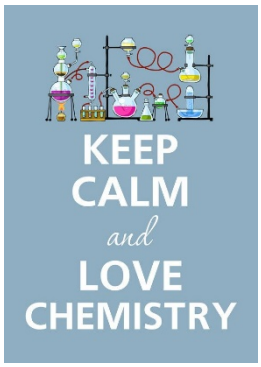


Transition Pack for A Level Chemistry

Are thinking of studying Chemistry?

This pack contains a programme of activities and resources to prepare you to start A level in Chemistry in September. It's aim is to give you a head start on some of the topics covered at A Level in the first year.

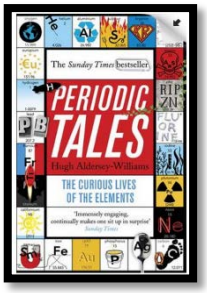
Complete the research tasks in Part A then continue with the new learning in Part B. There are answers to the tasks at the end of the booklet so you can check your learning as you complete a task. Do what you can. Remember this is A level standard.

There are also a few book and movie recommendations you may find interesting.

Book Recommendations

These are some interesting books on Science and Chemistry. They are not course texts and there is no expectation you must buy them however, if you are interested in A level Chemistry you may be interested in their content.

Periodic Tales: The Curious Lives of the Elements (Paperback) Hugh Aldersey-Williams

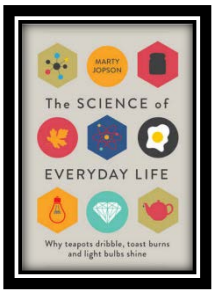


ISBN-10: 0141041455

http://bit.ly/pixlchembook1

This book covers the chemical elements, where they come from and how they are used. There are loads of fascinating insights into uses for chemicals you would have never even thought about.

The Science of Everyday Life: Why Teapots Dribble, Toast Burns and Light Bulbs Shine (Hardback) Marty Jopson

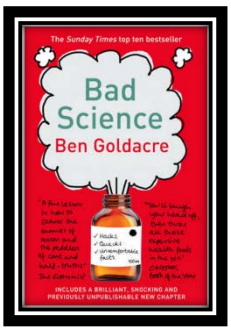


ISBN-10: 1782434186

http://bit.ly/pixlchembook2

The title says it all really, lots of interesting stuff about the things around you home!

Bad Science (Paperback) Ben Goldacre



ISBN-10: 000728487X

http://bit.ly/pixlchembook3

Here Ben Goldacre takes apart anyone who published bad / misleading or dodgy science – this book will make you think about everything the advertising industry tries to sell you by making it sound 'sciency'.

Salters' Advanced Chemistry: Chemical Storylines

Do not feel you need to buy the latest edition (unless you are doing Salters chemistry!) You can pick up an old edition for a few pounds on ebay, gives you a real insight into how chemistry is used to solve everyday problems from global pollution through feeding to world to making new medicines to treat disease.

Ted Talk recommendations

As close as you can get to Chemistry magic!

https://www.ted.com/talks/john_thomas_as_close_as_you_can_get_to_chemistry_magic

Armed with the chemical understanding of fireworks, smoke machines and other exciting reactions, Dr Thomas showcases some fascinating and explosive reactions, whilst teaching a thing or two about the chemistry going on! So, enjoy this educational and entertaining chemistry show!

The incredible Chemistry powering your smartphone

https://www.ted.com/talks/cathy_mulzer_the_incredible_chemistry_powering_your_smartphone

Ever wondered how your smartphone works? Take a journey down to the atomic level with scientist Cathy Mulzer, who reveals how almost every component of our high-powered devices exists thanks to chemists

Could a breathalyser detect cancer?

https://www.ted.com/talks/julian_burschka_could_a_breathalyzer_detect_cancer#t-257602

How is it that a breathalyzer can measure the alcohol content in someone's blood, hours after they had their last drink, based on their breath alone? And could we use this same technology to detect disease by analyzing a person's breath, without having to use more invasive diagnostic tools like biopsies, blood draws, and radiation?

Print your own medicine.

https://www.ted.com/talks/lee_cronin_print_your_own_medicine

Chemist Lee Cronin is working on a 3D printer that, instead of objects, is able to print molecules. An exciting potential long-term application: printing your own medicine using chemical inks.

