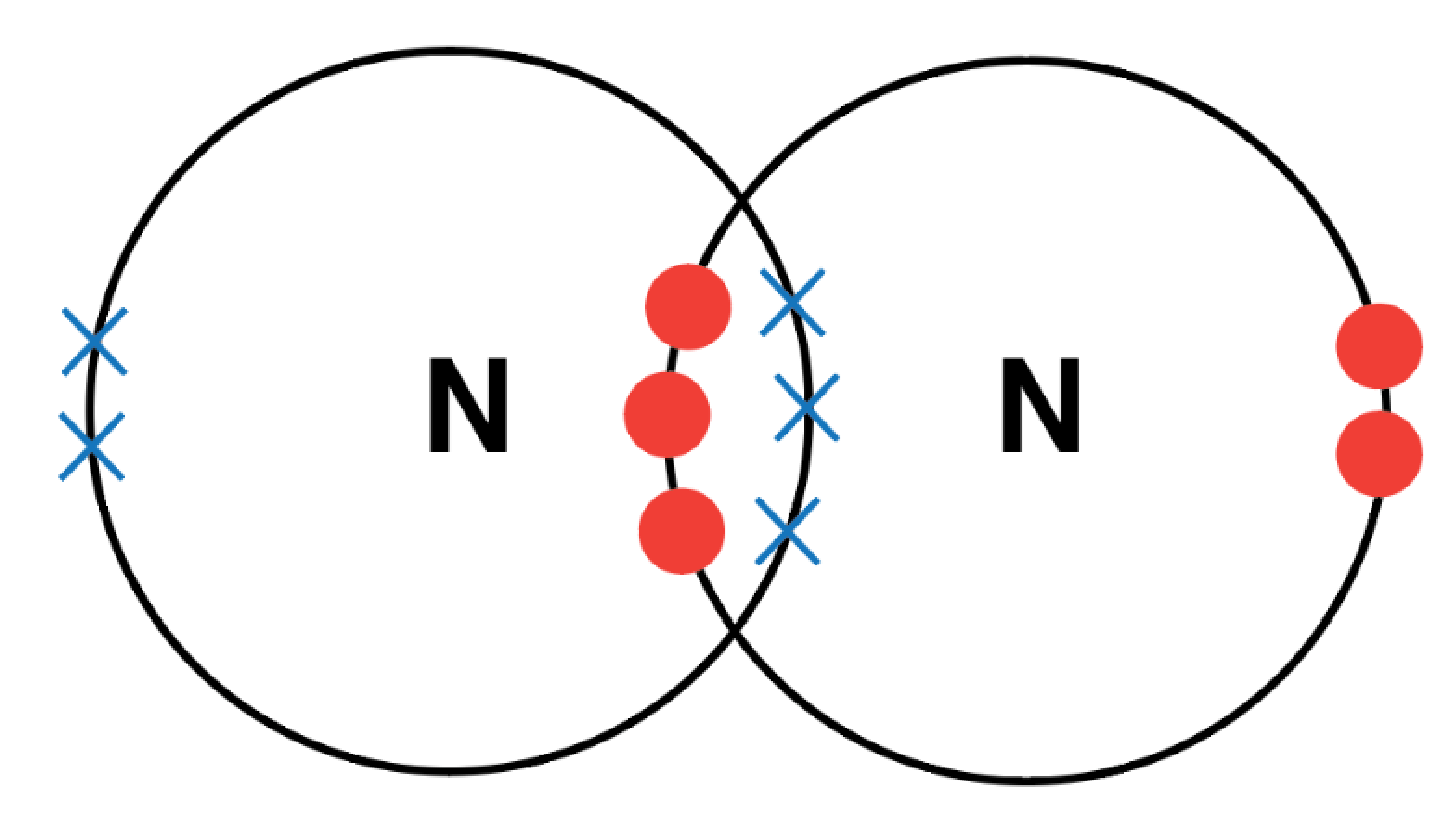
ANSWER

A: Giant molecular covalent.

Topic 1 CC6/7

Q: Draw a dot and cross diagram to show the formation of a N_2 molecule.

ANSWER



MAIN MENU

Back to start of section

Topic 1 CC6/7

Q: What does the term ‘valency’ mean?

MAIN MENU

Back to start of section

ANSWER

A: Atoms always share the same number of electrons that they need.

This is the number of bonds they will form and it is called the valency.

Topic 1 CC6/7

Q: What is the molecular formula for oxygen fluoride?

HINT: to work out use the valency

MAIN MENU

Back to start of section

ANSWER

A: OF_2 (work out using valency)

MAIN MENU

Back to start of section

Topic 1 CC6/7

Q: What is the molecular formula for Hydrogen sulfide?

HINT: to work out use the valency

MAIN MENU

Back to start of section

ANSWER

A: H_2S (work out using valency)

MAIN MENU

Back to start of section

Topic 1 CC6/7

Q: What is the molecular formula for Nitrogen chloride?

HINT: to work out use the valency

ANSWER

A: NCl_3 (work out using valency)

MAIN MENU

Back to start of section

Topic 1 CC6/7

Q: Define the term **allotrope**.

MAIN MENU

Back to start of section

ANSWER

A: ***Allotropes*** are different structures of the same element. They have different physical properties (because their atoms are arranged differently) but similar chemical properties.

MAIN MENU

Back to start of section

Topic 1 CC6/7

Q: I am a compound that is held together by electrostatic force due to my oppositely charged components.

What type of compound am I?

MAIN MENU

Back to start of section

ANSWER

A: Ionic

Topic 1 CC6/7

Q: What does the term '**malleable**' mean?

MAIN MENU

Back to start of section

ANSWER

A: Able to be hammered or pressed into shape without breaking or cracking.

Topic 1 CC6/7

Q: Why do metals have high melting points?

MAIN MENU

Back to start of section

ANSWER

A: A lot of energy is needed to overcome the string electrostatic forces of attraction between the delocalised electrons and the positive metal ions

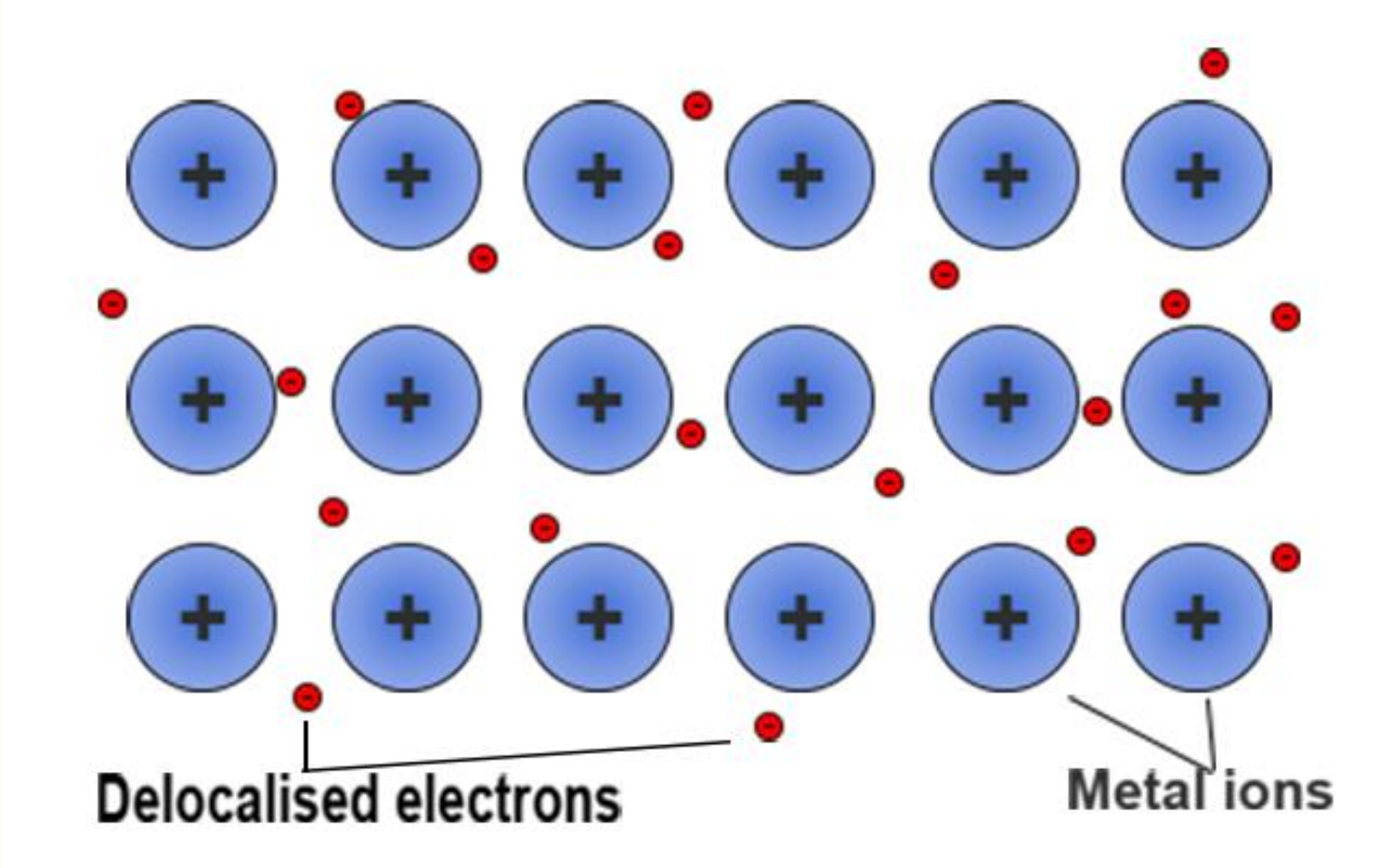
Topic 1 CC6/7 Q: Draw a metallic giant lattice structure

MAIN MENU

Back to start of section

ANSWER

A:



MAIN MENU

Back to start of section

Topic 1 CC6/7

Q: Which metal will be better at conducting electricity – sodium or aluminium.

Explain your answer.

MAIN MENU

Back to start of section

ANSWER

A: Aluminium

Sodium forms Na^+ ions but aluminium forms Al^{3+} ions.

There will be more delocalised electrons in aluminium to carry the electric charge.

MAIN MENU

Back to start of section

Calculations

MAIN MENU

Back to start of section

Topic 1 CC9 Q: What is relative atomic mass?

MAIN MENU

Back to start of section

ANSWER

A: The average atomic mass of an element taking into account the relative abundance of the isotopes of that element.

Topic 1 CC9

Q: What is relative formula mass?

MAIN MENU

Back to start of section

ANSWER

A: The sum of all of the relative atomic masses for all the atoms in a molecule.

MAIN MENU

Back to start of section

Topic 1 CC9

Q: What is an empirical formula?

ANSWER

A: A formula that shows the *simplest whole number ratio* of all the elements in a compound.

MAIN MENU

Back to start of section

Topic 1 CC9

Q: How do you calculate an empirical formula?

MAIN MENU

Back to start of section

ANSWER

A:

Step 1 – find the mass of each element in a compound;

Step 2 – divide the mass of each element by its atomic number;

Step 3 – divide your answers by the lowest answer; this gives you the simplest ratio ratio).

MAIN MENU

Back to start of section

Topic 1 CC9

Q: Burning 10.00 g of magnesium produces 16.40 g of oxide.

What is the empirical formula of magnesium oxide?

ANSWER

A: MgO.

MAIN MENU

Back to start of section

Topic 1 CC9

Q: Calculate the M_r of H_2SO_4?

ANSWER

A: 98

MAIN MENU

Back to start of section

Topic 1 CC9 Q:

Calculate the M_r of $Al_2(SO_4)_3$?

MAIN MENU

Back to start of section

ANSWER

A: 342

MAIN MENU

Back to start of section

Topic 1 CC9

Q: What is the A_r of Ca?

MAIN MENU

Back to start of section

ANSWER

A: 40

MAIN MENU

Back to start of section

Topic 1 CC9

Q:What is the A_r of Mg?

MAIN MENU

Back to start of section

ANSWER

A: 24

MAIN MENU

Back to start of section

Topic 1 CC9

Q: Balance the equation

$$CuO + HCl \rightarrow CuCl_2 + H_2O$$

MAIN MENU

Back to start of section

ANSWER

A: $CuO + 2HCl \rightarrow CuCl_2 + H_2O$

MAIN MENU

Back to start of section

Topic 1 CC9

Q: Balance the equation

$$KOH_{(aq)} + H_3PO_{4(aq)} \rightarrow K_3PO_{4(aq)} + H_2O_{(l)}$$

MAIN MENU

Back to start of section

ANSWER

A: $3KOH_{(aq)} + H_3PO_{4(aq)} \rightarrow K_3PO_{4(aq)} + 3H_2O_{(l)}$

MAIN MENU

Back to start of section

Topic 1 CC9

Q: What is a molecular formula?

ANSWER

A: The *actual* number of atoms of each element in one molecule

MAIN MENU

Back to start of section

Topic 1 CC9

Q: How can you determine the molecular formula from the empirical formula?

MAIN MENU

Back to start of section

ANSWER

A:

1. Find the empirical formula mass
2. Divide Mr by the empirical formula mass
3. Multiply the answer with the empirical formula to give you the molecular formula

Topic 1 CC9

Q: The empirical formula for glucose is CH_2O and its relative formula mass (RFM or M_r) is 180.

Determine the molecular formula for glucose?

MAIN MENU

Back to start of section

ANSWER

1. A:Find the empirical formula mass CH_2O:
   $= A_r(C)+(2x\ A_r\ (H))+A_r\ (O)$
   $= 12+(2x1)+16$
   $= 30$
2. Divide M_r by empirical formula mass = 180/30 = 6
3. Molecular formula is 6x the empirical
4. Molecular formula is $\mathbf{C_6H_{12}O_6}$

MAIN MENU

Back to start of section

Topic 1 CC9

Q: The empirical formula of butane is C_2H_5 and the M_r of butane is 58. What it its molecular formula?

MAIN MENU

Back to start of section

ANSWER

$A: C_2H_5 = (2x12)+(5x1)=29$

$58/29 = 2$

C_2H_5 x 2 = $\mathbf{C_4H_{10}}$

MAIN MENU

Back to start of section

Topic 1 CC9

Q: It is found that 207g of lead combined with 32g of sulphur to form 239g of lead sulphide.

