12.1 An overview of the Periodic Table

What is the Periodic Table?

- The Periodic Table is a way of classifying the elements.
- It shows them in order of their proton number.
- Lithium has 3 protons, beryllium has 4, boron has 5, and so on.
- (The proton number is the lower number beside each symbol.)
- When arranged by proton number, the elements show periodicity: elements with similar properties appear at regular intervals.
- The similar elements are arranged in columns.
- Look at the columns numbered 0 to VII. The elements in these form families called groups. Look where Group 0 is.
- The rows are called periods. They are numbered 0 to 7.
- The heavy zig-zag line above separates metals from non-metals, with the non-metals to the right (except for hydrogen).

More about the groups

- The group number is the same as the number of outer-shell electrons in the atoms, except for Group 0. In Group I they have one outer-shell electron, in Group II they have two, and so on.
- The outer-shell electrons are also called valency electrons. And they are very important: they dictate how an element behaves.
- So all the elements in a group have similar reactions, because they have the same number of valency electrons.
- The atoms of the Group 0 elements have a very stable arrangement of electrons in their outer shells. This makes them unreactive.

More about the periods

- The period number tell you the number of electron shells in the atoms.
- So in the elements of Period 2, the atoms have two electron shells.
- In Period 3 they have three, and so on.

The metals and non-metals

- Look again at the table. The metals are to the left of the zig-zag line. There are far more metals than non-metals. In fact over 80% of the elements are metals.
- Metals and non-metals have very different properties. See Unit 3.5 for more.

Hydrogen

- Find hydrogen in the table. It sits alone. That is because it has one outer electron, and forms a positive ion (H⁺) like the Group I metals – but unlike them it is a gas, and usually reacts like a non-metal.

The transition elements

- The transition elements, in the block in the middle of the Periodic Table, are all metals. There is more about these in Unit 12.3.

Artificial elements

- Some of the elements in the Periodic Table are artificial: they have been created in the lab. Most of these are in the lowest block. They include neptunium (Np) to lawrencium (Lr) in the bottom row. These artificial elements are radioactive, and their atoms break down very quickly.
- (That is why they are not found in nature.)

Patterns and trends in the Periodic Table

- As you saw, the elements in a group behave in a similar way. But they also show trends. For example as you go down Group I, the elements become more reactive. Down Group VII, they become less reactive.
- Across a period there is another trend: a change from metal to non-metal. For example in Period 2, only sodium, magnesium, and aluminium are metals. The rest are non-metals.
- So if you know where an element is, in the Periodic Table, you can use the patterns and trends to predict how it will behave.