Video Recommendations

10 weird and wonderful chemical reactions

10 good demonstration reactions, can you work out the chemistry of …. any… of them?

https://www.youtube.com/watch?v=0Bt6RPP2ANI

Rough science – the Open University – 34 episodes available (six series)

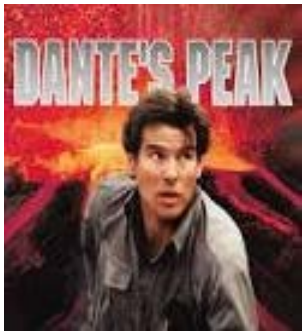
Real scientists are 'stranded' on an island and are given scientific problems to solve using only what they can find on the island. Great fun if you like to see how science is used in solving problems.

https://www.dailymotion.com/video/xxw6pr?playlist=x2igjq

A thread of quicksilver – The Open University

A brilliant history of the most mysterious of elements – mercury. This program shows you how a single substance led to empires and war, as well as showing you come of the cooler properties of mercury.

https://www.youtube.com/watch?v=t46lvTxHHTA



Dantes Peak 1997: Volcano disaster movie.

Use the link to look at the Science of acids and how this links to the movie.

http://www.open.edu/openlearn/science-maths-technology/science/chemistry/dantes-peak

Movies are my passion, while chemistry will be my profession, so I thought why not "combine" the two. My web project shows the diversity of chemistry portrayed on the 'silverscreen' and the 'small screen'

Chris Magee, School of Chemistry, University of Bristol

Use the link below for explanations of the chemical concepts in these movies.

http://www.chm.bris.ac.uk/webprojects2006/Macgee/Web%20Project/home_page.htm

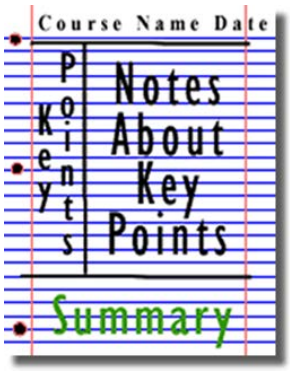
Part A-Research Activities

How to make notes from research

Research, reading and note making are essential skills for A level Chemistry study. For the following task you are going to produce 'Cornell Notes' to summarise your reading.

You can find out how to make Cornell Notes here
http://coe.jmu.edu/learningtoolbox/cornellnotes.html

You can see an example of Cornell Notes here
http://coe.jmu.edu/learningtoolbox/cornellnotes1.html



Task 1: The chemistry of fireworks

What are the component parts of fireworks? What chemical compounds cause fireworks to explode? What chemical compounds are responsible for the colour of fireworks?

Task 2: Why is copper sulfate blue?

Copper compounds like many of the transition metal compounds have got vivid and distinctive colours – but why?

Task 3: Aspirin

What was the history of the discovery of aspirin, how do we manufacture aspirin in a modern chemical process?

Task 4: The hole in the ozone layer

Why did we get a hole in the ozone layer? What chemicals were responsible for it? Why were we producing so many of these chemicals? What is the chemistry behind the ozone destruction?

Task 5: ITO and the future of touch screen devices

ITO – indium tin oxide is the main component of touch screen in phones and tablets. The element indium is a rare element and we are rapidly running out of it. Chemists are desperately trying to find a more readily available replacement for it. What advances have chemists made in finding a replacement for it?

Part B - Knowledge Activities

How to make notes from research

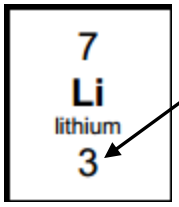
Research, reading and note making are essential skills for A level Chemistry study. For the following task you are going to produce 'Cornell Notes' to summarise your reading.

Chemistry topic 1 – Electronic structure, how electrons are arranged around the nucleus

A periodic table can give you the proton / atomic number of an element, this also tells you how many electrons are in the ***atom***.

You will have used the rule of electrons shell filling, where:

The first shell holds up to 2 electrons, the second up to 8, the third up to 8 and the fourth up to 18 (or you may have been told 8).



Atomic number =3, electrons = 3, arrangement 2 in the first shell and 1 in the second or Li = 2,1

At **A level** you will learn that the electron structure is more complex than this, and can be used to explain a lot of the chemical properties of elements.

The 'shells' can be broken down into 'orbitals', which are given letters:'s' orbitals, 'p' orbitals , 'd' orbitals and 'f' orbitals.