From the data work out the empirical formula of lead sulphide.

(Relative atomic masses: Pb = 207 and S = 32)

MAIN MENU

Back to start of section

ANSWER

A: PbS

MAIN MENU

Back to start of section

Topic 1 CC9

Q: A certain compound contains oxygen, and 43.4% Na and 11.3% C.

What is its empirical formula?

ANSWER

A: Na_2CO_3

MAIN MENU

Back to start of section

Topic 1 CC9

Q: A certain compound contains 85.7% C and 14.3% H.

What is its empirical formula?

The M_r of that compound is 42.

What is the molecular formula of the compound?

MAIN MENU

Back to start of section

ANSWER

A: Empirical CH_2

Molecular $CH_2 \times 3 = C_3H_6$

Topic 1 CC9

Q: It is found that 54g of aluminium forms 150g of aluminium sulphide.

Work out the formula of aluminium sulphide.

(Relative atomic masses: Al = 27 and S = 32).

MAIN MENU

Back to start of section

ANSWER

A: Al_2S_3

(Remember whole number ratios)

MAIN MENU

Back to start of section

Topic 1 CC9

Q: What is the empirical formula of the compound formed when 227 g of calcium reacts with 216 g of fluorine?

MAIN MENU

Back to start of section

ANSWER

A: CaF_2.

Topic 1 CC9

Q: What mass of magnesium oxide is produced when 112.1 g of magnesium burns in air?

MAIN MENU

Back to start of section

ANSWER

A: $2Mg + O_2 \rightarrow 2MgO$

186.8 g.

Topic 1 CC9

Q: What mass of sodium is needed to produce 108.2 g of sodium oxide?

MAIN MENU

Back to start of section

ANSWER

A: 4 Na + O_2 → 2 Na_2O

80.3 g.

MAIN MENU

Back to start of section

Topic 1 CC9

Q: Define the 'law of conservation of mass'

MAIN MENU

Back to start of section

ANSWER

A: Mass is never lost or gained in chemical reactions. We say that mass is always conserved. In other words, the total mass of products at the end of the reaction is equal to the total mass of the reactants at the beginning.

MAIN MENU

Back to start of section

Topic 1 CC9

Q: What is a non-enclosed system?

What is a closed system?

ANSWER

A: Closed system: Imagine you enter a closed system, a room that is perfectly sealed where nothing can enter the room and nothing can escape. i.e. precipitation reaction in a closed flask.

Non-enclosed system: a reaction in an open flask that takes in or gives out a gas.

MAIN MENU

Back to start of section

Topic 1 CC9

Q: What does the term ‘concentration’ mean?

MAIN MENU

Back to start of section

ANSWER

A: The amount of solute dissolved in a stated volume of a solution is its concentration

MAIN MENU

Back to start of section

Topic 1 CC9

Q: How can you convert between cm^3 and dm^3?

ANSWER

A: divide by 1000

MAIN MENU

Back to start of section

Definitions

State symbols

Back to start of section

ANSWER

- tells you the state of a substance in an equation (s, l, g and aq)

Atom

ANSWER

- consists of protons and neutrons in a nucleus surrounded by electrons in shells

MAIN MENU

Back to start of section

Giant covalent structures

MAIN MENU

Back to start of section

ANSWER

- all the atoms are bonded to each other by strong covalent bonds

Period number

MAIN MENU

Back to start of section

ANSWER

- the total number of shells

MAIN MENU

Back to start of section

Group number

MAIN MENU

Back to start of section

- the number of electrons in the outer shell of an atom

Atomic (proton) number

ANSWER

- the total number of protons

Mass number

ANSWER

- the total number of protons and neutrons contained within a nucleus

lon

MAIN MENU

Back to start of section

ANSWER

- charged particle (a atom that has lost or gained electrons)

Isotopes

MAIN MENU

Back to start of section

ANSWER

Atoms of the same element with the same number of protons but a different number of neutrons (OR the same atomic number and a different mass number)

Relative atomic mass

MAIN MENU

Back to start of section

ANSWER

- the mass of an atom relative to Carbon-12

Negative ions

ANSWER

(ANIONS) - formed when an atom gains electrons

MAIN MENU

Back to start of section

Positive ions

MAIN MENU

Back to start of section

(CATIONS) - formed when an atom loses electrons

Ball and stick models

MAIN MENU

Back to start of section

ANSWER

- shows how the atoms in a substance are connected

MAIN MENU

Back to start of section

Covalent bond

ANSWER

a shared pair of electrons

Simple molecular substances

MAIN MENU

Back to start of section

ANSWER

- made up of molecules containing a few atoms joined by covalent bonding

Polymers

MAIN MENU

Back to start of section

ANSWER

A large molecule, with a high average relative molecular mass, made from lots of small molecules called monomers

Monomers

ANSWER

Small molecules which join together to make polymers

MAIN MENU

Back to start of section

Fullerenes

MAIN MENU

Back to start of section

ANSWER

- molecules of carbon atoms, shaped like closed tubes or hollow balls

MAIN MENU

Back to start of section

Metallic bonding

MAIN MENU

Back to start of section

ANSWER

-metal atoms lose electrons from their outer shell, which are then donated to a sea of delocalised electrons. They have strong electrostatic forces of attraction between positive metal ions and the delocalised sea of electrons.

Malleable

ANSWER

-can be hammered or rolled into flat sheets

MAIN MENU

Back to start of section

Precipitation reaction

ANSWER

- when 2 soluble salts react and a solid precipitate forms in solution (an insoluble salt)

MAIN MENU

Back to start of section

Relative formula mass

ANSWER

-- the total mass of a formula, worked out by adding together all the relative atomic masses of atoms

MAIN MENU

Back to start of section

Empirical formula

ANSWER

- simplest whole number ratio of atoms of each element in a compound

Molecular formula

MAIN MENU

Back to start of section

ANSWER

-the actual number of atoms of each element in a compound

Concentration

MAIN MENU

Back to start of section

ANSWER

- measure of the amount of solute dissolved in a given volume of solvent to form a solution

Limiting reactant/reagent

MAIN MENU

Back to start of section

ANSWER

The reactant that is used up first in the a reaction

OR

The reactant that is not in excess.

MAIN MENU

Back to start of section

Excess reactant/reagent

ANSWER

-- the reactant that is left over in a reaction

Pure

MAIN MENU

Back to start of section

ANSWER

- a substance made up of only one type of atom / element / compound

Impure

MAIN MENU

Back to start of section

ANSWER

- made up of more than one type of atom or compound

MAIN MENU

Back to start of section

Simple distillation

ANSWER

Separation of a liquid from a solution based on boiling points- maximum amount of 2 liquids within the mixture

OR

Separation of a liquid from a dissolved solid

MAIN MENU

Back to start of section

Fractional distillation

ANSWER

-separation of a mixture, with 3 or more fractions present (or fractions with similar boiling points), based on boiling points

Filtration

ANSWER

- separation of an insoluble solute (solid) from a solvent (liquid)

Chromatography

ANSWER

- separation of a mixture of dyes based on solubility

MAIN MENU

Back to start of section

Crystallisation

MAIN MENU

Back to start of section

- separation of a soluble solute (solid) from a solvent (liquid)

Soluble

ANSWER

- describes a substance that will dissolve

MAIN MENU

Back to start of section

Insoluble

MAIN MENU

Back to start of section

ANSWER

-describes a substance that will not dissolve

MAIN MENU

Back to start of section

Solute

ANSWER

- is the solid that dissolves in a solvent to make a solution

Solvent

MAIN MENU

Back to start of section

ANSWER

-the liquid in which a substance dissolves

MAIN MENU

Back to start of section

Solution

ANSWER

- is the mixture formed when a solute has dissolved in a solvent

Filtrate

MAIN MENU

Back to start of section

ANSWER

- liquid that has passed through a filter

MAIN MENU

Back to start of section

Residue

ANSWER

- describes the solid left in the filter paper the end of filtration

MAIN MENU

Back to start of section

Dynamic equilibrium

ANSWER

- forward and backward reactions, both happening at the same rate

and

- concentrations of reactants and products have reached a balance and don’t change

MAIN MENU

Back to start of section

Electrolysis

ANSWER

- the breaking down of an ionic compound using electricity

Half equations

ANSWER

- show how electrons are transferred during reactions

Cathode

ANSWER

- negative electrode that has positive ions (cations) moving towards it

Anode

ANSWER

- positive electrode that has negative ions (anions) moving towards it

Oxidation

ANSWER

Gain of oxygen

or

the loss of a electrons (OIL in OILRIG)

MAIN MENU

Back to start of section

Reduction

MAIN MENU

Back to start of section

ANSWER

Loss of oxygen

or

the gain of electrons (RIG in OILRIG)

MAIN MENU

Back to start of section

Reactivity series

ANSWER

A list of elements from the most reactive to the least reactive

Ores

ANSWER

A rock containing enough metal to make it economic to extract (for profit)

MAIN MENU

Back to start of section

Native states/pure lumps

MAIN MENU

Back to start of section

-Unreactive metals found as elements in nature

Extraction

ANSWER

- Obtaining metals from ores

MAIN MENU

Back to start of section

Displacement reaction

ANSWER

- a more reactive element takes place of a less reactive element in a compound

MAIN MENU

Back to start of section

Fossil fuels

MAIN MENU

Back to start of section

ANSWER

- finite resources/ non-renewable resources
- coal, oil & natural gas

Finite

ANSWER

- No longer being made

MAIN MENU

Back to start of section

Non-renewable

ANSWER

- Being used up faster than it is being re-made

Bioleaching

MAIN MENU

Back to start of section

ANSWER

Biological method of metal extraction in which bacteria speed up reactions that release metal compounds from metal sulfides

MAIN MENU

Back to start of section

Phytoextraction

Biological method of metal extraction in which plants absorb metals through their roots and concentrate them in their cells

Life cycle assessment

ANSWER

‘Cradle to grace’ analysis of the environmental impact of making, using and disposing of a manufactured product

MAIN MENU

Back to start of section

Reversible reaction

MAIN MENU

Back to start of section

ANSWER

Chemical reaction that can proceed in either direction (can ‘go both ways’)

MAIN MENU

Back to start of section

Haber process

ANSWER

An example of a reversible reaction producing ammonia

$N_2 + 3H_2 \rightarrow 2NH_3$

MAIN MENU

Back to start of section

Le Chatelier’s Principle

ANSWER

- if there is a change in concentration, pressure or temperature in a reversible reaction the equilibrium position will move to help oppose / counteract that change

Ionise/dissociate

MAIN MENU

Back to start of section

ANSWER

- all acids can split up in a solution to produce hydrogen (H^+) ions and all alkalis can split up in solution to product hydroxide ions (OH^-)

Mobile phase

MAIN MENU

Back to start of section

ANSWER

- molecules that can move eg solvent in chromatography

MAIN MENU

Back to start of section

Stationary phase

MAIN MENU

Back to start of section

ANSWER

- molecules that cannot move eg paper in chromatography

MAIN MENU

Back to start of section

Surface water

MAIN MENU

Back to start of section

ANSWER

- lakes, rivers and reservoirs

Effluent

ANSWER

- sewage found in lakes and rivers

Aquifers

MAIN MENU

Back to start of section

ANSWER

-rocks that trap water underground / underground reservoirs

MAIN MENU

Back to start of section

Ground water

ANSWER

- from aquifers

Waste water

MAIN MENU

Back to start of section

ANSWER

- water contaminated by human activity

MAIN MENU

Back to start of section

Filtration (for water purification)

MAIN MENU

Back to start of section

ANSWER

- a wire mesh screen that filters out large twigs and other large solids

Sedimentation (for water purification)

MAIN MENU

Back to start of section

ANSWER

- makes fine particles clump together and settle at the bottom of a tank

MAIN MENU

Back to start of section

Chlorination (for water purification)

MAIN MENU

Back to start of section

ANSWER

- chlorine gas is bubbled through water to kill harmful bacteria and microbes

Desalination

ANSWER

-purification of sea water into drinking water

Deionised water

ANSWER

- water that has had the ions, that are in normal tap water, removed

MAIN MENU

Back to start of section

pH scale

MAIN MENU

Back to start of section

ANSWER

- measure of how acidic and alkaline a solution is

Indicator

MAIN MENU

Back to start of section

ANSWER

- a dye that changes colour depending on whether a substance is an acid or alkali

MAIN MENU

Back to start of section

Neutralisation

MAIN MENU

Back to start of section

ANSWER

- reaction between an acid and a base to form a salt and water

acid + base $\rightarrow$ salt + water

MAIN MENU

Back to start of section

Strong acids

ANSWER

- completely dissociate/ionise in solution

Weak acids

MAIN MENU

Back to start of section

ANSWER

-partially dissociate/ionise in solution

Collision theory

ANSWER

- chemical reactions can only happen if reactant particles collide with enough energy. The more frequently particles collide, and the greater the proportion of collisions with enough energy, the greater the rate of reaction.

Complete combustion

ANSWER

- reactions of hydrocarbons with a plentiful amount of oxygen to produce carbon dioxide and water.

Incomplete combustion

MAIN MENU

Back to start of section

ANSWER

- reactions of hydrocarbons with a reduced amount of oxygen to produce a mixture of carbon monoxide, carbon and water

Diatomic

ANSWER

- made up of two atoms

MAIN MENU

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Rate of reaction

MAIN MENU

Back to start of section

ANSWER

The rate of change of the concentration of the reactants per unit time

OR

The rate of change of the concentration of the products per unit time

Activation energy

MAIN MENU

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ANSWER

- The minimum amount of energy required for a chemical reaction to occur

Catalyst

MAIN MENU

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ANSWER

- a substance that increases the rate of a reaction, without being used up, by lowering the activation energy needed

Enzymes

ANSWER

- - biological catalysts which speed up chemical reactions in living cells

MAIN MENU

Back to start of section

Endothermic reactions

Back to start of section

ANSWER

- energy is taken into from the surrounds and this usually is shown by a fall in temperature

MAIN MENU

Back to start of section

Exothermic reactions

ANSWER

- energy is given out to the surroundings and this is shown in a rise in temperature

MAIN MENU

Back to start of section

Bond energies

MAIN MENU

Back to start of section

ANSWER

- how much energy is required in making and breaking chemical bonds

MAIN MENU

Back to start of section

Hydrocarbon

ANSWER

- contains carbon and hydrogen **only**

MAIN MENU

Back to start of section

Homologous series

MAIN MENU

Back to start of section

ANSWER

- a family of molecules which have the same general formula and share similar chemical properties

MAIN MENU

Back to start of section

Acid rain

ANSWER

- Rain containing acidic gases from the air that make an acidic solution, which then falls as rain

MAIN MENU

Back to start of section

Enhanced greenhouse effect

ANSWER

- more heat radiation from the Earth is absorbed by an increase in greenhouse gases in the atmosphere; therefore less gases are re-emitted back into space.

