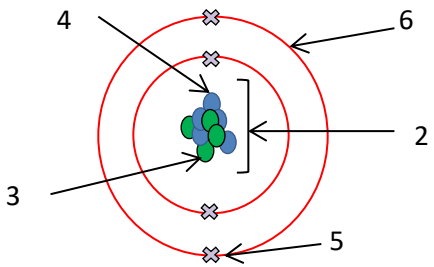
Science: Atomic Structure and the Periodic Table

1. Structure of the atom

	Key word	Definition
1	Atom	The smallest possible piece of an element. Has a radius of 0.1nm (or 1x10-10m).
2	Nucleus	The centre of an atom. Contains protons and neutrons.
3	Proton	A positively charged particle found in the nucleus.
4	Neutron	A neutral particle found in the nucleus. Has no charge.
5	Electron	A negatively charged particle found in energy levels (shells) around the nucleus.
6	Shell	Energy levels surrounding the nucleus of the atom.

Sub-atomic particle	Relative atomic mass	Charge
Proton	1	+1
Neutron	1	0
Electron	~0	-1

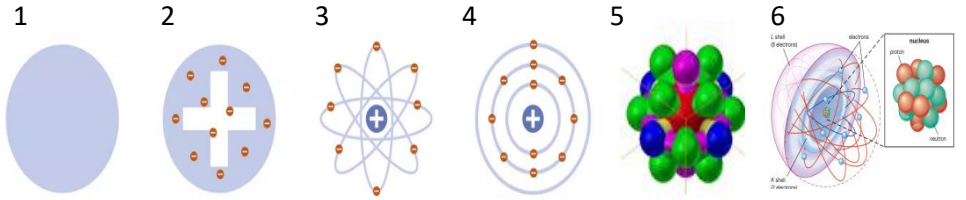


2. Key Words

Atomic number	Number of protons in the nucleus of an atom.
Atomic mass	Total number of protons **and** neutrons in the nucleus of an atom.
Isotope	Different forms of the same element with the same number of protons, but different numbers of neutrons.
Ion	A charged atom that forms when electrons are lost or gained.

3. Discovery of the Atomic Model

	Model	Discovery
1	Solid sphere	Dalton stated that the atom was the smallest particle and it could not be broken up further.
2	Plum Pudding Discovery of the electron	JJ Thompson stated that the atom was a cloud of positive charge with negatively charged electrons randomly dotted around the cloud.
3	Nuclear model Discovery of a positively charged nucleus	Rutherford conducted experiments with gold foil that proved that the atom contained a positively charged nucleus with the electrons randomly around the outside of the nucleus.
4	Planetary Model (Bohr) Discovery that electrons orbit the nucleus on energy levels called 'shells'	Bohr stated that electrons orbited around the nucleus like planets around the sun and that there were different numbers of shells in different elements.
5	Quantum Model Discovered that electrons are found in clouds of probability called orbitals	Schrodinger stated that electrons do not orbit the nucleus but move around in waves and it is impossible to know the exact location of an electron.
6	Modern Atomic Model Discovery of the neutron	Chadwick discovered the neutron in the nucleus which helped to explain the atomic mass of an atom.



4. Properties of metals and non-metals

Metals	Non-Metals
High density, sonorous, malleable, shiny, conducts heat and electricity.	Low density, brittle, dull, poor conductors of heat and electricity.

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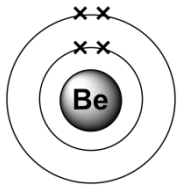
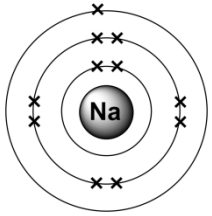
5. Electron configuration diagrams

Rules	1. Do not draw protons and neutrons in the nucleus. 2. Use small x's to show electrons. 3. Only 2 electrons can fit on the 1st shell, then 8 on 2nd, 8 on 3rd. 4. Draw the electrons from the nucleus outward.

Beryllium



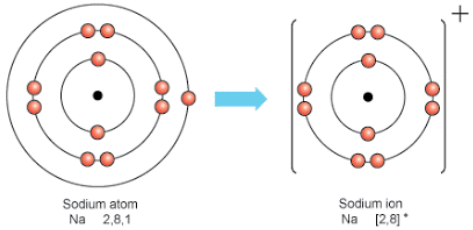
Sodium



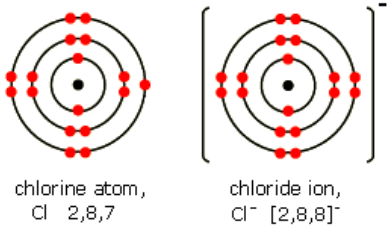
6. Forming ions

Rules	**Positively** charged ions have lost electrons from the outer shell. **Negatively** charged ions have gained electrons from the outer shell.

Sodium (Na^+)

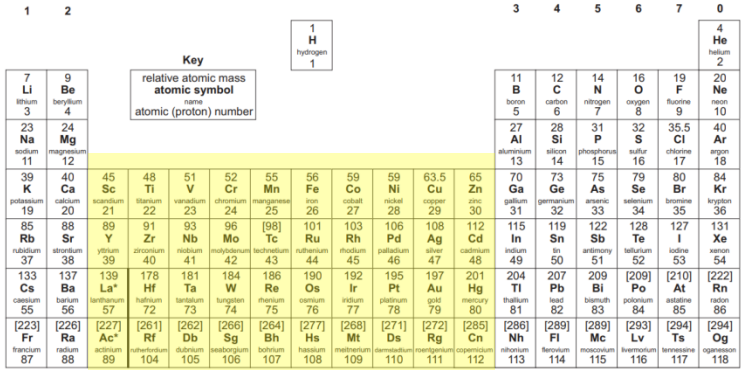


Chlorine (Cl^-)



7. The Periodic Table

Developed by Mendeleev, who arranged the elements in order of atomic **weight**. He left **gaps** for undiscovered elements and **predicted** their properties. When these predictions **proved correct**, Mendeleev's periodic table was widely accepted.



Arrangement	Elements are placed in order based on atomic number.
Groups	**The columns downwards:** Elements in each group have similar properties and electronic configurations.
Periods	**The rows across:** Elements in the same period have the same number of shells.
Transition metals	Highlighted in yellow are the transition metals of the periodic table. These elements can form more than one type of ion.

8. Patterns in the periodic table

Group	Name	Elements	Key feature	Patterns
1	Alkali Metals	Li, Na, K, Rb, Cs, Fr	Contains 1 electron on the outer shell.	Reactivity increases down the group and atom gets bigger.
7	Halogens	F, Cl, I, Br	Contain 7 electrons on the outer shell.	Reactivity decreases down the group and atom gets bigger.
0	Noble Gases	He, Ne, Ar, Kr, Xe, Rn	All atoms have a full outer shell.	Unreactive elements **(inert).**