You can find out about orbitals here:

http://bit.ly/pixlchem1

https://www.youtube.com/watch?v=oH0tpyrIcSY

Note The answer to the final question is wrong. See the comments for the correction.

Now that you are familiar with s, p and d orbitals try these problems, write your answer in the format:$1s^2$, $2s^2$, $2p^6$ etc.

Q1.1 Write out the electron configuration of:

a) Ca b) Al c) S d) Cl e) Ar f) Fe g) V h) Ni i) Cu j) Zn k) As

Q1.2 Extension question - Write out the electron arrangement of the following ***ion.*** : Remember to write out the configuration then remove or add electrons according to the charge on the ion.

a) K^+ b) O^{2-} c) Zn^{2+} d) V^{5+} e) Co^{2+}

Golden rules

- the 4s fills and empties before the 3d
- chromium and copper are exceptions and promote an electron from the 4s to the 3d

Chemistry topic 2 – Isotopes and mass

You will remember that an isotopes are elements that have differing numbers of neutrons. Hydrogen has 3 isotopes; H_1^1 H_1^2 H_1^3

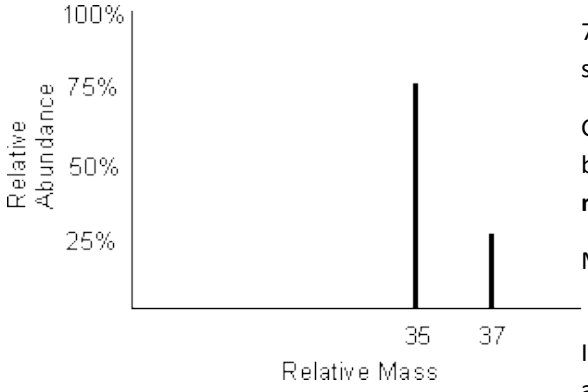
Isotopes occur naturally, so in a sample of an element you will have a mixture of these isotopes. We can accurately measure the amount of an isotope using a **mass spectrometer**. You will need to understand what a mass spectrometer is and how it works at A level. You can read about a mass spectrometer here:

https://filestore.aqa.org.uk/resources/chemistry/AQA-7404-7405-SG-TOFMS.PDF

Q2.1 What must happen to the atoms before they are accelerated in the mass spectrometer?

Q2.2 Explain why the different isotopes travel at different speeds in a mass spectrometer.

A mass spectrum for the element chlorine will give a spectrum like this:



75% of the sample consist of chlorine-35, and 25% of the sample is chlorine-37.

Given a sample of naturally occurring chlorine ¾ of it will be Cl-35 and ¼ of it is Cl-37. We can calculate what the **mean** mass of the sample will be:

Mean mass = $\frac{75}{100} \times 35) + (\frac{25}{100} \times 37)$ = 35.5

If you look at a periodic table this is why chlorine has an atomic mass of 35.5.

An A level periodic table has the masses of elements recorded much more accurately than at GCSE. Most elements have isotopes and these have been recorded using mass spectrometers.

GCSE

11 **B** boron 5	12 **C** carbon 6	14 **N** nitrogen 7	16 **O** oxygen 8	19 **F** fluorine 9
27 **Al** aluminium 13	28 **Si** silicon 14	31 **P** phosphorus 15	32 **S** sulfur 16	35.5 **Cl** chlorine 17

A level

10.8 **B** 5 boron	12.0 **C** 6 carbon	14.0 **N** 7 nitrogen	16.0 **O** 8 oxygen	19.0 **F** 9 fluorine
27.0 **Al** 13 aluminium	28.1 **Si** 14 silicon	31.0 **P** 15 phosphorus	32.1 **S** 16 sulphur	35.5 **Cl** 17 chlorine

Given the percentage of each isotope you can calculate the mean mass which is the accurate atomic mass for that element.

Q2.3 Use the percentages of each isotope to calculate the accurate atomic mass of the following elements.

a) Antimony has 2 isotopes: Sb-121 57.25% and Sb-123 42.75%
b) Gallium has 2 isotopes: Ga-69 60.2% and Ga-71 39.8%
c) Silver has 2 isotopes: Ag-107 51.35% and Ag-109 48.65%
d) Thallium has 2 isotopes: Tl-203 29.5% and Tl-205 70.5%
e) Strontium has **4** isotopes: Sr-84 0.56%, Sr-86 9.86%, Sr-87 7.02% and Sr-88 82.56%

Chemistry topic 3 – Chemical equations

Balancing chemical equations is the stepping stone to using equations to calculate masses in chemistry.