General formula of an homologous series

MAIN MENU

Back to start of section

ANSWER

- Represents the formula for the entire homologous series

Eg The general formula for alkanes is C_nH_{2n+2} (n=number of carbon atoms)

MAIN MENU

Back to start of section

Fractional distillation

ANSWER

- separation of a liquid mixture into fractions through a fractionating column; works because the fractions have different boiling points

MAIN MENU

Back to start of section

Greenhouse gases

MAIN MENU

Back to start of section

ANSWER

- gases in the atmosphere that absorb and reflect heat radiation; carbon dioxide, methane and water vapour

Nitrogen oxides

ANSWER

- **NO_x**
- harmful pollutants that contribute to acid rain and pollution

MAIN MENU

Back to start of section

Cracking

ANSWER

- the breaking down of alkane molecules into smaller, more useful, alkane and alkene molecules

MAIN MENU

Back to start of section

Thermal decomposition

MAIN MENU

Back to start of section

ANSWER

- the breaking down of a substance using heat

MAIN MENU

Back to start of section

Saturated

ANSWER

- single bonds **only**

MAIN MENU

Back to start of section

Unsaturated

MAIN MENU

Back to start of section

- contains at least one double bond

Alkane

ANSWER

- saturated hydrocarbon with the general formula C_nH_{2n+2}

MAIN MENU

Back to start of section

Alkene

MAIN MENU

Back to start of section

ANSWER

- unsaturated hydrocarbon with the general formula C_nH_{2n}

MAIN MENU

Back to start of section

Temperature gradient

MAIN MENU

Back to start of section

ANSWER

- a range of temperatures

Structural formula

MAIN MENU

Back to start of section

ANSWER

- a formula which shows the arrangement of atoms in the molecule of a compound.

Dilute

MAIN MENU

Back to start of section

ANSWER

- Low concentration of solute particles in a given volume of solution

Concentrated

ANSWER

- High concentration of solute particles in a given volume of solution

Chemical changes (Acids and Electrolysis)

MAIN MENU

Back to start of section

Topic 3

Q: Suggest a pH value for hydrochloric acid.

ANSWER

A: 1-3

Topic 3

Q: What ions make ethanoic acid acidic?

MAIN MENU

Back to start of section

ANSWER

A: H^+ ions.

Topic 3

Q: What ions make ammonia solution alkaline?

MAIN MENU

Back to start of section

ANSWER

A: OH^- ions.

Topic 3

Q: Which acid is needed to make ammonium nitrate?

MAIN MENU

Back to start of section

ANSWER

A: Nitric acid.

Topic 3

Q: What is the formula of ammonium sulphate?

MAIN MENU

Back to start of section

ANSWER

A: $(NH_4)_2SO_4$

MAIN MENU

Back to start of section

Topic 3

Q: Suggest a pH value for ammonia solution.

ANSWER

A: 10-13

Topic 3

Q: What type of reaction occurs between sulphuric acid and ammonia?

MAIN MENU

Back to start of section

ANSWER

A: Neutralisation.

Topic 3

Q: What is a precipitate?

MAIN MENU

Back to start of section

ANSWER

A: A solid formed when two aqueous solutions react.

Topic 3

Q: How can solid lead iodide be separated from solution?

ANSWER

A: Filtration

MAIN MENU

Back to start of section

Topic 3

Q: How can copper sulphate crystals be separated from copper sulfate solution?

MAIN MENU

Back to start of section

ANSWER

A: Evaporation

MAIN MENU

Back to start of section

Topic 3
Q: Why is KOH a strong alkali?

MAIN MENU

Back to start of section

ANSWER

A: Because in solution it fully dissociates into K^+ and OH^-

MAIN MENU

Back to start of section

Topic 3

Q: Why is ethanoic acid a weak acid?

MAIN MENU

Back to start of section

ANSWER

A: Because it only partially dissociates into ions in solution.

Topic 3

Q: Write an ionic equation for Neutralisation.

Include state symbols.

MAIN MENU

Back to start of section

ANSWER

A: $H^+(aq) + OH^-(aq) \rightarrow H_2O(l)$

MAIN MENU

Back to start of section

Topic 3

Q: What are the four state symbols and what do they mean?

MAIN MENU

Back to start of section

ANSWER

A:

s- solid,

l- liquid,

g- gas,

aq- aqueous

MAIN MENU

Back to start of section

Topic 3

Q: What is produced when an acid reacts with a metal oxide?

MAIN MENU

Back to start of section

ANSWER

A: Salt and water

MAIN MENU

Back to start of section

Topic 3

Q: What is produced when an acid reacts with a metal hydroxide?

MAIN MENU

Back to start of section

ANSWER

A: Salt and water

Topic 3

Q: What is produced when an acid reacts with a metal?

MAIN MENU

Back to start of section

ANSWER

A: Salt and hydrogen.

Topic 3

Q: What is produced when an acid reacts with a metal carbonate or metal hydrogen carbonate?

MAIN MENU

Back to start of section

ANSWER

A: Salt, water and carbon dioxide.

Topic 3

Q: What is produced when an acid reacts with ammonia?

MAIN MENU

Back to start of section

ANSWER

A: an ammonium salt.

MAIN MENU

Back to start of section

Topic 3

Q: What is the difference between ammonia and ammonium?

MAIN MENU

Back to start of section

ANSWER

A: ammonia is a base, ammonium is the ion formed when ammonia acts as a base. NH_3 is ammonia, NH_4^+ is ammonium.

MAIN MENU

Back to start of section

Topic 3

Q: When copper sulphate is made by reacting copper oxide with sulphuric acid, the acid is heated.

Why?

MAIN MENU

Back to start of section

ANSWER

A: To increase the rate of reaction.

MAIN MENU

Back to start of section

Topic 3

Q: How would you remove unreacted copper oxide from solution?

MAIN MENU

Back to start of section

ANSWER

A: Filtration

MAIN MENU

Back to start of section

Topic 3

Q: Here is a word equation:

Copper oxide + sulphuric acid →copper sulphate + water

Write down everything this equation tells you about the reaction.

MAIN MENU

Back to start of section

ANSWER

A: The reactants copper oxide and sulphuric acid react to make the products copper sulphate and water.

MAIN MENU

Back to start of section

Topic 3
Q: Name the salt formed from hydrochloric acid.

MAIN MENU

Back to start of section

ANSWER

A: chloride

MAIN MENU

Back to start of section

Topic 3

Q: Name the salt formed from sulphuric acid.

MAIN MENU

Back to start of section

ANSWER

A: sulphate

MAIN MENU

Back to start of section

Topic 3

Q: Name the salt formed from nitric acid.

ANSWER

A: nitrate

MAIN MENU

Back to start of section

Topic 3

Q: How do you make a soluble salt from an acid and an alkali?

MAIN MENU

Back to start of section

ANSWER

A:

Measure out acid using a pipette and transfer into conical flask. Add a few drops of indicator. Fill a burette with alkali. Add alkali to acid until indicator changes colour. Note down the volume of alkali used. Repeat without indicator, adding the same volume of alkali. Evaporate water slowly. Wash and dry the salt in an oven.

MAIN MENU

Back to start of section

Topic 3 Q:
Why is NaCl neutral?

MAIN MENU

Back to start of section

ANSWER

A: It does not contain any hydrogen or hydroxide ions.

Topic 3

Q: How do you make a soluble salt from an acid and a solid base?

ANSWER

A:

Warm acid. Add excess solid base until no more dissolves. Filter off excess base. Evaporate water slowly, wash and dry the salt.

Topic 3

Q: How does universal indicator show the difference in acid strength when added to ethanoic acid and hydrochloric acid of same concentration?

MAIN MENU

Back to start of section

ANSWER

A: Universal indicator goes red in HCl and orange in ethanoic acid.

Topic 3

Q: Which salts are insoluble?

ANSWER

A:

Barium, silver and lead sulphate;

silver and lead halides

transition metal hydroxides.

Topic 3

Q: Which salts are soluble?

MAIN MENU

Back to start of section

ANSWER

A:

nitrates,
chlorides (apart from
lead and silver chlorides),
group 1
salts,
ammonium salts

Topic 3

Q: Write a half equation for the formation of chlorine gas from chloride ions.

MAIN MENU

Back to start of section

ANSWER

A: $2Cl^- \rightarrow Cl_2 + 2e^-$

MAIN MENU

Back to start of section

Topic 3

Q: Write a half equation for the formation of hydrogen gas from hydrogen ions.

MAIN MENU

Back to start of section

ANSWER

A: $2H^+ + 2e^- \rightarrow H_2$

MAIN MENU

Back to start of section

Topic 3

Q: Write a half equation for the formation of aluminium from aluminium ions

ANSWER

A: $Al^{3+} + 3e^{-} \rightarrow Al$

MAIN MENU

Back to start of section

Topic 3

Q: Why is the formation of chlorine from chloride ions classed as oxidation?

ANSWER

A: Each chloride ion loses an electron.

MAIN MENU

Back to start of section

Topic 3

Q: Why is the formation of sodium from sodium ions classed as reduction?

MAIN MENU

Back to start of section

ANSWER

A: Because each sodium ion gains an electron.

MAIN MENU

Back to start of section

Topic 3

Q: What is an electrolyte?

MAIN MENU

Back to start of section

ANSWER

A: The substance that is to be electrolysed. Molten ionic substance or ionic solution

MAIN MENU

Back to start of section

Topic 3

Q: What is electrolysis?

MAIN MENU

Back to start of section

A: Breaking down (decomposing) a compound using electricity.

Topic 3

Q: Why do chloride ions move to the anode?

ANSWER

A: Chloride ions (anions) are negatively charged, the anode is positively charged; opposites attract.

MAIN MENU

Back to start of section

Topic 3

Q: Why do hydrogen ions move to the cathode?

MAIN MENU

Back to start of section

ANSWER

A: Hydrogen ions (cations) are positively charged and move to the negatively charged cathode because opposites attract.

MAIN MENU

Back to start of section

Topic 3

Q: During the electrolysis of brine hydrogen is produced at the cathode instead of sodium.

Why?

MAIN MENU

Back to start of section

ANSWER

A: Sodium is more reactive than hydrogen so the sodium ions will stay in solution

MAIN MENU

Back to start of section

Topic 3

Q: During electrolysis, which particles carry the electric current through the solution and which particles carry the current through the external wire?

MAIN MENU

Back to start of section

ANSWER

A: **Ions** carry the current through the solution

and

electrons carry the current through the wire

MAIN MENU

Back to start of section

Topic 3

Q: During the electrolysis of brine, what are the two products?

MAIN MENU

Back to start of section

ANSWER

A: Hydrogen gas is produced at the cathode.
Chlorine is produced at the anode.

MAIN MENU

Back to start of section

Topic 3

Q: Describe how you would produce pure copper from a lump of impure copper.

ANSWER

A: Use impure copper as anode. Use pure copper as cathode. Use copper sulphate as electrolyte. Copper atoms from anode lose 2 electrons each, form copper ions and join electrolyte.

Electrons travel through wire to cathode.

Copper ions receive two electrons each, form copper atoms and join the cathode.

Topic 3

Q: Describe the electrolysis of brine

MAIN MENU

Back to start of section

ANSWER

A: graphite electrodes and sodium chloride solution as electrolyte. Hydrogen ions travel to the cathode where they gain an electron each, pair up and form H_2 molecules. Chloride ions travel to the anode where they lose one electron each, pair up and form Cl_2 molecules. Na^+ and OH^- ions are left behind in solution.

Topic 3

Q: Why does electrolysis of solid KBr not work?

MAIN MENU

Back to start of section

ANSWER

A: The ions are not free to move in solid KBr.

MAIN MENU

Back to start of section

Topic 3

Q: What is the positive electrode called?

MAIN MENU

Back to start of section

ANSWER

A: Anode

MAIN MENU

Back to start of section

Topic 3

Q: What is the negative electrode called?

MAIN MENU

Back to start of section

ANSWER

A: Cathode

MAIN MENU

Back to start of section

Metals and Dynamic Equilibrium

Topic 4

Q: What is an ore?

MAIN MENU

Back to start of section

ANSWER

A: Rocks that contain enough metal compounds that make it economically viable to extract the metal compound.

MAIN MENU

Back to start of section

Topic 4

Q: What is a native metal?

ANSWER

A:A metal that can be found uncombined in the Earth’s crust.

MAIN MENU

Back to start of section

Topic 4

Q: Why and how is copper extracted from low-grade ores?

MAIN MENU

Back to start of section

ANSWER

A: Copper ores are running out and there are no high-grade ores left.

Phytoextraction and bioleaching can be used.

MAIN MENU

Back to start of section

Topic 4

Q: Describe bioleaching.

MAIN MENU

Back to start of section

A: Bacteria feed on low grade ores. A leachate is produced (this is a solution of copper ions). The leachate is either electrolysed or scrap iron is added to it.

Topic 4

Q: Why is it more expensive to extract aluminium than iron?

MAIN MENU

Back to start of section

ANSWER

A: Aluminium extraction involves electrolysis.
Larger amounts of energy are also needed.

MAIN MENU

Back to start of section

Topic 4

Q: Iron oxide is heated with carbon inside the blast furnace.

What type of reaction takes place?

ANSWER

A: Reduction.

Carbon removes the oxygen from iron oxide.

