O xidation

I s

L oss of electrons

R eduction

I s

G ain of electrons

https://phet.colorado.edu/sims/html/balancing-chemical-equations/latest/balancing-chemical-equations_en.html

Half equations

Redox reactions may be broken down into two half- equations. We can see the oxidation and reduction processes separately.

chlorine + potassium bromide → potassium chloride + bromine

$Cl_2(aq) + 2KBr(aq) \rightarrow 2KCl(aq) + Br_2(aq)$

$Cl_2(aq) + 2Br^-(aq) \rightarrow 2Cl^-(aq) + Br_2(aq)$

We can separate two processes:

$2Br^-(aq) \rightarrow 2e^- + Br_2(aq)$ oxidation

$Cl_2(aq) + 2e^- \rightarrow 2Cl^-(aq)$ reduction

Cl_2 + ~~2e~~$^-$ + $2Br^-$ → $2Cl^-$ + ~~2e~~$^-$ + Br_2

If we don’t put coefficient what will we see?

$Cl_2 \rightarrow Cl^-$

The number of atoms and the charges are not balanced. To balance the number of atoms and the charges we have to add two electrons and we have to add 2 as the coefficient before Cl^-: $Cl_2 + 2e^- \rightarrow 2Cl^-$

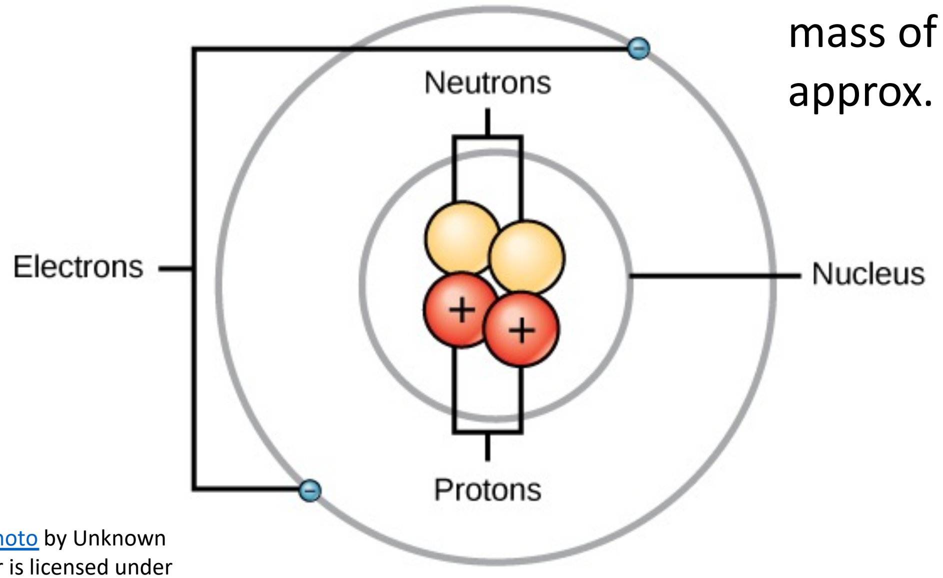
LOMONOSOV - LAVOISIER LAW

- The **Law** of **Conservation** of **Mass**/**Matter** (also known as the **Lomonosov**-Lavoisier **Law**) states that **mass** in a closed system will remain the same. Hence, **matter** cannot be created nor destroyed but can be rearranged.

- Mass of the reactants (substances that react) is equal to the mass of reaction products (substances that form in the reaction)

Atomic mass

- Atomic number – is the number of protons in nucleus
- Atomic mass ? Each proton and neutron has 1840 times the mass of an electron. Each proton and each electron weighs approx. 1 AMU

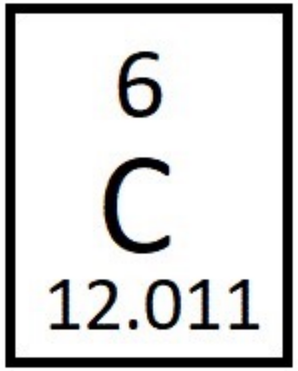


Particle	Mass	
	kg	AMU
PROTON NEUTRON ELECTRON	1.673×10^{-24}g 1.675×10^{-24}g 0.00091×10^{-24}g	1.00728 1.00867 0.000549

Atomic mass unit, or AMU, to be precisely one-twelfth the mass of a ^{12}C atom. The common carbon atom has a mass of exactly 12.000000 AMU, by definition.

When we talking about atomic weight, we are talking about average mass of the atom, counting all its isotopes. We call it **relative atomic mass A_r.**

The relative atomic mass **A_r** of an element is the average of the masses of the isotopes relative to the mass of 1/12 of an atom of carbon-12.



Knowing A_r we can calculate relative molecular mass M_r.

M_r is the sum of the relative atomic masses of the individual atoms making up a molecule.

What is relative molecular mass of methane?
CH_4

12.04 (A_r of C) + 4x1.01 (A_r of H) = 16.08

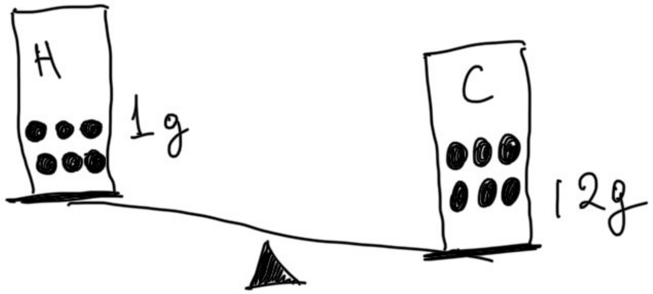

Afrosoricida - Chrysochloridae
Amblysomus hottentotus
Hottentot Golden Mole
HA York
ASM - MIL

Moles - unit of counting used in chemistry

Avogadro's number ($6.022x10^{23}$) represents the number of particles (atoms, ions, formula units, or molecules) in one mole of any substance

Any atom, element, or compound can have its mass expressed in atomic mass units (amu). The average atomic mass (in amu) for atoms of any element can be found on the periodic table.

