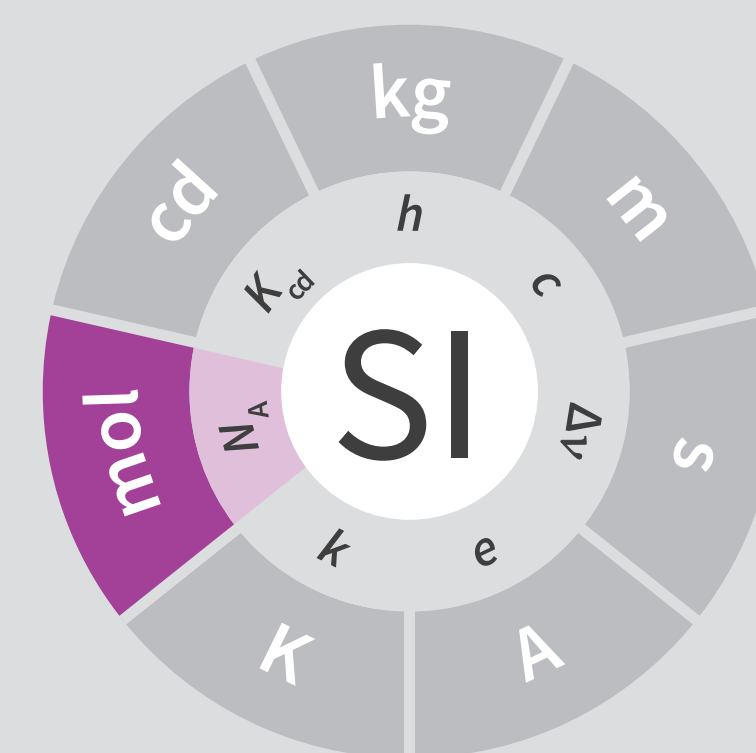


amount of substance measurement

mol

mole



The amount of substance matters

The amount of substance tells us the number of atomic or molecular entities present in a sample.

This matters for chemical reactions where measurements of molar quantities, rather than masses or volumes, are key to understanding and controlling the process.

Material	1 mole mass (g)	1 mole volume (cm ³)
Copper	63	7.09
Lead	207	11.3
Salt	29.5	14
Sugar	342	160
Hydrogen gas*	2	22 400
Oxygen gas*	32	22 400
Water*	18	18

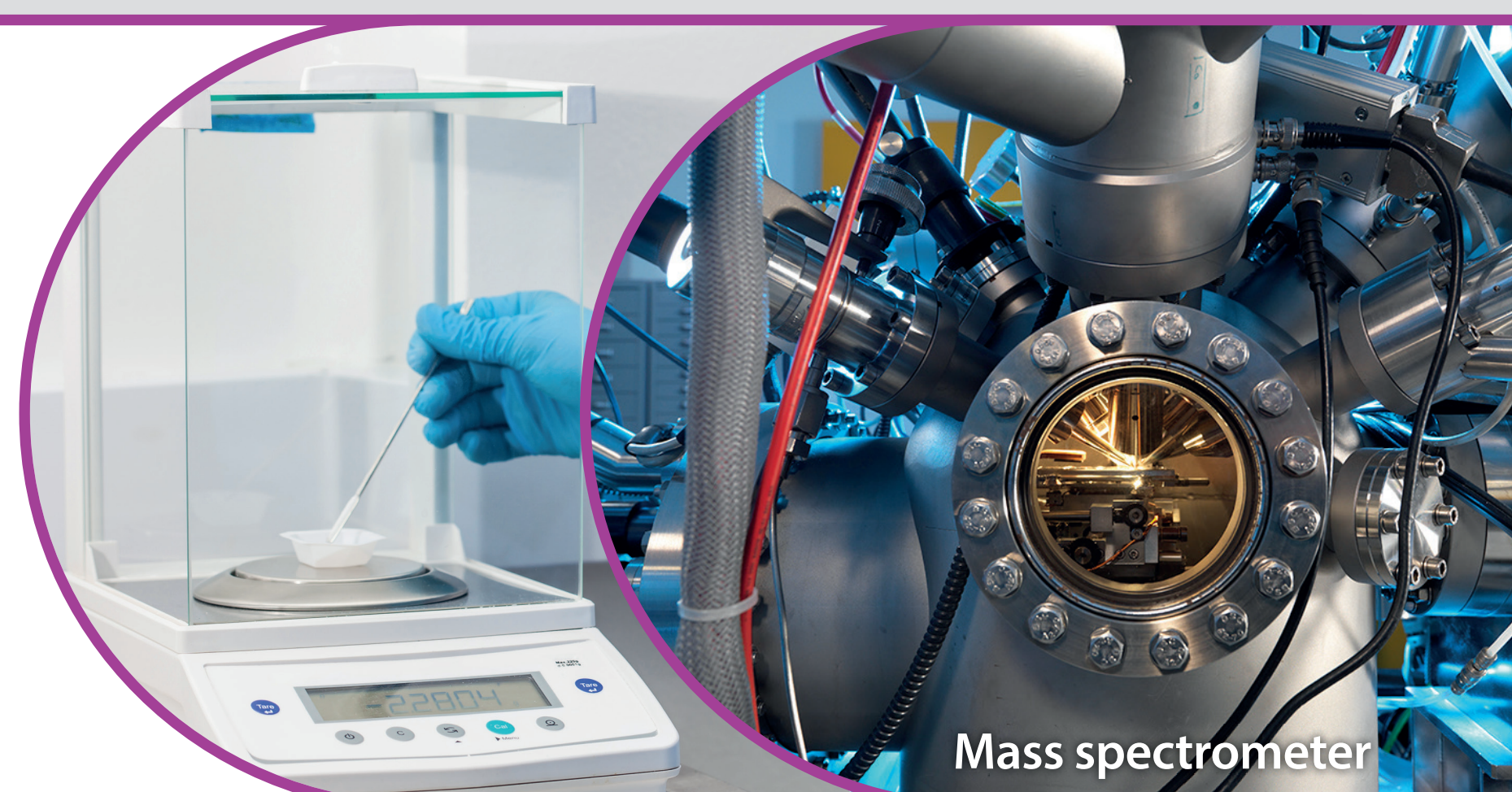
* at 0 °C and 101 325 Pa



Amount of substance measurements

Once we know of the type of elementary entity present, the amount of substance is generally identified by weighing.

The relative abundance of different atomic or molecular species is often measured with a mass spectrometer.



Definition

The base unit for amount of substance is the mole (mol) and is defined in terms of one fundamental constant

• N_A

One mole is defined as the amount of substance which contains exactly $6.022\,140\,76 \times 10^{23}$ elementary entities.

This number is chosen for our convenience because one mole of a substance with relative molecular mass X has a mass of almost exactly X grams.

Did you know?

Each of the seven billion people on Earth have 40 trillion cells. The total number of human cells on Earth is about half of the Avogadro number.

We only use the mole to describe fundamental chemical entities such as atoms, ions and molecules. It should not be used to count non-identical, non-chemical entities. For example 'a mole of stars' would not be correct usage.

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