MAIN MENU

Back to start of section

Topic 4

Q: Describe how aluminium is extracted from bauxite.

ANSWER

A: The mixture is heated and electrolysed.
Carbon dioxide is produced as well as aluminium.

MAIN MENU

Back to start of section

Topic 4

Q: Write the equation for iron oxide reacting with carbon monoxide to make iron and carbon dioxide

MAIN MENU

Back to start of section

ANSWER

A: $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$

MAIN MENU

Back to start of section

Topic 4

Q: Why is it important to recycle aluminium cans?

MAIN MENU

Back to start of section

ANSWER

A: To preserve aluminium ores; save 95% of energy compared to extracting it from bauxite; reduce CO_2 emissions.

Topic 4

Q: Why is it expensive to extract metals from metal ores?

MAIN MENU

Back to start of section

ANSWER

A:Large amounts of energy are Needed;
large amounts of rocks/ores have to be mined;
many steps are needed to process the ores.

MAIN MENU

Back to start of section

Topic 4

Q: Where do the raw materials in the Haber process come from?

A: Hydrogen comes from natural gas
and
nitrogen comes from the air

Topic 4

Q: What happens to any unreacted hydrogen and nitrogen in the Haber process?

ANSWER

A: It is recycled and passed back into the reaction chamber.

Back to start of section

Topic 4 Q: Describe the conditions used in the Haber process that increase the rate of reaction.

ANSWER

A: High pressure, high temperature and an iron catalyst.

Topic 4

Q: Describe the conditions used in the Haber process which increase the yield of ammonia.

MAIN MENU

Back to start of section

ANSWER

A: High pressure, ammonia is liquefied and removed at the end of the process;
Unreacted hydrogen and nitrogen are recycled.

Topic 4

Q: What are the conditions used in the Haber process?

MAIN MENU

Back to start of section

ANSWER

A:

Iron catalyst,

200atm pressure,

450°C

MAIN MENU

Back to start of section

Topic 4

Q: Why does increasing the pressure increase the rate of reaction in the Haber process?

MAIN MENU

Back to start of section

ANSWER

A: Higher collision frequency so more chance of a successful collision

Topic 4

Q: What are the ideal conditions in the Haber process? Why?

ANSWER

A: **Low temperature** to shift the equilibrium to the right as the forward reaction is exothermic.

High pressure to shift the equilibrium to the right as there are fewer moles of gas on the right hand side.

Topic 4

Q: Why is a low temperature not used in the Haber process?

MAIN MENU

Back to start of section

ANSWER

A: Because the rate of reaction would be too slow.

MAIN MENU

Back to start of section

Topic 4

Q: Why is a high pressure not used in the Haber process?

MAIN MENU

Back to start of section

ANSWER

A: The walls of the pipes would have to be very thick and this is too expensive to build. A lot of energy is needed to create high pressure and this is expensive.

Topic 4

Q: Describe and explain the effect of increasing the temperature in the reaction between nitrogen and hydrogen in the Haber process

ANSWER

A: Rate increases but yield decreases. The forward reaction is exothermic so the equilibrium would shift to the left and more hydrogen and nitrogen would be produced.

Topic 4

Q: Why are 450°C and 200atm the optimum conditions in the Haber process?

ANSWER

A: At a lower temperature the reaction would be too slow so 450°C is a compromise between rate and yield. 200atm gives a reasonable yield at an acceptable cost.

MAIN MENU

Back to start of section

Topic 4

Q: How does a reaction reach equilibrium?

MAIN MENU

Back to start of section

ANSWER

A: Equilibrium is reached in a closed system when the rate of the forward reaction is equal to the rate of the backward reaction.

MAIN MENU

Back to start of section

Groups of the periodic table

MAIN MENU

Back to start of section

TOPIC 6:

Q: What are groups - across or down?

MAIN MENU

Back to start of section

ANSWER

A: Across

MAIN MENU

Back to start of section

TOPIC 6:

Q: What are periods - across or down?

MAIN MENU

Back to start of section

ANSWER

A: Down

TOPIC 6:

Q: What are Group 1 elements called?

MAIN MENU

Back to start of section

ANSWER

A: Alkali metals

TOPIC 6:

Q: Which is the most reactive Group 1 element - the top or the bottom element?

ANSWER

A: Bottom

TOPIC 6:

Q: What ions do Group 1 elements form?

MAIN MENU

Back to start of section

ANSWER

A: +1 (Cations)

MAIN MENU

Back to start of section

TOPIC 6:

Q: Is the reactivity of Group 1 increasing or decreasing down the group?

MAIN MENU

Back to start of section

ANSWER

A: Increasing

TOPIC 6:

Q: Why is the reactivity increasing down Group 1?

MAIN MENU

Back to start of section

ANSWER

A: Electron is further away from the nucleus;
weaker force of attraction between nucleus & electron;
electron is easier to lose

MAIN MENU

Back to start of section

TOPIC 6:

Q: What are Group 7 elements called?

MAIN MENU

Back to start of section

ANSWER

A: Halogens

TOPIC 6:

Q: What ions do Group 7 elements form?

ANSWER

A: -1 (Anions)

TOPIC 6:

Q: Is the reactivity of Group 7 increasing or decreasing down the group?

MAIN MENU

Back to start of section

ANSWER

A: Decreasing

TOPIC 6:

Q: Why is the reactivity decreasing down group 7?

MAIN MENU

Back to start of section

ANSWER

A: Electron is further away from the nucleus;
weaker force of attraction between nucleus and incoming electron;
electron is harder to gain.

TOPIC 6:

Q: List the properties of metals

MAIN MENU

Back to start of section

ANSWER

High melting points

Shiny (when polished)

Malleable

High density

Good conductors of electricity

Good conductors of heat

Sonorous

MAIN MENU

Back to start of section

TOPIC 6:

Q: List the properties of non-metals

ANSWER

Low melting point (can be solid, liquids or gases)

Not shiny when solid

Brittle (when solid)

Low density

Poor conductors of electricity & heat

TOPIC 6:

Q: What do you see when lithium is added to water?

MAIN MENU

Back to start of section

ANSWER

A: Bubbles (hydrogen gas is produced), turn universal indicator blue (lithium hydroxide is produced), moves round, floats on water, dissolves

MAIN MENU

Back to start of section

TOPIC 6:

Q: What do you see when sodium is added to water?

MAIN MENU

Back to start of section

ANSWER

A: Melts into a ball, fizzes (hydrogen gas is produced), moves across the surface, floats on water, turn universal indicator blue (sodium hydroxide is produced), dissolves

MAIN MENU

Back to start of section

TOPIC 6:

A: What do you see when potassium is added to water?

MAIN MENU

Back to start of section

ANSWER

A: Reacts violently, produces a lilac flame and fizzes (hydrogen gas is produced), moves across the surface, floats on water, turn universal indicator blue (potassium hydroxide is produced), dissolves

MAIN MENU

Back to start of section

TOPIC 6:

Q: alkali metal + water $\rightarrow$ ________ + ________

MAIN MENU

Back to start of section

ANSWER

A:

Alkali metal + water $\rightarrow$ metal hydroxide + hydrogen

MAIN MENU

Back to start of section

TOPIC 6:

Q: What is the trend in boiling points and melting points down Group 7?

MAIN MENU

Back to start of section

ANSWER

A: Increases

TOPIC 6:

Q: What are the colours of each of the halogens at room temperature?

MAIN MENU

Back to start of section

ANSWER

Fluorine F_2	Pale yellow
Chorine Cl_2	Pale green
Bromine Br_2	Red/brown. Gives off an orange vapour
Iodine I_2	Dark grey crystalline. Gives off a purple vapour
Astatine At_2	black

TOPIC 6:

Q: What are the states of each of the halogens at room temperature?

MAIN MENU

Back to start of section

ANSWER

Fluorine F_2	Gas
Chorine Cl_2	Gas
Bromine Br_2	Liquid
Iodine I_2	Solid
Astatine At_2	Solid

TOPIC 6:

Q: What is the test for chlorine gas?

MAIN MENU

Back to start of section

ANSWER

Testing: A piece of damp litmus paper is placed over chlorine gas, it first turn red (because it is acidic) then bleaches, turning it white.

MAIN MENU

Back to start of section

TOPIC 6:
Q: The halogens react with metals to make salts called **metal halides**.

Write the general word equation for this reaction.

MAIN MENU

Back to start of section

ANSWER

A:

metal + halogen → metal halide

MAIN MENU

Back to start of section

TOPIC 6:

Q: The halogens react with hydrogen to make **hydrogen halides**.

Hydrogen halides dissolve in water to form acidic solutions.

Write the **word & symbol equations** for the reaction of **chlorine with hydrogen.**

MAIN MENU

Back to start of section

ANSWER

Hydrogen + Chlorine → Hydrogen chlor**<u>ide</u>**

$$H_{2\,(g)} + Cl_{2\,(g)} \rightarrow 2HCl_{(g)}$$

TOPIC 6:

Q: What are Group 0 called?

MAIN MENU

Back to start of section

ANSWER

A: Noble gases

MAIN MENU

Back to start of section

TOPIC 6:

Q: What does **inert** mean?

MAIN MENU

Back to start of section

ANSWER

A: unreactive

TOPIC 6:

Q: What are the uses of helium, argon and neon?

MAIN MENU

Back to start of section

ANSWER

A: **<u>Uses of Noble gases:</u>**

1. **Helium** – Low density; inflating balloons and airships and inflammable
2. **Neon**- produces a distinctive red-orange light when electricity is passed through it - illuminated signs
3. **Argon** – is low density, inert and non-flammable. It is added to light bulbs to prevent the tungsten filament from burning away. It can be used to for welding – it stops the hot metal from reacting with oxygen.

TOPIC 6:

Q: What is the trend in density down Group 0?

MAIN MENU

Back to start of section

ANSWER

A: <u>**Trend in Density**</u>:

Helium has the lowest density and the **densities increase** as you move down the group

TOPIC 6:

Q: What is the trend in boiling points as you go down Group 0?

MAIN MENU

Back to start of section

ANSWER

A: **Trend in Boiling Point**:

Low melting and boiling point: The boiling points increase as you move down the group

MAIN MENU

Back to start of section

TOPIC 6:

Q: What are the properties of Group 0 elements?

MAIN MENU

Back to start of section

ANSWER

A: **Properties:**

Colourless gases at room temperature

Monotomic

Inert

Non-flammable

Rate of Reaction + Energy changes

MAIN MENU

Back to start of section

Topic 7
Q: What do you see when magnesium is added to an acid?

MAIN MENU

Back to start of section

ANSWER

A: Fizzing and the magnesium disappears

MAIN MENU

Back to start of section

Topic 7

Q: Why do catalysts work for a long time before they need to be replaced?

ANSWER

A: They are not used up in a reaction.

MAIN MENU

Back to start of section

Topic 7

Q: What happens to the mass of a catalyst during a reaction?

MAIN MENU

Back to start of section

ANSWER

A: Nothing - the mass is unchanged

Topic 7

Q: Define rate of reaction

MAIN MENU

Back to start of section

ANSWER

A: The change in concentration of the reactants in a given time

Topic 7

Q: What is the collision theory?

MAIN MENU

Back to start of section

ANSWER

A:The rate of reaction depends on the frequency of successful collisions between particles.

For the collision to be successful the particles must exceed the activation energy.

MAIN MENU

Back to start of section

Topic 7

Q: Define activation energy

MAIN MENU

Back to start of section

ANSWER

A: Minimum amount of energy needed to start a reaction.

Topic 7

Q: How do you find the rate of a precipitation reaction?

MAIN MENU

Back to start of section

ANSWER

A: Time how long it takes for the precipitate to obscure a black cross once the chemicals have been mixed.

Topic 7

Q: How do you find the rate of a reaction that produces a gas?

MAIN MENU

Back to start of section

ANSWER

A: Use a gas syringe and time how long it takes to collect a specified volume of gas

OR

Measure the loss in mass over a specified period of time.

MAIN MENU

Back to start of section

Topic 7

Q: Why should bread be placed in the fridge?

ANSWER

A: The temperature is lowered so the rate of decomposition slows down.

Topic 7

Q: How and why does increasing temperature increase the rate of a reaction?

MAIN MENU

Back to start of section

ANSWER

A:

Particles gain energy and move faster.

More successful collisions per second as more particles have energy greater than the activation energy.

MAIN MENU

Back to start of section

Topic 7

Q: Why does increasing the concentration increase the rate of a reaction?

MAIN MENU

Back to start of section

ANSWER

A: There are **more particles per unit volume** (*more crowded particles*) so there are **more frequent collisions.**

Topic 7

Q: What is a catalyst?

MAIN MENU

Back to start of section

ANSWER

A:

A substance that increases the rate of reaction, without being used up, by lowering the activation energy needed.

Topic 7
Q: How does a catalyst work?

ANSWER

A:It provides an alternative reaction pathway with a lower activation energy.

Topic 7

Q: What is different about the energy distribution of particles in a hot and a cold reactant?

MAIN MENU

Back to start of section

ANSWER

A: In a cold reactant most particles have little energy and few have the required activation energy.

In a hot reactant particles have more energy and more particles have the required activation energy.

MAIN MENU

Back to start of section

Topic 7

Q: Which property of a catalyst will never change?

