Electrons in atoms Cheat Sheet
by resaraj via cheatography.com/209482/cs/45129/

Elements and compounds

Isotopes of Hydrogen

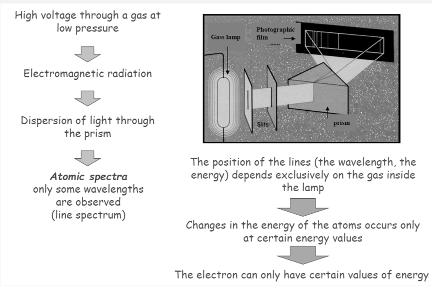
${}_1^1H$→Deuterium (${}_1^2H$)→Tritium (${}_1^3H$)

Mol: amount of substance SI

N_a=6,022*10^{23}entities/mol

mass of 1 mol of substance=its atomic mass (uma), taken as grams

Atomic spectra



Rydberg relation

$$\bar{\nu} = \frac{1}{\lambda} = R_H\left(\frac{1}{n_i^2} - \frac{1}{n_j^2}\right)$$

only a limited number of energy values are available to excited gaseous atoms

The Bohr Atom

First postulate

atom= nucleus(positivecharge and miuch of the system mass) +e^- moving in circular orbits around it	$F_e=F_c$⟶$r=(Ze^2)/(4\pi\varepsilon_0 m v^2)$

Second postulate

The e^- has only a fixed set of stationary states, as long as it remains in the same orbit, its energy is constant and no energy is emitted

Third postulate

An e^-can pass only from one allowed orbit to another emitting or absorvig quanta(fixed discrete quantities of energy)

Heisenberg's uncertainty principle

$$\Delta x \Delta p \geq \frac{h}{4\pi}$$

De Broglie's wave-particle duality

$$\lambda = \frac{h}{mc}$$

Particle in a box

Law of conservation of mass

Matter cannot be created nor destroyed	mass reactants=mass products

Law of definite proportions

A chemical compound always contains exactly the same proportion of elements by mass

The modern atom

	Electric Charge		Mass	
	SI (C)	Atomic	SI (g)	Atomic (u)[a]
Proton	$+1.6022 \times 10^{-19}$	+1	1.6726×10^{-24}	1.0073
Neutron	0	0	1.6749×10^{-24}	1.0087
Electron	-1.6022×10^{-19}	−1	9.1094×10^{-28}	0.00054858

[a]u is the SI symbol for atomic mass unit (abbreviated as amu).

Atomic Number=Z=protons
Mass number=A=protons+neutrons

By **resaraj**
cheatography.com/resaraj/

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Electromagnetic spectrum

c=λ*v	
γ rays	$[10^{-15},10^{-11}]$m
X rays	$[10^{-13},10^{-9}]$m
U.V.	$[10^{-9},390*10^{-6}]$m
Visible	[390,760]nm
Infrared	$[760*10^{-6},10^{-3}]$m
Microwave	$[10^{-3},10^{-1}]$m
Radio	$[10^{-2},10^{4}]$m

the given values are for λ

Atomic spectrum of Hydrogen

Balmer experimentally found a frequency formula to define H spectral lines

v=3,2881*10^{15}*(1/2-1/n²) s^{-1}

The photoelectric effect

$$E_{\text{photon}} = h\tilde{v} \rightarrow h\tilde{v} = \frac{1}{2}(mv^2) + eV_0$$

Einstein postulated that light is not a wave but a collection of discrete wave packets (photons)

The Zeeman effect

spectral lines are split in the presence of a magnetic fild	the split was proportional to the applied magnetic field

Quantum number

n (principal quantum number)	1,2,...,n
l (angular momentum number)	[0,...,n-1]
m (magnetic quantum number)	[-l,...,l]
s (spin number)	[-1/2,1/2]

Pauli Exclusion Principle

In an atom two electrons cannot have the same quantum numbers

Planck's formula

$$E = nh\nu$$

the quantum energy is proportional to the frequency of the emitted radiation, the energy of a system changes in specific quanta. h=6,626*10^{-34}

Orbitals

Description of the probability of finding the electron in the space

high electronic charge density

Multielectron atoms

Different penetrating and shielding properties of the orbitals	Zeff=Z-σ