Relative atomic masses

atomic mass 10^{-23} kg

Relative atomic mass:

- ~ Weighted average mass of naturally occuring atoms of an element on a scale where an atom $C-12$ has a mass of exactly 12 unit. (never whole)

- ~ $^{12}_{6}C : 1,99 \times 10^{-26}$ kg

1 unit: $\dfrac{1,99 \times 10^{-26}}{12} = 1,66 \times 10^{-27}$

- ~ $^{16}_{8}O : 2,6567 \times 10^{-26}$ kg   relative mass: $\dfrac{2,6567 \times 10^{-26}}{1,66 \times 10^{-27}} = 16,004$

- ~ $^{4}_{2}He : 6,6465 \times 10^{-27}$ kg   ~ $^{23}_{11}Na$ relative mass: 23

relative mass: $\dfrac{6,6465 \times 10^{-27}}{1,66 \times 10^{-27}} = 4,004$ $23 \times (1,66 \times 10^{-27}) =$

$= 3,818 \times 10^{-26} \approx 3,82 \times 10^{-26}$ kg

(3.s.f)

~ **Relative isotopic mass**: relative mass of a particular isotope of an element on a scale of carbon-12. (always whole)

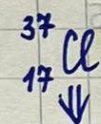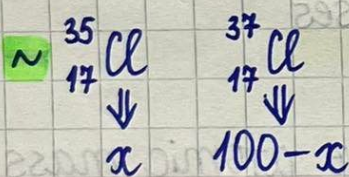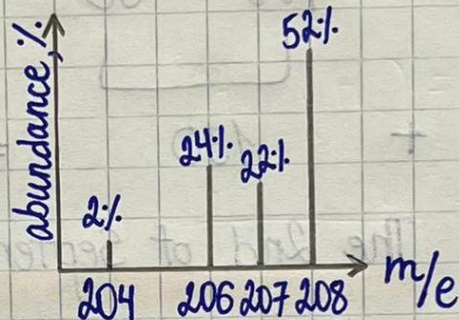## Determination of average atomic mass

mass spectrometre $\Rightarrow$ abundance (즈네즈 xy66)

~ isotopic abun-
mass   dance

Pb		
	204	2%
	206	24%
	207	22%
	208	52%

$$Ar_{(ave)} = \frac{204 \times 2 + 206 \times 24 + 207 \times 22 + 208 \times 52}{100}$$

$$Ar_{(ave)} = 207,22$$

~ $^{35}_{17}Cl$ $^{37}_{17}Cl$ $Ar_{(ave)} = 35,453$

$\quad \downarrow \qquad \downarrow$

$\quad x \qquad 100-x \qquad x = 77,35$

$$\frac{35x + 37(100-x)}{100} = 35,453$$

$35x + 3700 - 37x = 3545,3 \qquad -2x = -154,7$

$x = 77,35$

~ $^{24}_{12}Mg \quad 79\%$

$^{26}_{12}Mg \quad 11\%$

$^{25}_{12}Mg \quad 10\%$
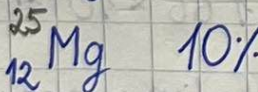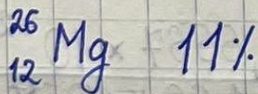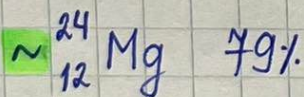
$$\frac{24 \times 79 + 26 \times 11 + 10x}{100} = 24,305$$

$1896 + 286 + 10x = 2430,5$

$10x = 248,5 \qquad x = 24,85 \approx 25$

Avogadro constant $\rightarrow 6,02 \times 10^{23} = N_A$

Avogadro 1 mole substance is the amount of the substance that has
constant the same number of specific particles (atoms, ions, molecules).

The calculation of empirical and molecular formula.

Empirical formula: simplest whole number ratio of elements present in one molecule of formula unit of the compound.

~ $\underline{Mg + O_2} \longrightarrow \underline{\text{magnesium oxide}}$ $\qquad \underline{MgO}$

0,486g excess $\qquad$ 0,806g $\longrightarrow$ $n(Mg) : n(O) = 1 : 1$

$\qquad\qquad\qquad\qquad \hookrightarrow Mg \quad 0,486g \div 24,3g\ mol^{-1} = 0,02\ mol$

$\qquad\qquad\qquad\qquad \hookrightarrow O \quad 0,320g \div 16g\ mol^{-1} = 0,02\ mol$