

# OCR A GCSE Chemistry

## Topic 1: Particles

### Atomic structure

#### Notes





### *C1.2a describe how and why the atomic model has changed over time*

- John Dalton:
  - proposed the atomic theory that:
    - atoms of an element are identical, different elements have different atoms
    - atoms can't be divided and make up all substances
    - atoms join to make new substances
- Thomson:
  - plum pudding model- atom is a positively charged sphere with electrons dotted inside
  - used a cathode-ray tube to conduct an experiment which showed that there are small particles inside atoms- disproved Dalton that atoms couldn't be split
- Rutherford:
  - proposed atoms were made up of a positive nucleus with negative electrons orbiting around
  - later discovered the proton
- Bohr:
  - proposed that electrons occupy shells around nucleus
- Geiger and Marsden:
  - Carried out the experiment designed by Rutherford:
    - shot a beam of positively charged particles at a gold foil sheet
    - some of the particles were deflected to the sides a bit, and a few bounced straight back- according to the plum pudding model they should have gone straight through
    - led to theory about nucleus existing within an atom

### *C1.2b describe the atom as...*

- A positively charged nucleus surrounded by negatively charged electrons.
- The nuclear radius is much smaller than that of the atom
- Most of the mass is in the nucleus

### *C1.2c recall the typical size (order of magnitude) of atoms and small molecules*

- atoms and small molecules are incredibly small
- since atoms make up small molecules, small molecules are larger in size than atoms
- Typical atomic radii and bond length are in the order of  $10^{-10}\text{m}$





*C1.2d recall relative charges and approximate relative masses of protons, neutrons and electrons*

particle	relative charge	relative mass
proton	+1	1
neutron	0	1
electron	-1	1/1836

*C1.2e calculate numbers of protons, neutrons and electrons in atoms and ions, given atomic number and mass number of isotopes*

- atomic number: number of protons (= number of electrons if it's an atom not an ion)
- isotope: atoms of the same element with different numbers of neutrons, but the same number of protons
- mass number: number of protons + number of neutrons
- ion: an atom (or group of atoms) with a positive or negative charge

if given atomic number and mass number of an isotope:

- to find number of protons:
  - number of protons = atomic number
- to find number of neutrons:
  - number of protons + number of neutrons = mass of isotope
  - number of protons = atomic number
  - therefore, number of neutrons = mass of isotope - atomic number
- to find number of electrons:
  - for an atom of an element:
    - in an atom of an element, the overall charge is zero, meaning there are the same number of protons and electrons
    - number of electrons = number of protons = atomic number
  - for an ion:
    - in an ion, electrons (-1 charge) have been lost or gained, leaving the atom with a positive or negative charge
    - work out the number of protons (this doesn't change for an ion)
    - look at the charge on the ion to work out how many electrons have been lost/gained and add/take the number off of the proton number