MAIN MENU

Back to start of section

ANSWER

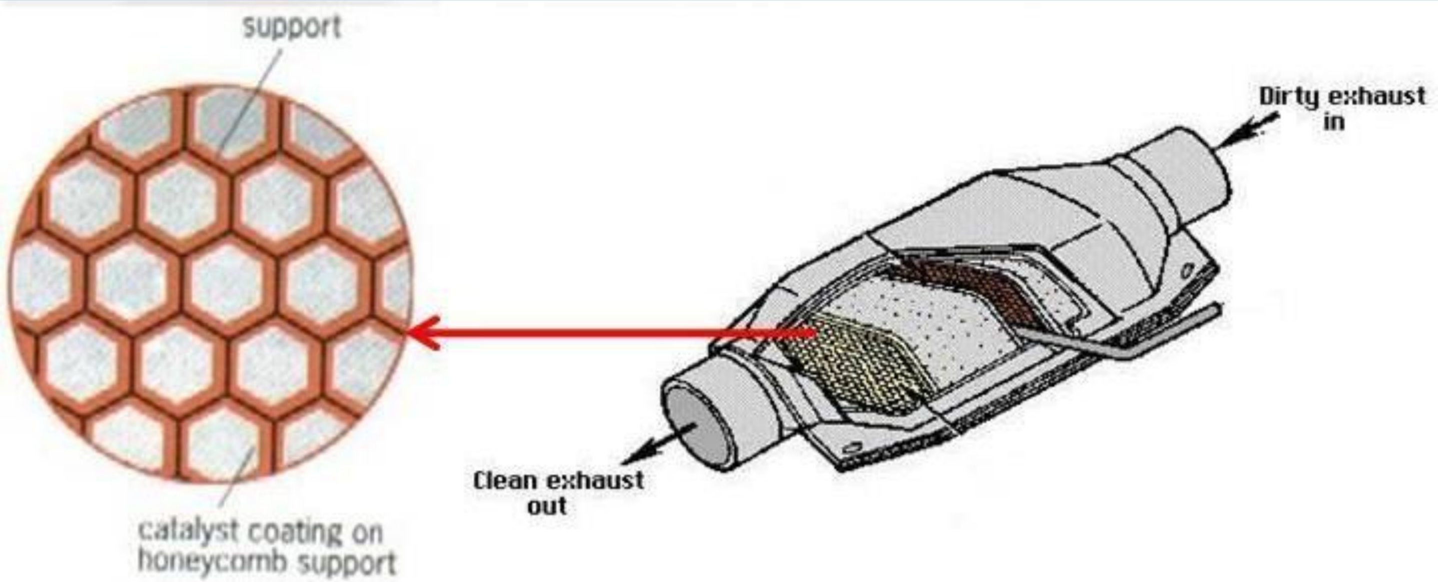
A: Mass

MAIN MENU

Back to start of section

Topic 7

Q: Why are catalysts often spread over a honeycomb surface?



MAIN MENU

Back to start of section

ANSWER

A: To increase the surface area.

Topic 7

Q: A student does an experiment between magnesium and acid. The experiment is repeated with half the amount of magnesium.

How is the shape of the time (x-axis) v volume (y-axis) graph different?

ANSWER

A: The graph levels out at half the volume of gas produced.

MAIN MENU

Back to start of section

Topic 7

Q: Although gold is rare and expensive, it is used as a catalyst in industry.

Why?

MAIN MENU

Back to start of section

ANSWER

A: You only need small amounts and the catalyst is not used up in the reaction.

MAIN MENU

Back to start of section

Topic 7

Q: Marble chips react with acid.

At the end of the reaction there are still some chips left over.

Why?

MAIN MENU

Back to start of section

ANSWER

A: Either the chips were in excess and all the acid has been used up

OR

not enough acid was used.

MAIN MENU

Back to start of section

Topic 7

Q: Why does increasing the surface area increase the rate of a reaction?

MAIN MENU

Back to start of section

ANSWER

A: More particles are available for Collisions, so there are **more frequent collisions**.

MAIN MENU

Back to start of section

Topic 7

Q: How can you show that a reaction is exothermic?

MAIN MENU

Back to start of section

ANSWER

A: Use a thermometer to find the temperature of the surroundings before and after the reaction. If the temperature rises, the reaction is exothermic. If the temperature drops, the reaction is endothermic.

MAIN MENU

Back to start of section

Topic 7

Q: What is the meaning of endothermic?

MAIN MENU

Back to start of section

ANSWER

A: Energy is taken from the surroundings to the chemical system

MAIN MENU

Back to start of section

Topic 7

Q: In an endothermic reaction the temperature of the surroundings drops. Why?

MAIN MENU

Back to start of section

ANSWER

A: Energy is transferred from the surroundings to the chemical system

Topic 7

Q: Give examples of endothermic and exothermic reactions.

MAIN MENU

Back to start of section

ANSWER

A: Combustion and respiration are exothermic.
Thermal decomposition and photosynthesis are endothermic.

Topic 7

Q: If a forward reaction is exothermic, what do you need to do to reverse the reaction?

MAIN MENU

Back to start of section

ANSWER

A: Add heat as the reverse reaction will be endothermic.

Topic 7

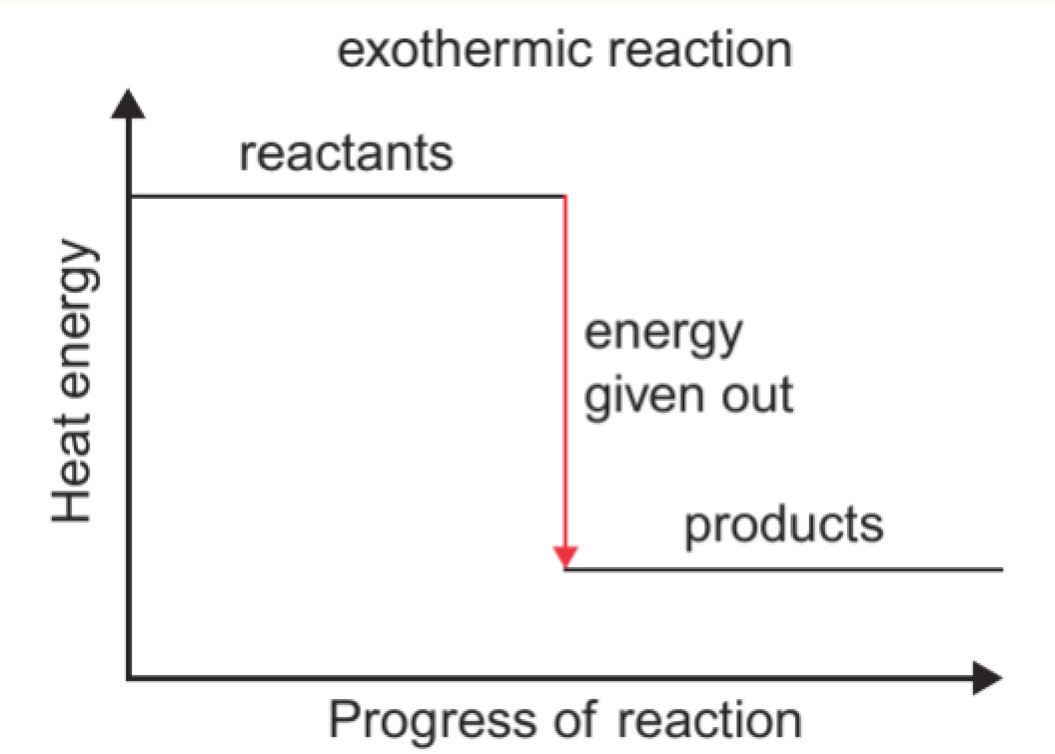
Q: How do you know from an energy profile diagram that a reaction is **exothermic**?

MAIN MENU

Back to start of section

ANSWER

A: The energy of the products is below the energy of the reactants.



MAIN MENU

Back to start of section

Topic 7

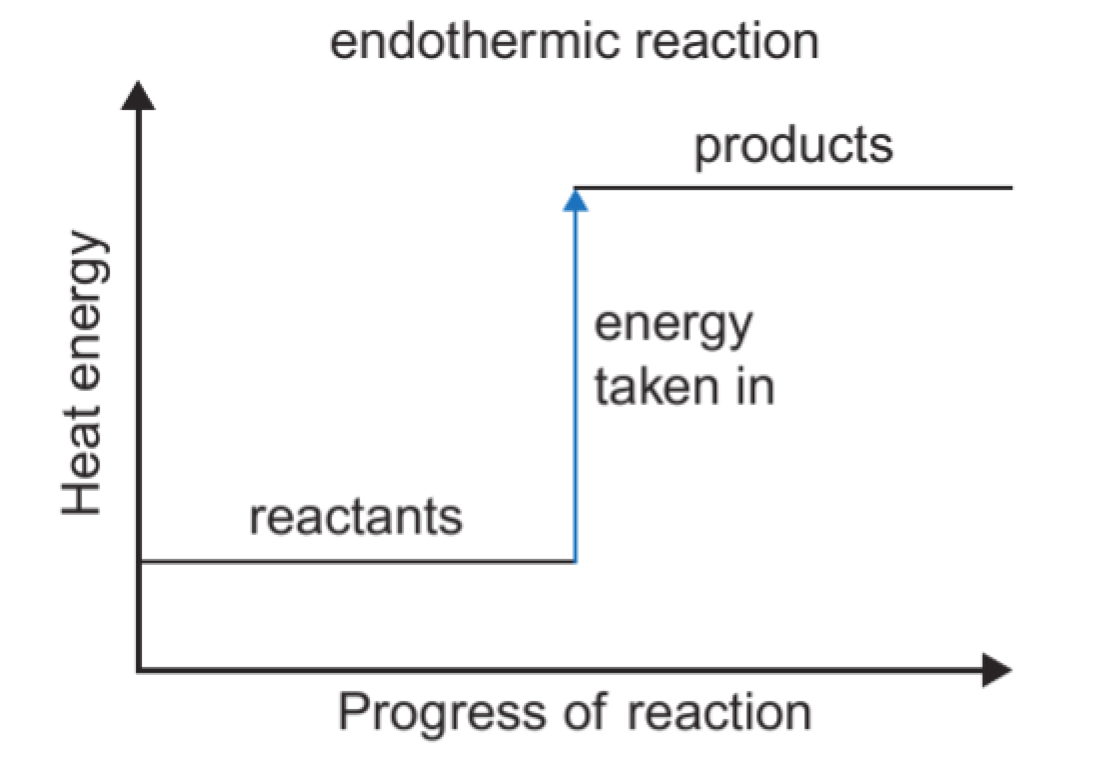
Q: How do you know from an energy profile diagram that a reaction is **endothermic**?

MAIN MENU

Back to start of section

ANSWER

A: The energy of the products is above the energy of the reactants.



MAIN MENU

Back to start of section

Topic 7

Q: How do you convert blue **hydrated** copper sulphate into white **anhydrous** copper sulphate?

MAIN MENU

Back to start of section

ANSWER

A: Supply heat to evaporate the water present in the blue hydrated copper sulfate

MAIN MENU

Back to start of section

Topic 7

Q: What does ***BRENDa on holiday in MEXico***

OR

MEXican BEN stand for?

ANSWER

A: Breaking bonds is endothermic
and
making bonds is exothermic

MAIN MENU

Back to start of section

Topic 7

Q: How do you know if a reaction is endothermic or exothermic?

ANSWER

A: The temperature rises in an exothermic reaction, but drops in an endothermic reaction. More energy is released in bond making than is needed to break the bonds in an exothermic reaction. The energy of the products is below the energy of the reactants in an exothermic reaction.

Topic 7

Q: Is bond breaking exothermic or endothermic?

MAIN MENU

Back to start of section

ANSWER

A: endothermic.
Bond making is exothermic.

MAIN MENU

Back to start of section

Topic 7

Q: How do you calculate the total energy change from bond energy data?

MAIN MENU

Back to start of section

A: Calculate the total amount of energy needed to break the bonds in the reactants and take away the total amount of energy released when the bonds in the products are made.

Topic 7

Q: Define activation energy.

MAIN MENU

Back to start of section

ANSWER

A: Minimum amount of energy needed to start the reaction.
(The energy needed to break the bonds in the reactants).

Topic 7

Q: Why does energy need to be supplied at the start of an exothermic reaction but the reaction continues by itself afterwards?

MAIN MENU

Back to start of section

ANSWER

A: Existing bonds must be broken first, which is why energy must be supplied. Much more energy is released when new bonds form and this energy is used to continue breaking the reactants' bonds.

Topic 7

Q: A reaction happens rapidly without the help of a catalyst.

What does this suggest about the activation energy?

MAIN MENU

Back to start of section

ANSWER

A: The activation energy is small..

MAIN MENU

Back to start of section

CORE PRACTICALS

CORE PRACTICAL

SEPARATION OF INKS:

1. Why is it important to draw the lines and write labels on the chromatography paper in pencil and not in ink?

MAIN MENU

Back to start of section

ANSWER

CORE PRACTICAL

SEPARATION OF INKS:

Pencil is insoluble in the solvent (but ink is soluble).

CORE PRACTICALS

SEPARATION OF INKS:

2. Why should the spots of ink be above the level of the solvent in the beaker?

MAIN MENU

Back to start of section

ANSWER

CORE PRACTICALS

SEPARATION OF INKS:

So do not dissolve in the solvent; ink is soluble in the solvent.

CORE PRACTICALS

SEPARATION OF INKS:

What is meant by the term ‘solvent front’?

MAIN MENU

Back to start of section

ANSWER

CORE PRACTICALS

SEPARATION OF INKS:

The level that solvent rises to / distance moved by solvent

MAIN MENU

Back to start of section

CORE PRACTICALS

SEPARATION OF INKS:

What is the mobile phase?

MAIN MENU

Back to start of section

ANSWER

CORE PRACTICALS

SEPARATION OF INKS:

Solvent

MAIN MENU

Back to start of section

CORE PRACTICALS

SEPARATION OF INKS:

What is the stationary phase?

MAIN MENU

Back to start of section

ANSWER

CORE PRACTICALS
SEPARATION OF INKS:
Chromatography paper

MAIN MENU

Back to start of section

CORE PRACTICALS

SEPARATION OF INKS:

Where do the insoluble substances appear on the chromatogram?

MAIN MENU

Back to start of section

ANSWER

CORE PRACTICALS

SEPARATION OF INKS:

On the pencil line / baseline

MAIN MENU

Back to start of section

CORE PRACTICALS

SEPARATION OF INKS:

What change could you make to the experiment in order to determine an R_f value of an insoluble food colouring?

MAIN MENU

Back to start of section

ANSWER

CORE PRACTICALS
SEPARATION OF INKS:
Change the solvent

MAIN MENU

Back to start of section

CORE PRACTICALS

SEPARATION OF INKS:

What process takes place when a liquid turns into a gas?

What process takes place when a gas turns into a liquid?

MAIN MENU

Back to start of section

ANSWER

CORE PRACTICALS

SEPARATION OF INKS:

Evaporation

Condensation

CORE PRACTICALS

SEPARATION OF INKS:

In a distillation experiment, which liquid will be collected first - Liquid A with a boiling point of 100^{o}C or Liquid B which boils at 65^{o}C?

