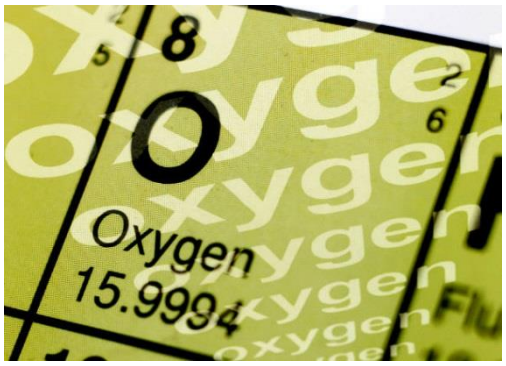
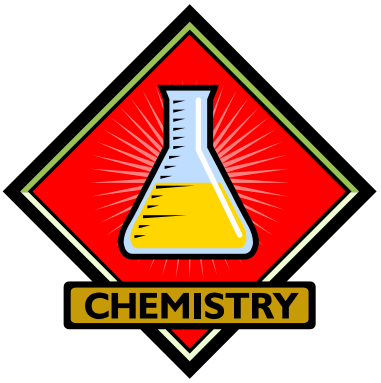
GCSE Chemistry

The extra help sessions that you have been invited to are going to cover the following topics:

1. Atom structure
2. Energy changes





AQA Combined Trilogy Chemistry

1	2											3	4	5	6	7	0
							1 **H** hydrogen 1										4 **He** helium 2
7 **Li** lithium 3	9 **Be** beryllium 4											11 **B** boron 5	12 **C** carbon 6	14 **N** nitrogen 7	16 **O** oxygen 8	19 **F** fluorine 9	20 **Ne** neon 10
23 **Na** sodium 11	24 **Mg** magnesium 12											27 **Al** aluminium 13	28 **Si** silicon 14	31 **P** phosphorus 15	32 **S** sulfur 16	35.5 **Cl** chlorine 17	40 **Ar** argon 18
39 **K** potassium 19	40 **Ca** calcium 20	45 **Sc** scandium 21	48 **Ti** titanium 22	51 **V** vanadium 23	52 **Cr** chromium 24	55 **Mn** manganese 25	56 **Fe** iron 26	59 **Co** cobalt 27	59 **Ni** nickel 28	63.5 **Cu** copper 29	65 **Zn** zinc 30	70 **Ga** gallium 31	73 **Ge** germanium 32	75 **As** arsenic 33	79 **Se** selenium 34	80 **Br** bromine 35	84 **Kr** krypton 36
85 **Rb** rubidium 37	88 **Sr** strontium 38	89 **Y** yttrium 39	91 **Zr** zirconium 40	93 **Nb** niobium 41	96 **Mo** molybdenum 42	[98] **Tc** technetium 43	101 **Ru** ruthenium 44	103 **Rh** rhodium 45	106 **Pd** palladium 46	108 **Ag** silver 47	112 **Cd** cadmium 48	115 **In** indium 49	119 **Sn** tin 50	122 **Sb** antimony 51	128 **Te** tellurium 52	127 **I** iodine 53	131 **Xe** xenon 54
133 **Cs** caesium 55	137 **Ba** barium 56	139 **La*** lanthanum 57	178 **Hf** hafnium 72	181 **Ta** tantalum 73	184 **W** tungsten 74	186 **Re** rhenium 75	190 **Os** osmium 76	192 **Ir** iridium 77	195 **Pt** platinum 78	197 **Au** gold 79	201 **Hg** mercury 80	204 **Tl** thallium 81	207 **Pb** lead 82	209 **Bi** bismuth 83	[209] **Po** polonium 84	[210] **At** astatine 85	[222] **Rn** radon 86
[223] **Fr** francium 87	[226] **Ra** radium 88	[227] **Ac*** actinium 89	[261] **Rf** rutherfordium 104	[262] **Db** dubnium 105	[266] **Sg** seaborgium 106	[264] **Bh** bohrium 107	[277] **Hs** hassium 108	[268] **Mt** meitnerium 109	[271] **Ds** darmstadtium 110	[272] **Rg** roentgenium 111	[285] **Cn** copernicium 112	[286] **Uut** ununtrium 113	[289] **Fl** flerovium 114	[289] **Uup** ununpentium 115	[293] **Lv** livermorium 116	[294] **Uus** ununseptium 117	[294] **Uuo** ununoctium 118

