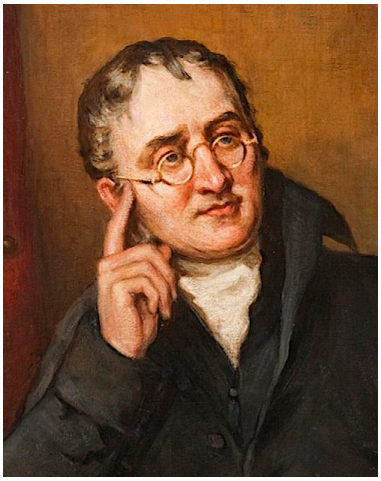
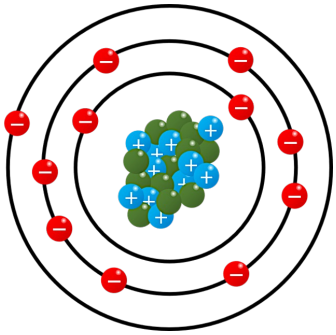
Inside an atom



John Dalton came from a Cumbrian Quaker family. He was a great thinker, philosopher and chemist, and in his time suggested theories for meteorology, colour blindness and gas laws. His most influential work was on atomic theory. In fact, he wanted to prove that elements were made from these unobservable particles. He proposed that these particles combined in ratios with the particles of other elements. Through his experiments with gas, he had reasoned that matter did not divide equally but combined in different atomic weights by ratio, meaning that there had to be particles unobservable to the eye through a microscope that were the building blocks of all matter.

The structure of an atom

An atom is comprised of a nucleus in the centre that has positively charged protons and neutral neutrons, and energy levels or shells, of negatively charged electrons circulating around. If you were to make a comparison in scale, imagine that the atom was the size of Manchester Arena; the nucleus in the centre would be the size of a cricket ball.



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 ythium 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* lantharum 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	[227] Ac* radium 89	[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] Nh nihonium 113	[289] Fl flerovium 114	[289] Mc moscovium 114	[293] Lv livermorium 116	[294] Ts tennessine 117	[294] Og oganesson 118

Key

Relative atomic mass
Atomic symbol
Name
Atomic (proton) number

To this date, scientists have discovered 118 different types of atom. That is why there are 118 different elements in the periodic table.

* each element has a unique atomic number

Practice

1. There are three types of particle in an atom. Complete the following sentence.

   There are two particles in the nucleus. The particles in the nucleus of an atom are

   _____

electrons and neutrons
electrons and protons
neutrons and protons

2. Which of the three particles:

   a) Is found outside the nucleus?

   _____

   b) Has a negative charge?

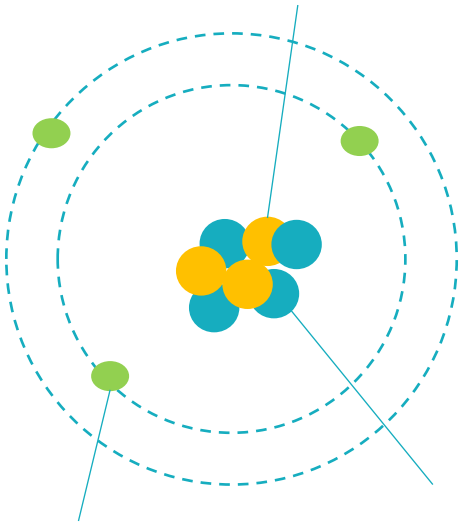
   _____

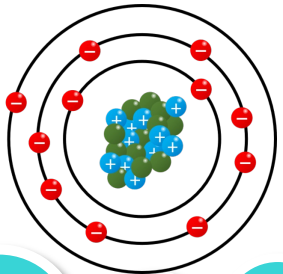
3. This is a diagram of a lithium atom.

   - Label the diagram.
   - Which one of the particles is not charged?

   (Draw a ring around the correct answer.)

   electron neutron proton





4. A sodium atom has an atomic mass of 23 and an atomic number of 11. How a many neutrons are in the atom?

   _____

   _____

   _____

Energy

5. Complete the sentences:-

i. Atoms consist of protons, neutrons and _____.

ii. Protons and _____ make up the nucleus.

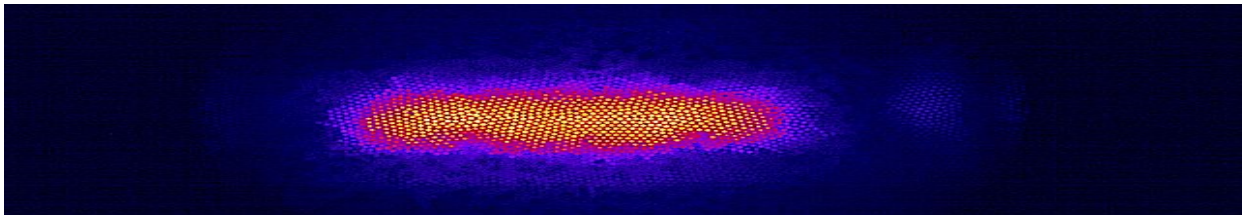
iii. The nucleus is tiny compared to the rest of the atom but it contains most of the _____

iv. Neutrons have a mass of _____and a charge of _____

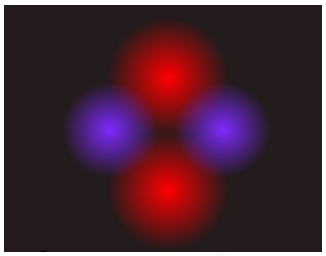
v. Protons have a mass of _____and a charge of _____

vi. The rest of the atom is mainly empty space and contains the _____ in energy levels or shells.

vii. Electrons have a negligible mass and a charge of _____



6. Complete the table to show the relative charge of each the particles.



Particle	Relative Charge
electron	- 1
neutron	
proton	