MAIN MENU

Back to start of section

ANSWER

CORE PRACTICALS
SEPARATION OF INKS:

Liquid B (boiling point 65°C)

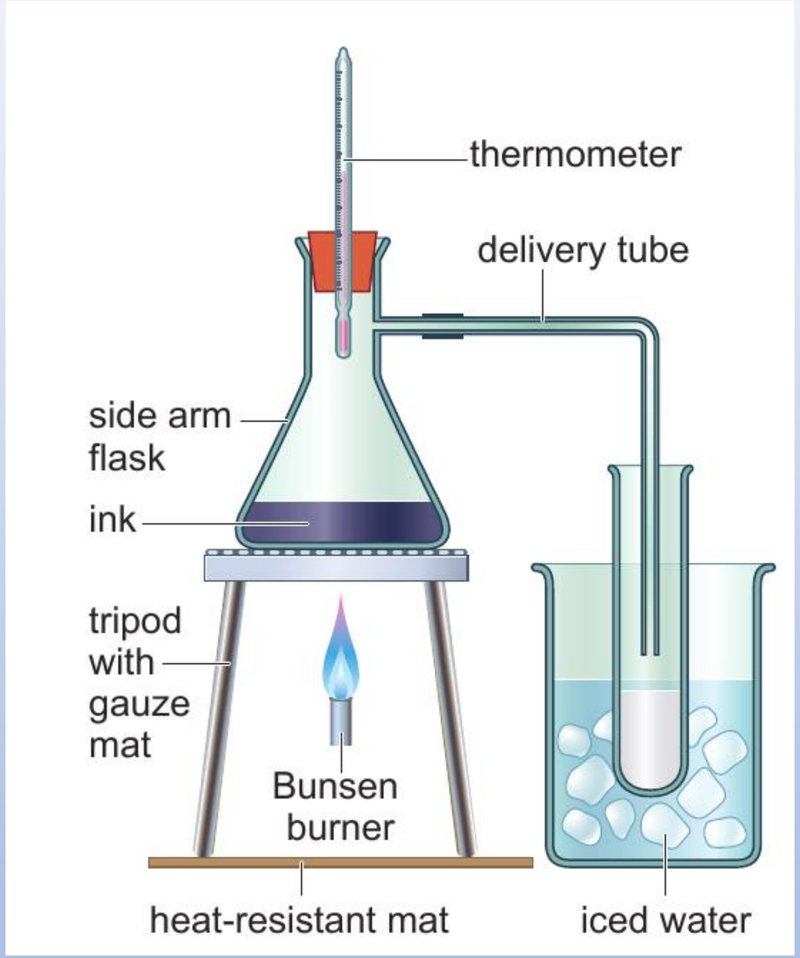
MAIN MENU

Back to start of section

CORE PRACTICALS

SEPARATION OF INKS:

What is the temperature on the thermometer when the water is distilling off?



MAIN MENU

Back to start of section

ANSWER

CORE PRACTICALS
SEPARATION OF INKS:

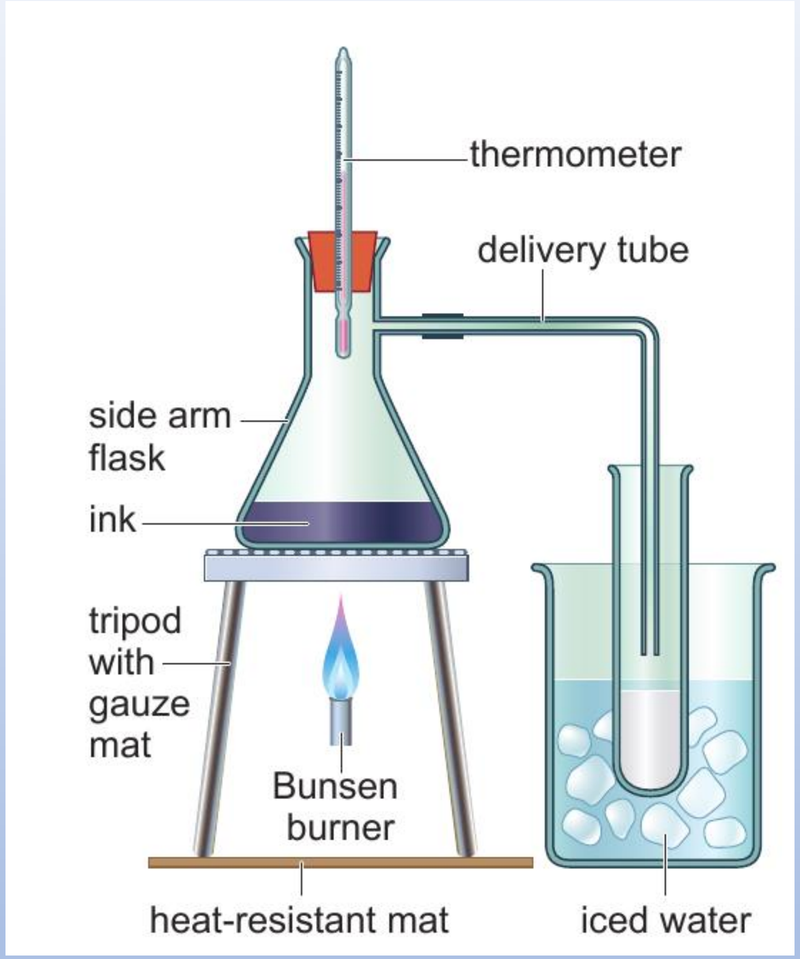
$100^{o}C$

MAIN MENU

Back to start of section

CORE PRACTICALS
SEPARATION OF INKS:

What is the purpose of the crushed ice?



ANSWER

CORE PRACTICALS

SEPARATION OF INKS:

Speed up the process of condensation

MAIN MENU

Back to start of section

CORE PRACTICALS
SEPARATION OF INKS:

What is the difference between simple and fractional distillation?

ANSWER

CORE PRACTICALS
SEPARATION OF INKS:

The difference between simple and fractional distillation is that **simple** is mainly used for two liquids with two different boiling points (or a soluble solid and a liquid)
and **fractional** is used for multiple liquids with different boiling points.

MAIN MENU

Back to start of section

CORE PRACTICALS

SEPARATION OF INKS:

What is a temperature gradient found in the fractional distillation column?

ANSWER

CORE PRACTICALS
SEPARATION OF INKS:

As the column heats up, it will be hottest at the bottom and the temperature will drop towards the top.

CORE PRACTICALS
SEPARATION OF INKS:

What method would be used to separate crude oil and saltwater?

MAIN MENU

Back to start of section

ANSWER

CORE PRACTICALS
SEPARATION OF INKS:

Crude oil – fractional distillation (more than 2 liquids)
Salt water – simple distillation (1 soluble compound and 1 liquid)

MAIN MENU

Back to start of section

CORE PRACTICALS NEUTRALISATION:

Your task

Calcium and magnesium are in group 2 of the periodic table. Calcium hydroxide has similar chemical properties to magnesium hydroxide, but it is more soluble in water. You will investigate the change in pH when you add powdered calcium hydroxide to dilute hydrochloric acid. You will add small portions of powder to the acid and record the pH of the mixture after each addition.

What are the main errors in this experiment? Explain one way to improve the accuracy of the experiment.

ANSWER

CORE PRACTICALS NEUTRALISATION:

Main error - Using the universal indicator paper.
Improvement - Use a pH meter or probe, which will digitally record the pH.

CORE PRACTICALS NEUTRALISATION:

What is the best piece of apparatus to measure the volume of hydrochloric acid?
Why is that the best piece of apparatus?

MAIN MENU

Back to start of section

ANSWER

CORE PRACTICALS NEUTRALISATION:

Measuring cylinder.

It has an appropriate scale on the size to measure out volume correctly.

CORE PRACTICALS NEUTRALISATION:

How do you use universal indicator paper to measure the pH of the solution?

MAIN MENU

Back to start of section

ANSWER

CORE PRACTICALS NEUTRALISATION:

Remove a sample using a glass rod and add to the paper. Then use a pH chart to compare the colours.

CORE PRACTICALS NEUTRALISATION:

How do you know when the hydrochloric acid is exactly neutralised?

MAIN MENU

Back to start of section

ANSWER

CORE PRACTICALS NEUTRALISATION:

pH is 7

MAIN MENU

Back to start of section

CORE PRACTICALS NEUTRALISATION:

What colour and pH is neutral when using universal indicator?

MAIN MENU

Back to start of section

ANSWER

CORE PRACTICALS NEUTRALISATION:

Green/pH 7

CORE PRACTICALS
FORMATION OF A SOLUBLE SALT FROM AN INSOLUBLE BASE:

What is meant by the filtrate and residue?

MAIN MENU

Back to start of section

ANSWER

CORE PRACTICALS
FORMATION OF A SOLUBLE SALT FROM AN INSOLUBLE BASE:

Filtrate – solution which passes through the filter paper
Residue – solid remaining in filter paper

MAIN MENU

Back to start of section

CORE PRACTICALS
FORMATION OF A SOLUBLE SALT FROM AN INSOLUBLE BASE:

What colour was the copper sulfate solution that formed?

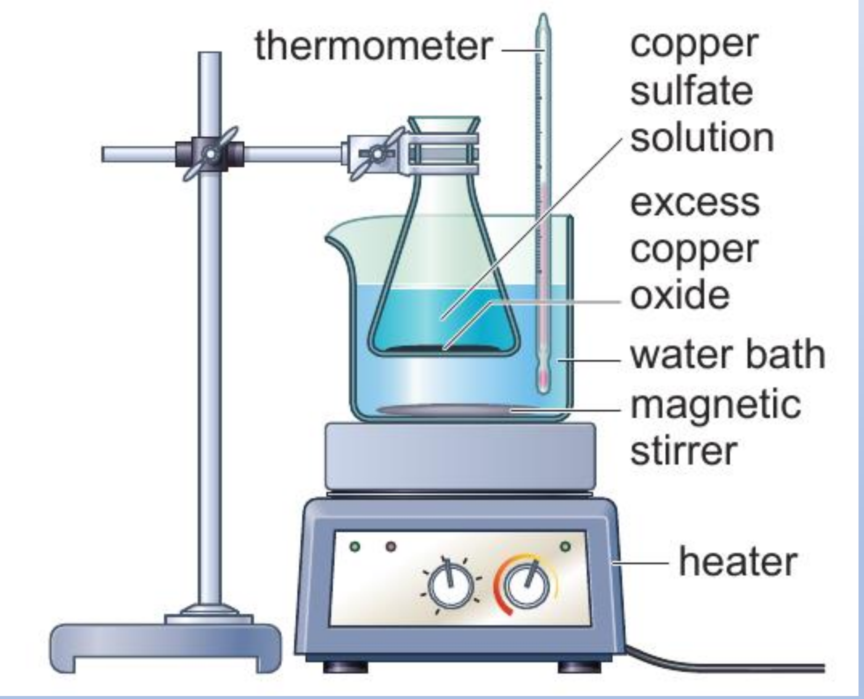
ANSWER

CORE PRACTICALS
FORMATION OF A SOLUBLE SALT FROM AN INSOLUBLE BASE:

Blue

CORE PRACTICALS
FORMATION OF A SOLUBLE SALT FROM AN INSOLUBLE BASE:

Why should the acid solution be warmed slightly?



MAIN MENU

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CORE PRACTICALS
FORMATION OF A SOLUBLE SALT FROM AN INSOLUBLE BASE:

To speed up the reaction

CORE PRACTICALS
FORMATION OF A SOLUBLE SALT FROM AN INSOLUBLE BASE:

Why is the metal oxide added in excess?

MAIN MENU

Back to start of section

ANSWER

CORE PRACTICALS
FORMATION OF A SOLUBLE SALT FROM AN INSOLUBLE BASE:

To ensure all the acid has reacted

MAIN MENU

Back to start of section

CORE PRACTICALS
FORMATION OF A SOLUBLE SALT FROM AN INSOLUBLE BASE:

How did you know when the copper oxide was present in excess?

ANSWER

CORE PRACTICALS
FORMATION OF A SOLUBLE SALT FROM AN INSOLUBLE BASE:

It was insoluble (copper oxide is insoluble in water) and black solid remained.

CORE PRACTICALS
FORMATION OF A SOLUBLE SALT FROM AN INSOLUBLE BASE:

Why is the mixture filtered?

MAIN MENU

Back to start of section

ANSWER

CORE PRACTICALS
FORMATION OF A SOLUBLE SALT FROM AN INSOLUBLE BASE:

To remove the excess metal oxide

CORE PRACTICALS
FORMATION OF A SOLUBLE SALT FROM AN INSOLUBLE BASE:

Why should a water bath be used rather than a Bunsen burner?

MAIN MENU

Back to start of section

ANSWER

CORE PRACTICALS

FORMATION OF A SOLUBLE SALT FROM AN INSOLUBLE BASE:

It is safer and gives equal distribution of heat

CORE PRACTICALS
ELECTROLYSIS OF COPPER SULFATE SOLUTION WITH **COPPER ELECTRODES**

Why is it necessary to clean the copper electrodes with emery paper before using them?

ANSWER

CORE PRACTICALS

ELECTROLYSIS OF COPPER SULFATE SOLUTION WITH **COPPER ELECTRODES**

Clean the copper electrodes – to reduce the amount of sludge that will form under the anode or to remove all grease present on the electrodes.

MAIN MENU

Back to start of section

CORE PRACTICALS

ELECTROLYSIS OF COPPER SULFATE SOLUTION WITH **COPPER ELECTRODES**

Which factors should be kept the same during the electrolysis?

MAIN MENU

Back to start of section

CORE PRACTICALS
ELECTROLYSIS OF COPPER SULFATE SOLUTION WITH **COPPER ELECTRODES**

The key control variables are the

- concentration of the electrolyte,
- the time of electrolysis and
- the volume of copper sulphate used

CORE PRACTICALS

ELECTROLYSIS OF COPPER SULFATE SOLUTION WITH **COPPER ELECTRODES**

How do you wash and dry the electrodes at the end of the electrolysis?