There are loads of websites that give ways of balancing equations and lots of exercises in balancing.

Some of the equations to balance may involve strange chemical, don't worry about that, the key idea is to get balancing right.

http://bit.ly/pixlchem7

http://www.chemteam.info/Equations/Balance-Equation.html

This website has a download; it is safe to do so:

http://bit.ly/pixlchem8

https://phet.colorado.edu/en/simulation/balancing-chemical-equations

Q3.1 Balance the following equations

a. $H_2 + 0_2 \rightarrow H_20$

b. $S_8 + 02 \rightarrow SO_3$

c. $HgO \rightarrow Hg + 0_2$

d. $Zn + HCl \rightarrow ZnCl_2 + H_2$

e. $Na + H_20 \rightarrow NaOH + H_2$

f. $C_{10}H_{16} + Cl_2 \rightarrow C + HCl$

g. $Fe + 0_2 \rightarrow Fe_20_3$

h. $C_6H_{12}O_6 + 0_2 \rightarrow C0_2 + H_20$

i. $Fe_20_3 + H_2 \rightarrow Fe + H_20$

j. $Al + FeO \rightarrow Al_2O_3 + Fe$

Chemistry topic 4 – Measuring chemicals – the mole

From this point on you need to be using an A level periodic table, not a GCSE one you can view one here:

http://bit.ly/pixlpertab

https://secondaryscience4all.files.wordpress.com/2014/08/filestore_aqa_org_uk_subjects_aqa-2420-w-trb-ptds_pdf.png

Now that we have our chemical equations balanced, we need to be able to use them in order to work out masses of chemicals we need or we can produce.

The ***mole*** is the chemists equivalent of a dozen, atoms are so small that we cannot count them out individually, we weigh out chemicals.

For example: magnesium + sulfur → magnesium sulfide

Mg + S → MgS

We can see that one atom of magnesium will react with one atom of sulfur, if we had to weigh out the atoms we need to know how heavy each atom is.

From the periodic table: Mg = 24.3 and S = 32.1

If I weigh out exactly 24.3g of magnesium this will be 1 mole of magnesium, if we counted how many atoms were present in this mass it would be a huge number (6.02×10^{23}!!!!), if I weigh out 32.1g of sulfur then I would have 1 mole of sulfur atoms.

So 24.3g of Mg will react precisely with 32.1g of sulfur, and will make 56.4g of magnesium sulfide.

Here is a comprehensive page on measuring moles, there are a number of descriptions, videos and practice problems.

You will find the first 6 tutorials of most use here, and problem sets 1 to 3.

http://bit.ly/pixlchem9

http://www.chemteam.info/Mole/Mole.html

Q4.1 Answer the following questions on moles.

a) How many moles of phosphorus pentoxide (P_4O_{10}) are in 85.2g?
b) How many moles of potassium in 73.56g of potassium chlorate (V) ($KClO_3$)?
c) How many moles of water are in 249.6g of hydrated copper sulfate(VI) ($CuSO_4.5H_2O$)? For this one, you need to be aware the dot followed by $5H_2O$ means that the molecule comes with 5 water molecules so these have to be counted in as part of the molecules mass.
d) What is the mass of 0.125 moles of tin sulfate ($SnSO_4$)?
e) If I have 2.4g of magnesium, how many g of oxygen(O_2) will I need to react completely with the magnesium? $2Mg + O_2 \rightarrow MgO$

Chemistry topic 5 – Solutions and concentrations

In chemistry a lot of the reactions we carry out involve mixing solutions rather than solids, gases or liquids.

You will have used bottles of acids in science that have labels saying 'Hydrochloric acid 1M', this is a solution of hydrochloric acid where 1 mole of HCl, hydrogen chloride (a gas) has been dissolved in 1dm^3 of water.

