# 1 Atomic structure and periodic trends – Part 2

Name: _____ Class: _____ Date: _____

## Vocabulary

*Write each word three times.*

| **English** | **Write it 3 times** (English) | | |
|---|---|---|---|
| nucleus | | | |
| electron configuration | | | |
| valence electrons | | | |
| atomic radius | | | |
| ionization energy | | | |
| electronegativity | | | |
| cations | | | |
| anions | | | |
| ionic compound | | | |

## Recall

You already know a lot about atoms and the periodic table:

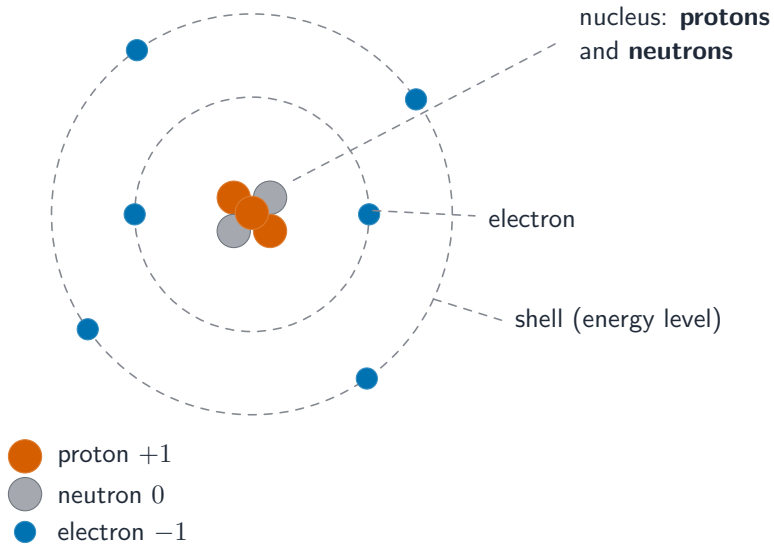
- An atom has a tiny central **nucleus** with electrons around it.
- Electrons sit in **shells**; the outer ones decide how the atom reacts.
- The periodic table groups elements with similar behaviour.

This sheet lines these ideas up for AP. Each idea has a worked example.

## New ideas

### 1 Inside the atom

An atom has a tiny **nucleus** (protons and neutrons) surrounded by electrons in shells and subshells (s, p, d).




The **electron configuration** lists how the electrons fill up, lowest energy first, e.g. $1s^2\,2s^2\,2p^6$.

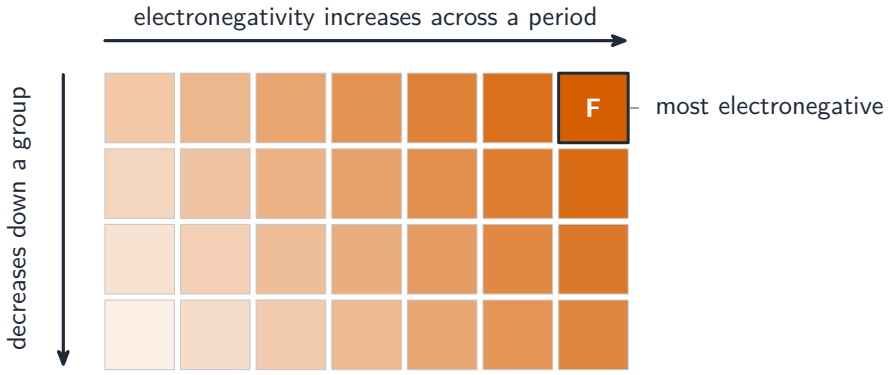
*Worked example.* Sulfur ($Z = 16$) fills to $1s^2\,2s^2\,2p^6\,3s^2\,3p^4$ – its 16 electrons placed in order.

### 2 Valence electrons

The outer **valence electrons** control an atom's chemistry: they are the ones gained, lost, or shared in reactions.

### 3 Periodic trends

Across and down the table, three trends follow from nuclear pull and shielding:




- **atomic radius** : smaller across a period, larger down a group.

- **ionization energy** (energy to remove an electron): larger across, smaller down.
- **electronegativity** (pull on shared electrons): larger across and up, toward fluorine.

### ■ 4 Ions and ionic compounds

Metals lose electrons to form positive **cations** ; nonmetals gain electrons to form negative **anions** . Opposite charges attract into an **ionic compound** , whose formula balances the charges.

*Worked example.* Aluminium (3+) and oxide (2−) combine as $Al_2O_3$, so the +6 and −6 cancel.

**Watch out:** atomic radius and ionization energy go in **opposite** directions – a small atom holds its electrons tightly (high ionization energy), a large atom holds them loosely (low ionization energy).

## Practice

Try these in order. The methods are all above.

**2.1** Write the electron configuration of oxygen ($Z = 8$). [2]

**2.2** State what "valence electrons" are and why they matter. [2]

**2.3** State how atomic radius changes (a) across a period, (b) down a group. [2]

**2.4** Sodium loses one electron and chlorine gains one. Write the formula of the compound they form, and state the charges. [2]

**2.5** Magnesium (2+) combines with chloride (1−). Write the formula of the compound. [2]