MAIN MENU

Back to start of section

ANSWER

CORE PRACTICALS

ELECTROLYSIS OF COPPER SULFATE SOLUTION WITH **COPPER ELECTRODES**

Propanone has a higher evaporation point than water and can quickly dry the electrodes. These are washed with propanone and then this evaporates quickly. The electrodes should be dry as any liquid left on them will increase the mass.

MAIN MENU

Back to start of section

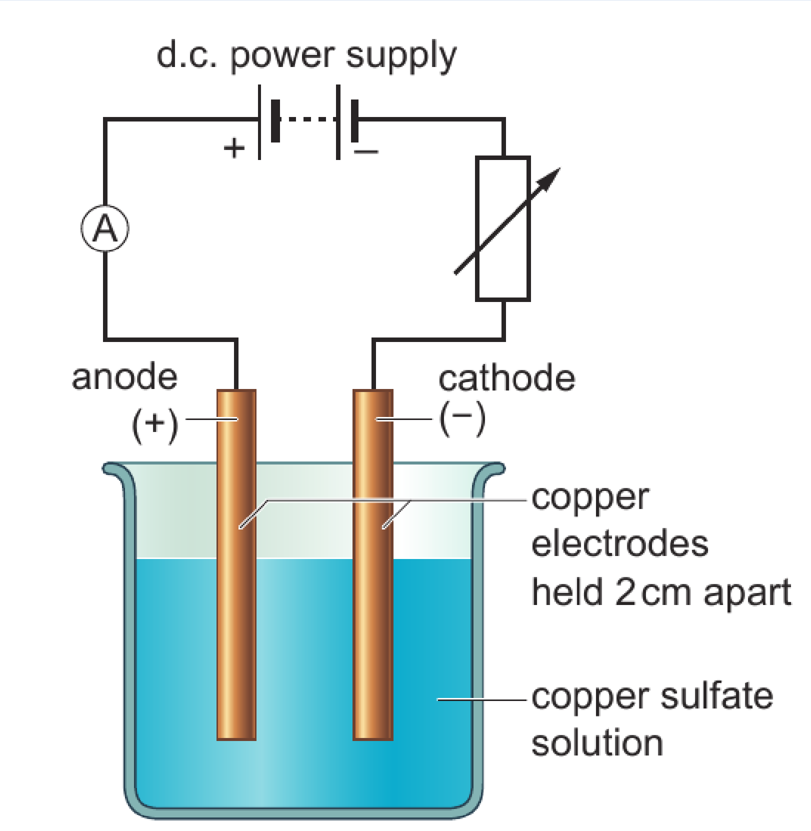
CORE PRACTICALS

ELECTROLYSIS OF COPPER SULFATE SOLUTION WITH **COPPER ELECTRODES**

What safety precautions should you take when carrying out this experiment and why?

CLUE:

Turn off the power and remove the electrodes from the beaker. Gently wash the electrodes with distilled water then dip them into propanone. Lift the electrodes out and gently shake off the propanone. Allow the remainder of the propanone to evaporate.



MAIN MENU

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ANSWER

CORE PRACTICALS
ELECTROLYSIS OF COPPER SULFATE SOLUTION WITH **COPPER ELECTRODES**

Propanone is an irritant and highly flammable. Keep away from naked flames and avoid getting it on your skin.

MAIN MENU

Back to start of section

CORE PRACTICALS
ELECTROLYSIS OF COPPER SULFATE SOLUTION WITH
COPPER ELECTRODES

Why is there a difference in the change in mass of the anode and the change in mass of the cathode?

MAIN MENU

Back to start of section

ANSWER

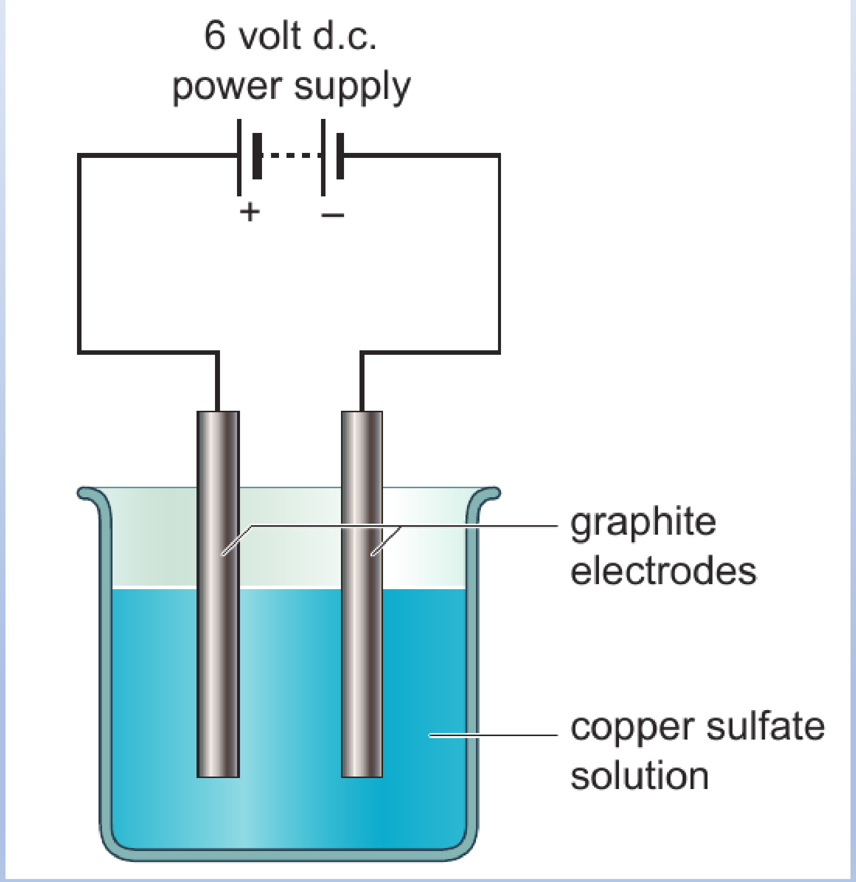
CORE PRACTICALS
ELECTROLYSIS OF COPPER SULFATE SOLUTION WITH **COPPER ELECTRODES**

The copper atoms in the anode lose electrons to become copper ions.
The copper ions dissolve in the solution and migrate (move) to the cathode, where they are deposited as pure copper.

CORE PRACTICALS

ELECTROLYSIS OF COPPER SULFATE SOLUTION WITH <u>INERT</u> ELECTRODES

State and explain one safety precaution



MAIN MENU

Back to start of section

ANSWER

CORE PRACTICALS
ELECTROLYSIS OF COPPER SULFATE SOLUTION WITH **INERT ELECTRODES**

Be careful using liquid around a live current; risk of electric shock)
The electrodes will become hot if a high current is used

MAIN MENU

Back to start of section

CORE PRACTICALS

ELECTROLYSIS OF COPPER SULFATE SOLUTION WITH **INERT ELECTRODES**

What did you observe at the **anode**?

MAIN MENU

Back to start of section

ANSWER

CORE PRACTICALS

ELECTROLYSIS OF COPPER SULFATE SOLUTION WITH **INERT ELECTRODES**

Gas given off (oxygen)

MAIN MENU

Back to start of section

CORE PRACTICALS

ELECTROLYSIS OF COPPER SULFATE SOLUTION WITH **INERT ELECTRODES**

What did you observe at the **cathode**?

MAIN MENU

Back to start of section

ANSWER

CORE PRACTICALS

ELECTROLYSIS OF COPPER SULFATE SOLUTION WITH **INERT ELECTRODES**

(Pure) copper deposited

CORE PRACTICALS

ELECTROLYSIS OF COPPER SULFATE SOLUTION WITH **INERT ELECTRODES**

How do you explain the formation of the product at the anode?

ANSWER

CORE PRACTICALS
ELECTROLYSIS OF COPPER SULFATE SOLUTION WITH **INERT** **ELECTRODES**

Oxide ions (O^{2-}) are negatively charged and more reactive (than sulfate ions, SO_4^{2-})therefore will migrate towards the positive electrode (anode) and therefore oxygen gas with form

MAIN MENU

Back to start of section

CORE PRACTICALS

ELECTROLYSIS OF COPPER SULFATE SOLUTION WITH **<u>INERT</u> ELECTRODES**

How do you explain the formation of the product at the cathode?

ANSWER

CORE PRACTICALS
ELECTROLYSIS OF COPPER SULFATE SOLUTION WITH **INERT ELECTRODES**

Copper ions (Cu^{2+}) are positively charged and therefore will migrate towards the negative electrode (cathode) and therefore copper metal will deposited.

MAIN MENU

Back to start of section

CORE PRACTICALS

ELECTROLYSIS OF COPPER SULFATE SOLUTION WITH **INERT ELECTRODES**

What happens to the blue colour of the copper sulfate solution?

ANSWER

CORE PRACTICALS
ELECTROLYSIS OF COPPER SULFATE SOLUTION WITH **INERT ELECTRODES**

Copper(II) sulfate solution is blue because of the copper(II) ions it contains.
As these ions are discharged as copper atoms at the cathode, the blue colour of the solution gradually fades (as the concentration of the copper(II) ions decreases).

CORE PRACTICALS

ELECTROLYSIS OF COPPER SULFATE SOLUTION WITH **<u>INERT</u> ELECTRODES**

Explain why a different product is formed at the anode when copper sulfate solution is electrolysed using graphite (inert) electrodes rather than copper electrodes.

MAIN MENU

Back to start of section

ANSWER

CORE PRACTICALS
ELECTROLYSIS OF COPPER SULFATE SOLUTION WITH **INERT ELECTRODES**

Using copper electrodes - The copper anode is preferentially oxidised to discharge Cu^{2+} copper ions.

Using inert electrodes - Oxygen gas is formed at the positive electrode, an oxidation reaction (electron loss).

CORE PRACTICALS

ELECTROLYSIS OF COPPER SULFATE SOLUTION WITH **INERT ELECTRODES**

If the electrolysis is continued for a long time, what will be left in the solution?

MAIN MENU

Back to start of section

ANSWER

CORE PRACTICALS

ELECTROLYSIS OF COPPER SULFATE SOLUTION WITH **INERT ELECTRODES**

H_2SO_4 (H^+ and SO_4^{2-}) and water (H^+ and OH^-)

MAIN MENU

Back to start of section

CORE PRACTICALS

RATE OF REACTION – **COLLECTING A GAS**

What is the best practical method to determine the rate of this reaction and why?

ANSWER

CORE PRACTICALS

RATE OF REACTION – **COLLECTING A GAS**

To collect the gas over 5 minutes using a gas syringe.

Air tight system so no gas escapes/closed system

MAIN MENU

Back to start of section

CORE PRACTICALS

RATE OF REACTION – **COLLECTING A GAS**

What are two different methods of collecting and measuring the volume of gas produced?

ANSWER

CORE PRACTICALS

RATE OF REACTION – **COLLECTING A GAS**

- The volume of gas given off
- The change in mass

MAIN MENU

Back to start of section

CORE PRACTICALS

RATE OF REACTION – **COLLECTING A GAS**

Increasing surface area will do what to the production of the gas?

ANSWER

CORE PRACTICALS

RATE OF REACTION – **COLLECTING A GAS**

Speeds up the production of gas

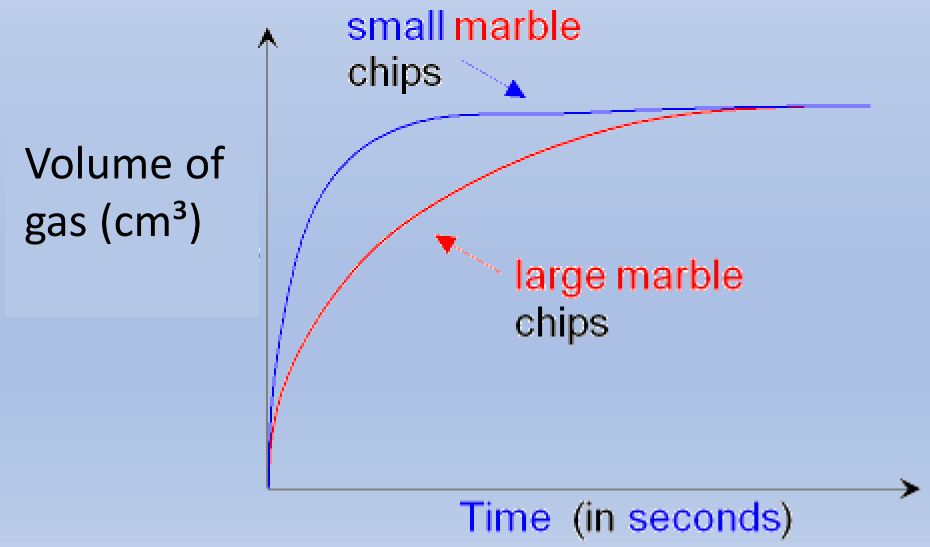
MAIN MENU

Back to start of section

CORE PRACTICALS

RATE OF REACTION – **COLLECTING A GAS**

How can you explain the graphs of volume of gas plotted against time for two different sizes of marble chips?



MAIN MENU

Back to start of section

ANSWER

CORE PRACTICALS
RATE OF REACTION – **COLLECTING A GAS**

The graph for the small pieces of marble chips is steeper- larger surface area- faster rate of reaction (steeper the gradient)

MAIN MENU

Back to start of section

CORE PRACTICALS

RATE OF REACTION – **COLLECTING A GAS**

What needs to be kept the same when you repeat the first experiment but use different size marble chips?

MAIN MENU

Back to start of section

ANSWER

CORE PRACTICALS
RATE OF REACTION – **COLLECTING A GAS**

- Same volume of acid
- Same concentration of acid
- Same amount of calcium carbonate (marble chips)

CORE PRACTICALS

RATE OF REACTION – **COLLECTING A GAS**

How can you calculate the rate of reaction from a graph?

ANSWER

CORE PRACTICALS

RATE OF REACTION – **COLLECTING A GAS**

$$\text{Gradient} = \frac{\text{change in y}}{\text{change in x}}$$

MAIN MENU

Back to start of section

CORE PRACTICALS

RATE OF REACTION – **CHANGE IN TEMPERATURE**

What is seen when sodium thiosulfate solution reacts with dilute hydrochloric acid?