The dm^3 is a cubic decimetre, it is actually 1 litre, but from this point on as an A level chemist you will use the dm^3 as your volume measurement.

http://bit.ly/pixlchem10

http://www.docbrown.info/page04/4_73calcs11msc.htm

Q5.1

a) What is the concentration (in mol dm^{-3}) of 9.53g of magnesium chloride ($MgCl_2$) dissolved in 100cm^3 of water?
b) What is the concentration (in mol dm^{-3}) of 13.248g of lead nitrate ($Pb(NO_3)_2$) dissolved in 2dm^3 of water?
c) If I add 100cm^3 of 1.00 mol dm^3 HCl to 1.9dm^3 of water, what is the molarity of the new solution?
d) What mass of silver is present in 100cm^3 of 1moldm^{-3} silver nitrate ($AgNO_3$)?
e) The Dead Sea, between Jordan and Israel, contains 0.0526 moldm^{-3} of Bromide ions (Br^-), what mass of bromine is in 1dm^3 of Dead Sea water?

Chemistry topic 6 – Titrations

One key skill in A level chemistry is the ability to carry out accurate titrations. You may have carried out a titration at GCSE but if not don't worry, you will get plenty of practice and support with both the practical and the theory. At A level you will have to carry out titrations very precisely **and** be able to describe in detail how to carry out a titration - there will be questions on the exam paper about how to carry out practical procedures.

You can use the following resources to learn about how to carry out a titration and how to work out the concentration of the unknown.

https://www.youtube.com/watch?v=rLc148UCT2w

https://www.youtube.com/watch?v=c3Ehqt-uW0U

https://www.bbc.co.uk/bitesize/guides/z49tng8/revision/1

https://filestore.aqa.org.uk/resources/chemistry/AQA-7404-7405-P1.PDF

https://www.youtube.com/watch?v=ovx-Sro4NXM

http://alevelchem.com/aqa_a_level_chemistry/unit3.3/331/titration.htm

Remember for any titration calculation you need to have a balanced symbol equation; this will tell you the ratio in which the chemicals react.

E.g. a titration of an unknown sample of sulfuric acid with sodium hydroxide.

A 25.00cm^3 sample of the unknown sulfuric acid was titrated with 0.100$moldm^{-3}$ sodium hydroxide and required exactly 27.40cm^3 for neutralisation. What is the concentration of the sulfuric acid?

Step 1: the equation $2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$

Step 2; the ratios 2 : 1

Step 3: how many moles of sodium hydroxide $27.40cm^3 = 0.0274dm^3$

number of moles = c x v = 0.100 x 0.0274 = 0.00274 moles

step 4: Using the ratio, how many moles of sulfuric acid

for every 2 NaOH there are 1 H_2SO_4 so, we must have 0.00274/2 =0.00137 moles of H_2SO_4

Step 5: Calculate concentration. concentration = moles/volume ←in dm^3 = 0.00137/0.025 = ***0.0548 moldm^{-3}***

Here are some additional problems, which are harder, ignore the questions about colour changes of indicators.

http://bit.ly/pixlchem12

http://www.docbrown.info/page06/Mtestsnotes/ExtraVolCalcs1.htm

Use the steps on the last page to help you

Q6.1 A solution of barium nitrate will react with a solution of sodium sulfate to produce a precipitate of barium sulfate.

$Ba(NO_3)_2(aq) + Na_2SO_4(aq) \rightarrow BaSO_4(s) + 2NaNO_3(aq)$

What volume of 0.25$moldm^{-3}$sodium sulfate solution would be needed to precipitate all of the barium from 12.5cm^3 of 0.15 $moldm^{-3}$ barium nitrate?

Chemistry topic 7 – Organic chemistry – functional groups

At GCSE you would have come across **hydrocarbons** such as alkanes (ethane etc) and alkenes (ethene etc). You may have come across molecules such as alcohols and carboxylic acids. At A level you will learn about a wide range of molecules that have had atoms added to the carbon chain. These are called functional groups, they give the molecule certain physical and chemical properties that can make them incredibly useful to us.

Here you are going to meet a selection of the functional groups, learn a little about their properties and how we give them logical names.

You will find a menu for organic compounds here:

http://bit.ly/pixlchem13

And how to name organic compounds here:

http://bit.ly/pixlchem14

http://www.chemguide.co.uk/basicorg/conventions/names.html#top

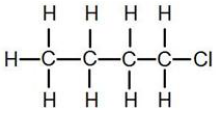
https://www.youtube.com/watch?v=6mEO-3ogOA0

https://www.youtube.com/watch?v=UqRfBoudZqs

Using these links see if you can answer the following questions:

Q7.1 Halogenoalkanes

What is the name of this halogenoalkane?



How could you make it from butan-1-ol?

Q7.2 Alcohols

How could you make ethanol from ethene?