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

* The Lanthanides (atomic numbers 58 – 71) and the Actinides (atomic numbers 90 – 103) have been omitted.

Relative atomic masses for **Cu** and **Cl** have not been rounded to the nearest whole number.

Topic 1: Atomic structure	Taught	Practiced	Mastered
What is an atom, an element, a compound and a mixture?			
Describe and draw the structure of the atom.			
What are protons, neutrons and electrons and what do the numbers on the periodic table mean?			
Can you draw the electron structure of all the elements on the periodic table up to calcium?			
Why are atoms not charged?			
How do atoms become ions? How do we draw an ions?			

Atoms, elements, compounds and mixtures:

Choose from the following words to fill the gaps (there maybe be some extra):

element periodic element two compounds mass radius symbol atoms elements bond iron reactions sulphide chemical separated react atom formula reactions elements chemically unique

Atoms:

All substances are made up of a_____. An a_____ being the smallest part of an e_____ that can exist.

1. Define an element:

Every e_____ is represented by a chemical s_____ and can be found on the p_____ table.

Complete the tables below by finding the right symbol:

Element	Symbol
Sodium	
Chlorine	
Oxygen	
	K
	Si

Compounds:

Compounds are formed when e_____ combine through a chemical _____ and b_____ together. The compound can be represented using a name and f_____.

Compounds can **only** be separated into e_____ by c_____ r_____.

When a mixture of iron and sulphur is heated the iron and sulphur _____ together to produce _____ _____.

Mixtures:

A mixture consists of t____ or more e_____ or c_____ not c_____ combined. The chemical properties of each substance in the mixture are u_____.

Mixtures can be s_____ quite easily by various processes. An example might include separating NaCl (sea salt) from water.

1. Draw and label the apparatus used for separating salt from water:

2. What physical property does distillation rely on to separate the substances

Atoms (more detail):

Choose from the following words to fill the gaps (there maybe be some extra):

small very element 10 000 react protons mass protons

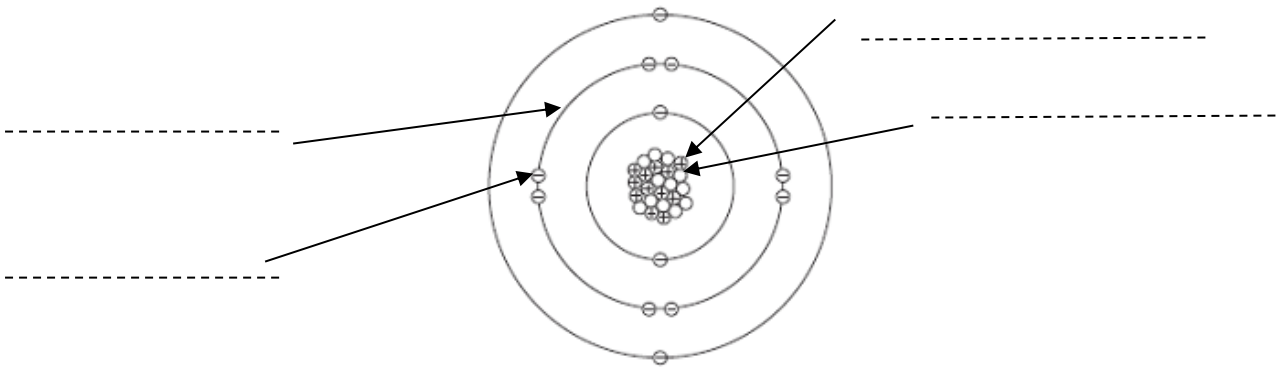
nucleus gain equal charged electrons 0.1 nanometres electrons

lose neutrons shells protons electrons electrons shells

charged ion protons neutrons neutrons protons nucleus energy

Atoms have a small central _____, which is made up of _____ and _____. Around the nucleus there are s_____ which hold the orbiting _____. These s_____ are sometimes called e_____ levels