MAIN MENU

Back to start of section

ANSWER

CORE PRACTICALS

RATE OF REACTION – **CHANGE IN TEMPERATURE**

A cloudy precipitate (of sulfur) is formed

CORE PRACTICALS

RATE OF REACTION – **CHANGE IN TEMPERATURE**

What safety precautions should you take in this investigation?

ANSWER

CORE PRACTICALS
RATE OF REACTION – **CHANGE IN TEMPERATURE**

Increasing the temperature can cause burns
SO_2 given off in the reaction can be a trigger for asthma
HCl is corrosive

MAIN MENU

Back to start of section

CORE PRACTICALS

RATE OF REACTION – **CHANGE IN TEMPERATURE**

What is the best practical method to determine the rate of this reaction and why?

MAIN MENU

Back to start of section

CORE PRACTICALS

RATE OF REACTION – **CHANGE IN TEMPERATURE**

Disappearing cross method - The cross disappears quicker as the rate of reaction increases

CORE PRACTICALS
RATE OF REACTION – **CHANGE IN TEMPERATURE**

What happens to the time taken for the reaction to occur as the temperature increases?

ANSWER

CORE PRACTICALS

RATE OF REACTION – **CHANGE IN TEMPERATURE**

The time taken decreased as the temperature increases

CORE PRACTICALS

RATE OF REACTION – **CHANGE IN TEMPERATURE**

How do you explain this change in terms of the energy of the particles and collisions?

MAIN MENU

Back to start of section

CORE PRACTICALS
RATE OF REACTION – **CHANGE IN TEMPERATURE**

- When the temperature is **increased** the particles have **more energy**, move **quicker**, and there are **more frequent collisions**
- **Higher** temperatures also increase the energy of the collisions, since the particles are moving faster. Reactions only happen if the particles collide with enough **energy**.
- At higher temperatures there are more **successful** collisions (more particles will collide with enough energy to react).
- Increasing the temperature **increases** the rate of reaction

EARTH AND FUELS

Topic 9
Q: What is combustion?

ANSWER

A: A reaction between oxygen and a fuel that releases energy.

MAIN MENU

Back to start of section

Topic 9

Q: Which pollutant gases are produced during the combustion of fossil fuels?

MAIN MENU

Back to start of section

ANSWER

A:

- carbon particulates
- carbon dioxide
- carbon monoxide
- sulphur dioxide
- nitrogen oxides
- water

MAIN MENU

Back to start of section

Topic 9

Q: What are the environmental effects of particulates, carbon dioxide, carbon monoxide, nitrogen oxides and sulphur?

MAIN MENU

Back to start of section

ANSWER

A:

Carbon particulates - global dimming (particulates travel into the atmosphere and reflect light back into space),

CO_2 - global warming,

CO – poisonous; leads to suffocation,

SO_2 – acid rain/asthma,

NO_x - acid rain.

MAIN MENU

Back to start of section

Topic 9

Q: Why are particulates and carbon monoxide produced when petrol burns in a car engine?

ANSWER

A: Sometimes insufficient oxygen is available which means incomplete combustion occurs inside the engine.

Topic 9

Q: Why are nitrogen oxides produced during the combustion of petrol?

MAIN MENU

Back to start of section

ANSWER

A: Nitrogen and oxygen from the air react inside the combustion engine due to the very high temperatures inside the engine.

Topic 9

Q: How are carbon dioxide and sulphur dioxide produced when fossil fuels burn?

MAIN MENU

Back to start of section

ANSWER

A:Carbon dioxide is produced from complete combustion of hydrocarbons.
Some fossil fuels contain sulphur.
This reacts with oxygen during combustion to form sulphur dioxide.

Topic 9

Q: What is crude oil?

MAIN MENU

Back to start of section

ANSWER

A: A mixture of different hydrocarbons.

Topic 9

Q: What is a hydrocarbon?

ANSWER

A: A compound made of hydrogen and carbon **ONLY**.

MAIN MENU

Back to start of section

Topic 9

Q:Describe how the different hydrocarbons in crude oil are separated.

MAIN MENU

Back to start of section

ANSWER

A: FRACTIONAL DISTILLATION - Different fractions have different boiling points.

Crude oil is heated; some of the hydrocarbons turn into vapour while others remain a liquid. The liquid flows to the bottom of the fractionating tower, the vapours rise up the tower. The temp decreases as you rise up the tower; as they cool they condense and are piped off.

Topic 9

Q: What is a fraction?

MAIN MENU

Back to start of section

ANSWER

A: A mixture of hydrocarbons with similar chain length and boiling points.

MAIN MENU

Back to start of section

Topic 9

Q: What are the products of fractional distillation of crude oil?

MAIN MENU

Back to start of section

ANSWER

A:Refinery gases, petrol, kerosene, diesel oil, fuel oil, bitumen

MAIN MENU

Back to start of section

Topic 9

Q: What are the products of fractional distillation of crude oil used for?

ANSWER

A: Refinery gases for camping gas,
petrol as car fuel,
kerosene as aircraft fuel,
diesel oil as lorry fuel,
fuel oil to heat houses,
bitumen for road surfacing.

Topic 9

Q: What are alkanes?

MAIN MENU

Back to start of section

ANSWER

A: Saturated hydrocarbons with the general formula C_nH_{2n+2}.

Topic 9

Q: Name the first 5 alkanes and give their formula.

ANSWER

A: Methane CH_4,

Ethane C_2H_6,

Propane C_3H_8,

Butane C_4H_{10},

Pentane C_5H_{12}

Topic 9

Q: What is a homologous series?

MAIN MENU

Back to start of section

ANSWER

A: A family of organic compounds with the same functional group and general formula; each member of the series differs by a CH_2 group.

The compounds have similar chemical reactions and similar trends in their physical properties.

Topic 9

Q: What are alkenes?

MAIN MENU

Back to start of section

ANSWER

A: Unsaturated hydrocarbons with the general formula C_nH_{2n}.

MAIN MENU

Back to start of section

Topic 9

Q: What is the difference between saturated and unsaturated hydrocarbons?

ANSWER

A: Saturated hydrocarbons have **only** C-C **single bonds**.

Unsaturated hydrocarbons have a **carbon to carbon double bond** (C=C) as well as C-C single bonds.

MAIN MENU

Back to start of section

Topic 9

Q: What are the similarities between alkanes and alkenes?

MAIN MENU

Back to start of section

ANSWER

A: Both are hydrocarbons

Topic 9

Q: What are the differences between alkanes and alkenes?

MAIN MENU

Back to start of section

ANSWER

A:Alkanes are saturated and do not decolourise bromine water. Alkenes are unsaturated and decolourise bromine water. Alkanes have 2 extra hydrogen atoms than an alkene with the same number of carbon atoms.

Topic 9

Q: Name the first 4 alkenes and give their formula.

ANSWER

A: Ethene C_2H_4,
Propene C_3H_6,
Butene C_4H_8,
Pentene C_5H_{10}.

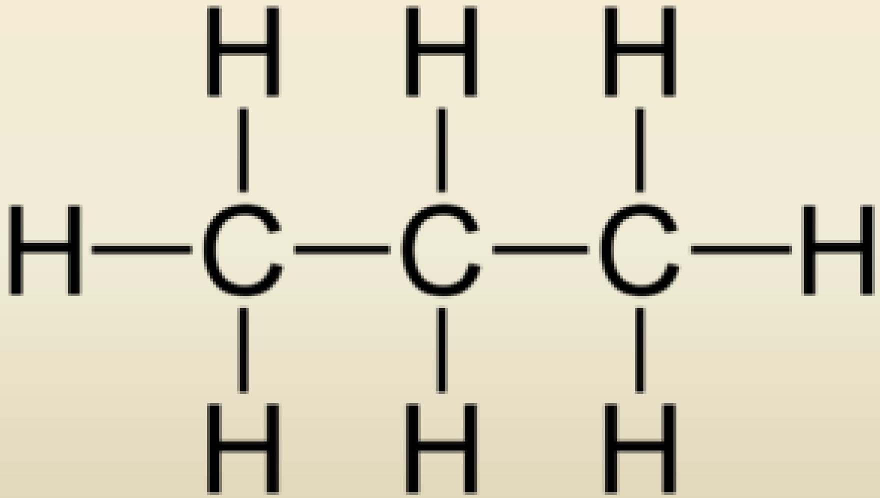
Topic 9

Q: What is a displayed formula?

ANSWER

A: The drawn out formula that shows each atom and each bond present in a molecule

Eg



MAIN MENU

Back to start of section

Topic 9

Q: State and explain the trend in boiling point,
viscosity
and volatility of alkanes.

MAIN MENU

Back to start of section

ANSWER

A: As the number of carbon atoms increases, boiling points and viscosity increase and volatility decreases.

This is because there are more intermolecular forces between the molecules which makes it harder to separate them.

Topic 9

Q: What is cracking?

MAIN MENU

Back to start of section

ANSWER

A: The breaking down (thermal decomposition) of long alkanes into shorter, more useful, alkanes and alkenes.

Topic 9

Q: Why are long hydrocarbons cracked?

A: There is a high demand for short chain alkanes but a low supply. There is a high supply but low demand of long chain hydrocarbons. Cracking ensures that there is a good supply of short chain alkanes.

Topic 9

Q: What are the conditions for catalytic cracking?

ANSWER

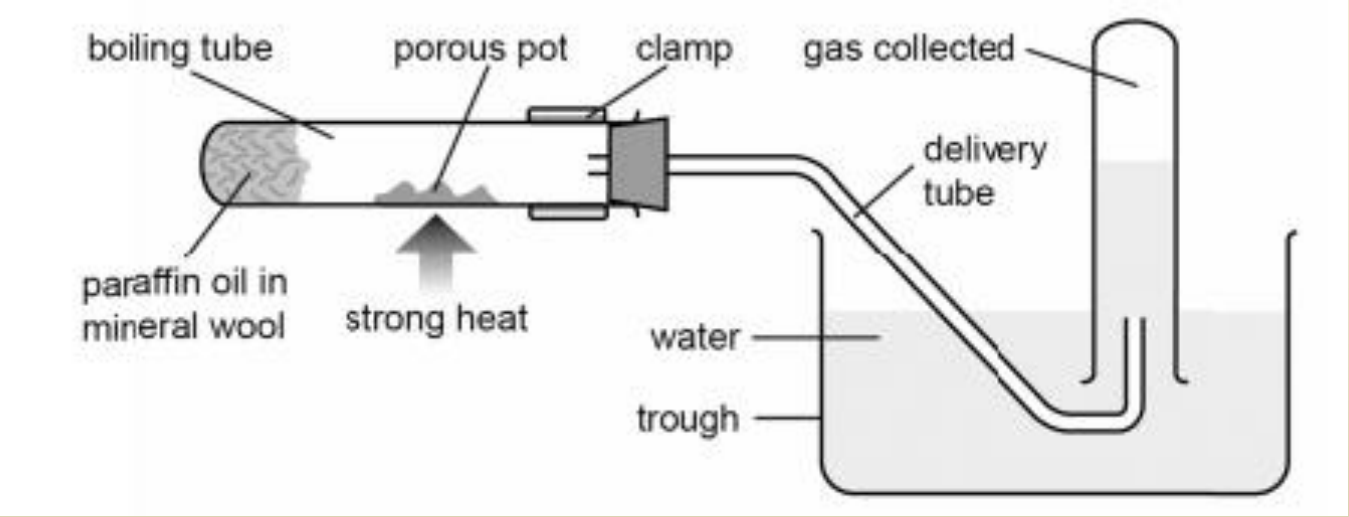
A: High temperatures and a catalyst of broken porous pot or aluminium oxide.

Topic 9

Q: How is cracking carried out in the lab?

ANSWER

A: Alkane vapours are passed over a hot catalyst made of broken porous pot or aluminium oxide. The vapours can also be mixed with steam at very high temperatures.



MAIN MENU

Back to start of section

Topic 9

Q: What is a monomer?

MAIN MENU

Back to start of section

A: Small molecules (often alkenes) that can join together to form polymer molecules.

Topic 9

Q: What is a polymer?

MAIN MENU

Back to start of section

ANSWER

A: A large molecule, with a high average relative molecular mass, made from lots of small molecules called monomers

Topic 9

Q: Why don’t scientists know for sure how life began?

ANSWER

A: No one was around when the first organisms formed.

MAIN MENU

Back to start of section

Topic 9

Q: What causes carbon dioxide to be removed from the atmosphere?

MAIN MENU

Back to start of section

A: photosynthesis,
formation of carbonate rocks and marine shells,
CO_2 dissolving in the oceans,
locked up in fossil fuels.

Topic 9

Q: What causes carbon dioxide to be released into the atmosphere?

MAIN MENU

Back to start of section

ANSWER

A: Respiration,
combustion of fossil fuels,
warming of oceans releases dissolved carbon dioxide.

Topic 9

Q: What is the composition of the atmosphere?

ANSWER

A: 78% Nitrogen,
21% oxygen,
0.035% carbon dioxide,
<1% other gases

Topic 9

Q: What is causing the amount of carbon dioxide in the atmosphere to increase?

MAIN MENU

Back to start of section

ANSWER

A: Increased burning of fossil fuels, deforestation

MAIN MENU

Back to start of section

Topic 9

Q: The early atmosphere contained mainly carbon dioxide (95%), methane, ammonia and water vapour.

Where did these gases come from?

MAIN MENU

Back to start of section

ANSWER

A: Volcanic activity

MAIN MENU

Back to start of section

Topic 9

Q: How did the oceans form?

MAIN MENU

Back to start of section

ANSWER

A: As the atmosphere cooled, water vapour condensed.

Topic 9

Q: Describe what happened to the gases that made up the early atmosphere (ammonia, methane, carbon dioxide).

MAIN MENU

Back to start of section

ANSWER

A:

- Plants absorbed CO_2 during photosynthesis.
- CO_2 dissolved in the oceans.
- Plants released O_2 which reacted with the methane to form more CO_2 and H_2O.
- O_2 also reacted with ammonia to form N_2 and H_2O.