How does ethanol react with sodium, in what ways is this a) similar to the reaction with water, b) different to the reaction with water?

Q7.3 Aldehydes and ketones

Draw the structures of a) propanal b) propanone

How are these two functional groups different?

Chemistry topic 8 – Acids, bases, pH

At GCSE you will know that an acid can dissolve in water to produce H^+ ions, at A level you will need a greater understanding of what an acid or a base is.

Read the following page and answer the questions

http://bit.ly/pixlchem15

Q8.1 What is your new definition of what an acid is?

Q8.2 How does ammonia (NH_3) act as a base?

http://bit.ly/pixlchem16

Q8.3 Ethanoic acid (vinegar) is a weak acid, what does this mean?

Q8.4 What is the pH of a solution of 0.01 $moldm^{-3}$ of the strong acid, hydrochloric acid?

Chemistry topic 9 – Oxidation and reduction

At GCSE you know that oxidation is adding oxygen to an atom or molecule and that reduction is removing oxygen, or that oxidation is removing hydrogen and reduction is adding hydrogen. You may have also learned that oxidation is removing electrons and reduction is adding electrons.

At A level we use the idea of ***oxidation number*** a lot!

You know that the metals in group 1 react to form ions that are +1, i.e. Na^+ and that group 7, the halogens, form -1 ions, i.e. Br -.

We say that sodium, when it has reacted has an oxidation number of +1 and that bromide has an oxidation number of -1.

All atoms that are involved in a reaction can be given an oxidation number.

An element, Na or O_2 is always given an oxidation state of zero (0), any element that has reacted has an oxidation state of + or -.

As removing electrons is **reduction**, if, in a reaction the element becomes **more** negative it has been reduced, if it becomes more positive it has been oxidised.

You can read about the rules for assigning oxidation numbers here:

http://www.dummies.com/how-to/content/rules-for-assigning-oxidation-numbers-to-elements.html

Elements that you expect to have a specific oxidation state actually have different states, so for example you would expect chlorine to be -1, it can have many oxidation states: NaClO, in this compound it has an oxidation state of +1

There are a few simple rules to remember:

Metals have a + oxidation state when they react.

Oxygen is 'king' it always has an oxidation state of -2

Hydrogen has an oxidation state of +1 (except metal hydrides)

The charges in a molecule must cancel.

Examples: Sodium nitrate, $NaNO_3$ sulfate ion, SO_4^{2-}

Na +1 3x O^{2-} $4xO^{2-}$ and 2- charges 'showing'

+1 -6 -8 -2

To cancel: N = +5 S = +6

Q9.1 Work out the oxidation state of the **underlined** atom in the following:

a) $Mg\underline{C}O_3$ b) $\underline{S}O_3$ c) $NaClO_3$ d) $\underline{Mn}O_2$ e) $\underline{Fe}_2O_3$ f) $\underline{V}_2O_5$

g) $K\underline{Mn}O_4$ h) $\underline{Cr}_2O_7^{2-}$ i) $\underline{Cl}_2O_4$

Part B - Knowledge Activities Answers to problems

Q1.1a) $1s^2\ 2s^2\ 2p^6 3s^2 3p^6 4s^2$ b) $1s^2\ 2s^2\ 2p^6 3s^2 3p^1$ c) $1s^2\ 2s^2\ 2p^6 3s^2 3p^4$ d) $1s^2\ 2s^2\ 2p^6 3s^2 3p^5$

e) $1s^2\ 2s^2\ 2p^6 3s^2 3p^6$ f) $1s^2\ 2s^2\ 2p^6 3s^2 3p^6\ 3d^6 4s^2$ g) $1s^2\ 2s^2\ 2p^6 3s^2 3p^6\ 3d^3 4s^2$

h) $1s^2\ 2s^2\ 2p^6 3s^2 3p^6\ 3d^8 4s^2$ i) $1s^2\ 2s^2\ 2p^6 3s^2 3p^6\ 3d^{10}\ 4s^1$ j) $1s^2\ 2s^2\ 2p^6 3s^2 3p^6\ 3d^{10}\ 4s^2$

k) $1s^2\ 2s^2\ 2p^6 3s^2 3p^6\ 4s^2\ 3d^{10}\ 4p^3$

Q1.2a) $1s^2\ 2s^2\ 2p^6 3s^2 3p^6$ b) $1s^2\ 2s^2\ 2p^6 3s^2 3p^6$ c) $1s^2\ 2s^2\ 2p^6 3s^2 3p^6\ 3d^{10}$

d) $1s^2\ 2s^2\ 2p^6 3s^2 3p^6$ e) $1s^2\ 2s^2\ 2p^6 3s^2 3p^6\ 3d^7$

==========

Q2.1 They must be ionised / turned into ions

Q2.2 The ions are all given the same amount of kinetic energy, as KE = ½ mv^2 the lighter ions will have greater speed / heavier ions will have less speed.