One mole is the amount of substance that contains the same number of particles (atoms, ions, molecules etc.) as there are carbon atoms in 12 g of carbon 12



1 g of H – $6.02 \cdot 10^{23}$ atoms of H

12 g of C – $6.02 \cdot 10^{23}$ atoms of C

Mole and amu

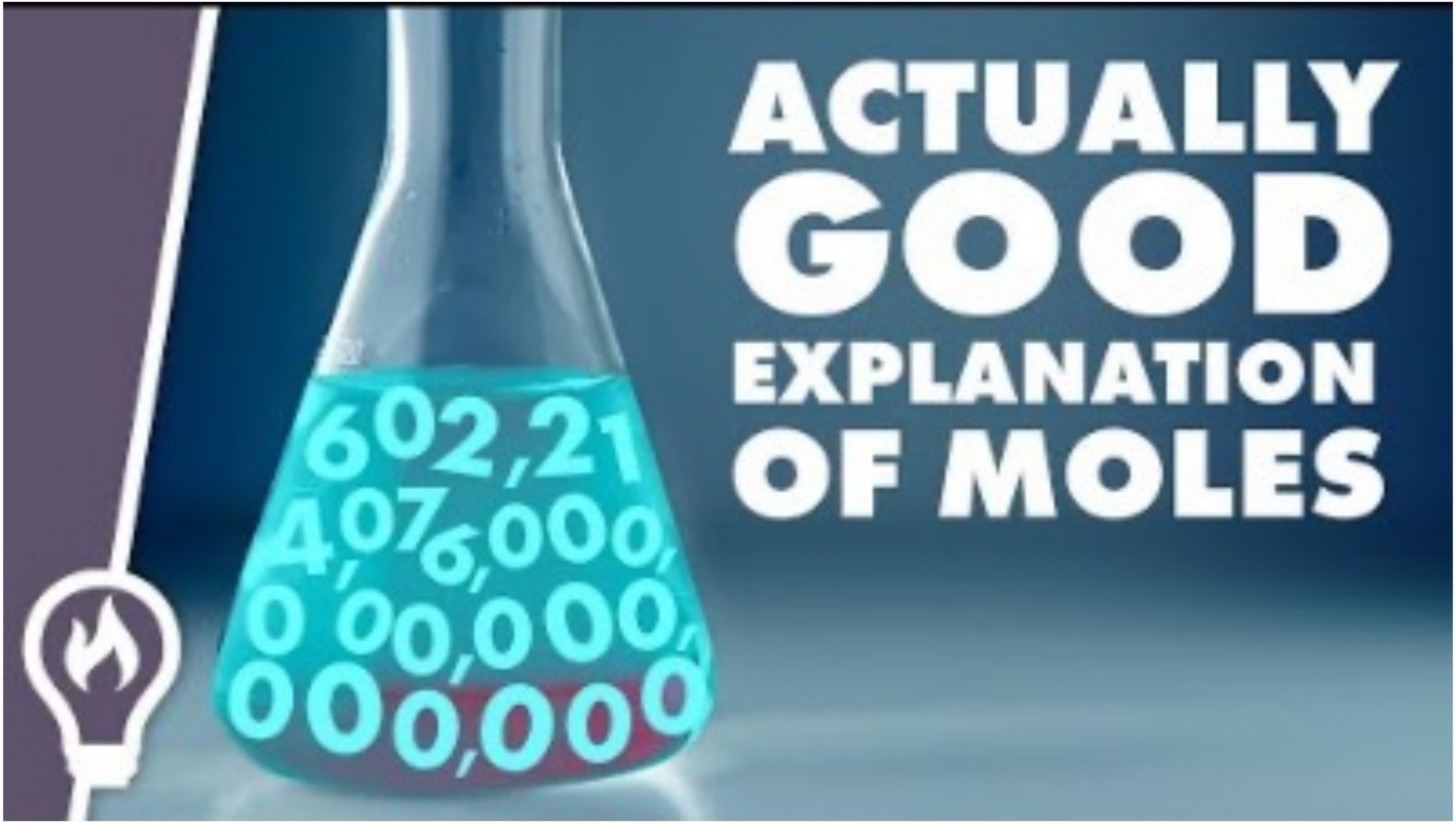
The numerical value of the amu of the atoms of a given elements is equal to the mass in grams of one mole of that element.

The mass of a single Na atom is 22.99 amu
One mole of Na has an average mass of 22.99 grams

Conversions of # of particles, # of moles, and the mass

E.g. $NaCl$ has a mass of $(22.99 + 35.45) = 58.44$ amu

One mole of $NaCl$ has a mass of $(22.99 + 35.45) = 58.44$ g https://youtu.be/Z_TjGRPPR9Q



The number of moles present in the certain mass of a substance can be figured out using the following equation

Number of moles (n) = mass of substance/ molar mass

$n = m/M$

The unit for M (molar mass) is g/mol or $gmol^{-1}$
Mass of substance (m) must be in grams.

Consider sulfur, if A_r of S is 32.06
Molar mass of sulfur 32.06 $gmol^{-1}$
This means 32.06 g of S contains 6.02×10^{23} sulfur atoms or 1 mole of sulfur.