Atoms are v_____ s_____ and typically have a radius of a about _____. The radius of the n_____ is about _____ times smaller than the atom but it contains almost all of the m_____.



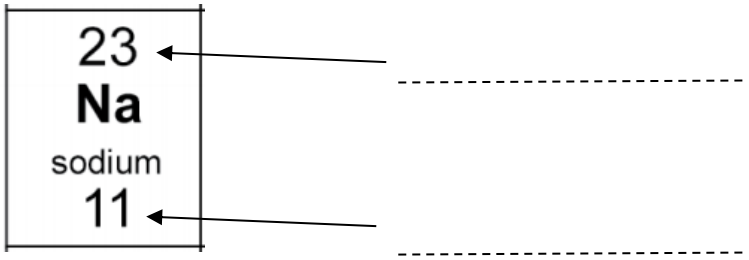
Name of Particle	Relative Mass	Relative Charge

The atomic (proton number) tells us the number of p_____ in an atom which also happens to be the number of e_____.

When some atoms r_____ they l_____ or g_____ e_____. In this case the number of p_____ and e_____ are not e_____ and therefore the atom is now c_____. We call a c_____ atom an i_____.

3. How do you calculate the number of electrons in an ion? Try and work out how many electrons are in Na^+.

The mass number tells us the total number of p_____ and n_____ in that element.



4. How do you calculate the number of neutrons in an atom?

e.g. For Sodium:

Mass number. = 23

Atomic number. = 11

Therefore number of neutrons = 23 - 11 = **12**

Using your Periodic Table complete the following table.

Element	Atomic No.	Mass No.	Protons	Electrons	Neutrons
C	6				6
F			9		
Mg				12	
^{35}Cl		35			
Ca					20
^{238}U		238			
$^{7}Li^{+}$					
$^{16}O^{2-}$					

Isotopes are atoms of the same _____ which have the same number of _____ but different number of _____.

Electron Configuration:

The electrons orbit the nucleus. The electrons are arranged in shells that represent energy levels.

1st Shell: Max 2 electrons

2nd Shell: Max 8 electrons

3rd Shell: Max 8 electrons

4th Shell: The remainder if any

e.g. Sodium - 11 Electrons (check your periodic table)

Therefore: 1st Shell: 2

2nd Shell: 8

3rd Shell: 1

Overall: **2, 8, 1**

Workout the electron configurations for the following elements:

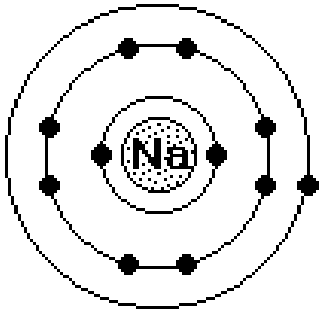
i) Carbon

ii) Magnesium

iii) Potassium

Electron Configurations can also be drawn:

e.g. Sodium



Draw electron configurations for the following:

i) Oxygen

ii) Chlorine

iii) Calcium

a) What is the relationship between the **group** number and the number of **outer electrons**?

5. Can you draw the structure of a sodium ion?

6. Why are <u>atoms</u> themselves not charged?

Past paper questions

Q1. Magnesium burns in oxygen.

(a) Use the Chemistry Data Sheet to help you to answer this question.

