This is an atom, this is an element, this is an ion, this is an isotope, and this is Atomic Structure (*and the periodic table!)

Everything is made up of atoms. Atoms are the smallest units of matter. Atoms are made up of a subatomic particles. Subatomic particles are particles that are smaller than atoms. The subatomic particles found in atoms are Protons, Neutrons, and Electrons. Protons and Neutrons are found in the Nucleus of an atom. The nucleus is essetially a clump of these subatomic particles in the center of an atom. Orbiting around the nucleus are rings of electrons, known as shells. Each subatomic particle has a charge. Overall, an atom has no charge as the charges of the subatomic particles cancel each other out. The protons has a charge of +1, and the electrons have a charge of –1. The neutrons have a charge of 0, hence the name neutron as in neutral. Subatomic particles also have a relative mass. Protons and Neutrons both have a relative mass of 1. Electrons have a relative mass of 0.0005.

To calculate the relative atomic mass (Ar) we use the equation: (Isotope abundance * isotope mass number) / sum of abundances of all isotopes.

Elements are groups of the same atom. They are made of atoms with the same atomic number. Elements cannot be broken down into other substances by chemical reactions.

An isotope is an element with a different number of neutrons.

A compound is when two or more different elements chemically join together. The chemical bonds that hold them together make them difficult to separate.

Elements can be represented as symbols on the periodic table. The periodic table is a useful tool provided in every chemistry exam. Therefore, it is very important that we know how to read it. The table is grouped into two main categories. The metals are found on the left side of the periodic table, and the non-metals are found on the right side of the periodic table. Elements are arranged in order of the number of protons (atomic mass). Elements are further divided into columns. The columns show the groups. Group 1 are the Alkali metals, they are categorized into this group because they have 1 electron in their outer shell. Having only 1 electron in their outer shell makes them very unreactive, however, as you go down the group, the elements get more reactive. This is because as you go down a group, the number of shells of electrons in an element increases – those further down have more shells of electrons, therefore the outer shell will be further away from the nucleus further down the group, and so the forces between electrons in the outer shells and protons are weaker. This is true for all groups that the row corresponds to the amount of shells of electrons the element has. All elements in row one have one shell of electrons, all elements in row two have two shells of electrons, all elements on row three have three shells of electrons, and so on and so on. All elements in row 1 have two electrons in their outer shells, all elements in row two have 8 electrons in their outer shell, and all elements in row 3 have 8 electrons in their outer shell. Between groups 2 and three, we have the transition metals. Compared to other metals, most of the transition metals have higher melting points and densities, and greater strength and hardness. The other groups we need to know are group 7, the halogens, and group 8, the noble gases. The term 'halogen' means 'salt former'. All of the halogens exist as diatomic molecules. This means that the elements are made up of pairs of atoms that are chemically joined together. The halogens become darker in colour as you go down the group. Unlike other groups, the halogens get less reactive as you go down the group. The Noble gases in group 8, also known as group 0, are very unreactive because their outer shells are already full, so they will not bond with other elements. At room temperature, the noble gases are colourless. The periodic table also tells us useful information about specific elements. Each "box" in the periodic table contains a letter, the symbol of the element. Most periodic tables will also spell the name of the element out in full. The number above the element symbol is the relative atomic mass and the number below the element symbol is the atomic number which is the number of protons, and as the number of protons must be equal to the number of electrons in order to create an overall neutral charge, the atomic number is also the number of electrons. We can calculate the number of protons in an element by subtracting the atomic number from the mass number.

The periodic table have changed somewhat overtime. In the early 1800s, elements were arranged by atomic mass. The table was also incomplete because some elements had not been found. Some elements were also put in the wrong group. In 1869, Dimitri Mendeleev reconstructed the periodic table, putting elements in order of atomic mass, and leaving gaps where he thought that undiscovered elements should be placed. Once found, the elements were put in the correct place which Dimitri had left for them. Nowadays, our modern periodic table displays elements in order of atomic mass.

Like the periodic table, atoms too have an interesting history. At the start of the 19^{th} century, John Dalton described atoms as just tiny solid spheres. In 1897, JJ Thompson proposed the plum pudding model, in which an atom is said to be a ball of positive charge with negatively charged electrons scattered randomly inside it. In 1909, the atom changed again when Ernest Rutherford discovered that atoms are mostly empty space and concluded that atoms most have a nucleus where most of the mass is concentrated. Around 1911, Niels Bohr discovered that electrons are in shells that orbit the nucleus. Finally, in around 1940, James Chadwick descovered the subatomic particles, neutrons in the nucleus.