Q2.3 a) 121.855 b) 67.796 c) 107.973 d) 204.41 e) 87.710 / 87.7102

==========

Q3a. $2H_2 + 0_2 \rightarrow 2\ H_20$

b. $S_8 + 1202 \rightarrow 8SO_3$

c. $2HgO \rightarrow 2Hg + 0_2$

d. $Zn + 2HCl \rightarrow ZnCl_2 + H_2$

e. $2Na + 2H_20 \rightarrow 2NaOH + H_2$

f. $C_{10}H_{16} + 8Cl_2 \rightarrow 10C + 16HCl$

g. $2Fe + 30_2 \rightarrow 2Fe_2O_3$

h. $C_6H_{12}O_6 + 60_2 \rightarrow 6\ C0_2 + 6\ H_20$

i. $Fe_2O_3 + 3H_2 \rightarrow 2Fe + 3H_20$

j. $2Al + 3\ FeO \rightarrow Al_2O_3 + 3Fe$

==========

Q4.1 a) 85.2/284 = 0.3 moles b) 73.56/122.6 = 0.6 moles c) 249.5/249.5 = 1.0 moles

d) 0.125 x 212.8 = 26.6g e) 2Mg : 2O or 1:1 ratio 2.4g of Mg = 0.1moles so we need 0.1 moles of oxygen (O_2): 0.1 x 32 = 3.2g

==========

Q5.1 a) 9.53g/95.3 = 0.1 moles, in $100cm^3$ or $0.1dm^3$ in $1dm^3$ 0.1moles/$0.1dm^3$ = 1.0 mol dm^{-3}

b) 13.284g/331.2 = 0.04 moles, in $2dm^3$ in $1dm^3$ 0.04moles /$2dm^3$ = 0.02 mol dm^{-3}

c) $100cm^3$ of 0.1 mol dm^{-3} = 0.01 moles added to a total volume of 2 dm^3 = 0.01moles/$2dm^3$ = 0.005 mol dm^{-3}

d) in $1dm^3$ of 1 mol dm^{-3} silver nitrate, 1 mole of Ag = 107.9g in $0.1dm^3$ = 107.9 x 0.1 = 10.79g

e) 0.0526 x 79.7 = 42.0274g

==========

Q6.1

$Ba(NO_3)_2 : Na_2SO_4$

1 : 1 ratio

12.5cm^3 of $Ba(NO_3)_2$ = 0.0125dm^3

0.15 $moldm^{-3}$ x 0.0125dm^3 = 0.001875 moles

same number of moles of sodium sulfate needed, which has a concentration of 0.25 mol dm^{-3}

0.001875 moles / 0.25 mol dm^{-3} = 0.0075 dm^3 or 7.5cm^3

==========

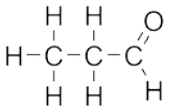
Q7.1 1-chlorobutane

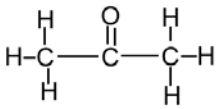
Add butan-1-ol to concentrated HCl and shake

Q7.2 react ethene with hydrogen gas at high temperature and pressure with a nickel catalyst

The reaction is similar in that it releases hydrogen but different as it proceeds much slower than in water

Q7.3 propanal propanone





The carbon atom joined to oxygen in propanal has a hydrogen attached to it, it does not in propanone.

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Q8.1 An acid is a proton donor

Q8.2 Ammonia can accept a proton, to become NH_4^+

Q8.3 ethanoic acid has not fully dissociated, it has not released all of its hydrogen ions into the solution.

$CH_3COOH \leftrightharpoons CH_3COO^- + H^+$
Mostly this Very few of these

Q8.4 pH = -log [0.01] = 2 The pH = 2

==========

Q9.1 a) +4 b) +6 c) +5 d) +4 e) +3 f) +5 g) +7 h) +6 i) +4