The word equation for magnesium burning is:

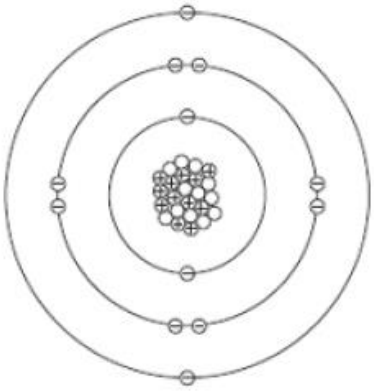
magnesium + oxygen ⟶ magnesium oxide

Draw **one** line from each substance to its correct description.

Substance	Description
magnesium	compound
magnesium oxide	metal
oxygen	mixture
	non-metal

(3)

(b) The diagram represents a magnesium atom.



Complete the table to show the name of each particle and the charge of each particle in the magnesium atom.

Name of particle	Charge
proton	+1
neutron	.....
.....	−1

(2)

(c) Use the Chemistry Data Sheet to help you to answer these questions.

Draw a ring around the correct answer to complete each sentence.

(i)

In a magnesium atom, the protons and neutrons are in the

core.

nucleus.

shell.

(1)

(ii)

The number of protons in a magnesium atom is the

atomic number

mass number.

group number.

(1)

(iii)

The sum of the protons and neutrons in a magnesium atom is the

atomic number.

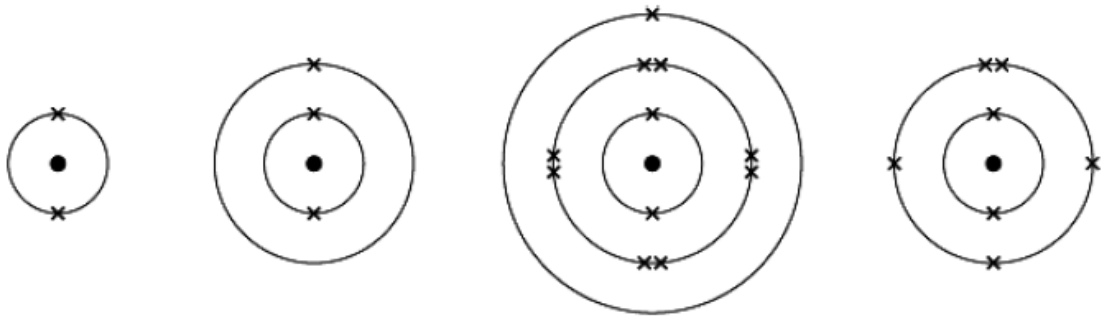
mass number.

group number.

(1)

(Total 8 marks)

Q2. The diagrams show the electronic structure of four different atoms.



Atom A **Atom B** **Atom C** **Atom D**

(a) Name the two sub-atomic particles in the nucleus of an atom.

.....

(1)

(b) Why is there no overall electrical charge on each atom?

.....

.....

(1)

(c) Why is **Atom A** unreactive?

.....

(1)

(d) Which **two** of these atoms have similar chemical properties?
Give a reason for your answer.

.....

.....

.....

(2)
(Total 5 marks)

3. The structure in **Figure 2** represents a beryllium atom.

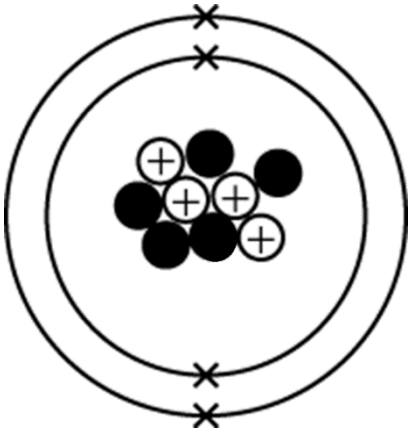


Figure 2

The atom contains three types of sub-atomic particles – protons, neutrons, and electrons.

Describe the structure of the beryllium atom.

You should include the number of each type of particle and where it is found in the atom.

.....

.....

.....

.....

..... (*5 marks*)