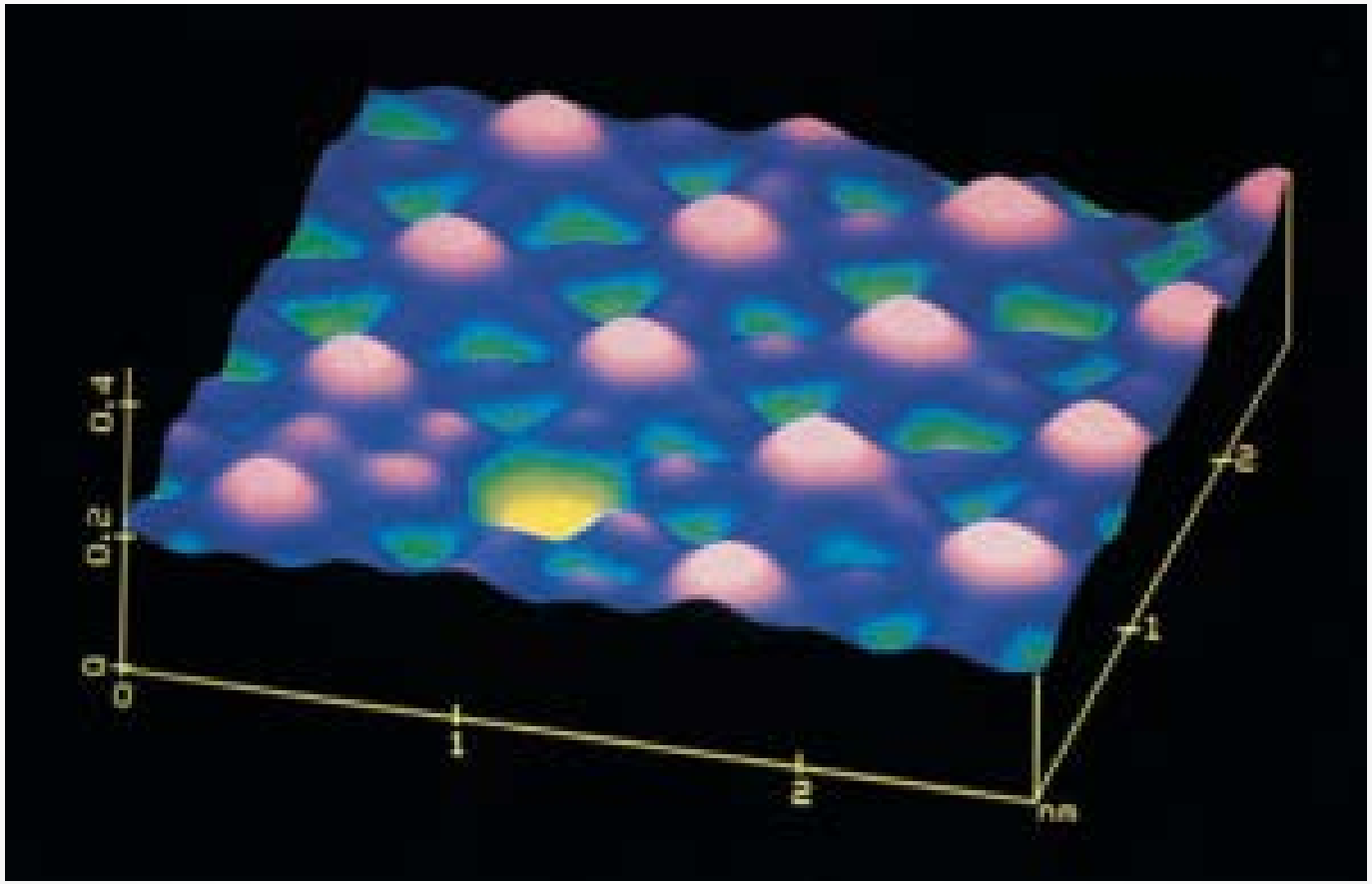
GENERAL CHEMISTRY

ATOMIC THEORY AND ATOMIC STRUCTURE

- Reaction of Sodium and Chlorine

Ebbing, Gammon,2009

- Iodine atoms in on a platinum metal surface

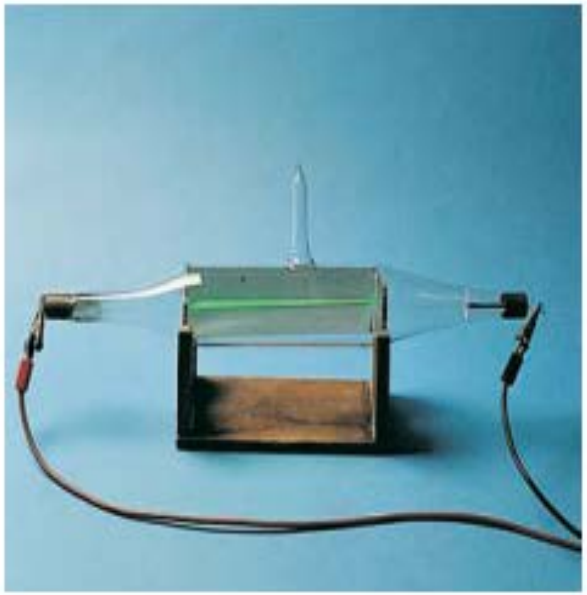


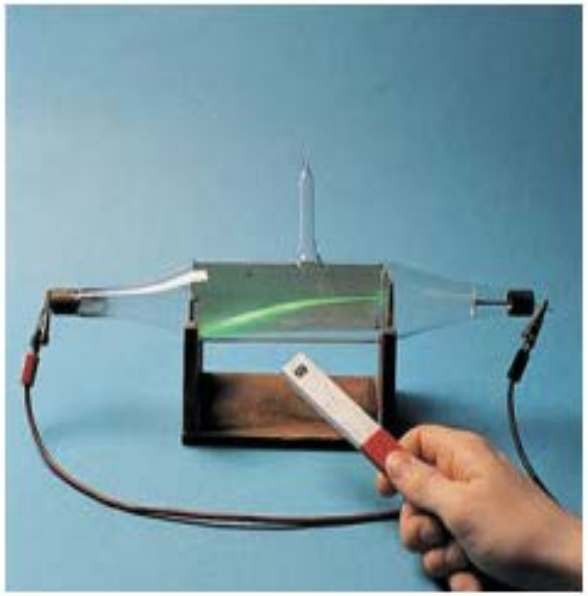
Ebbing, Gammon,2009

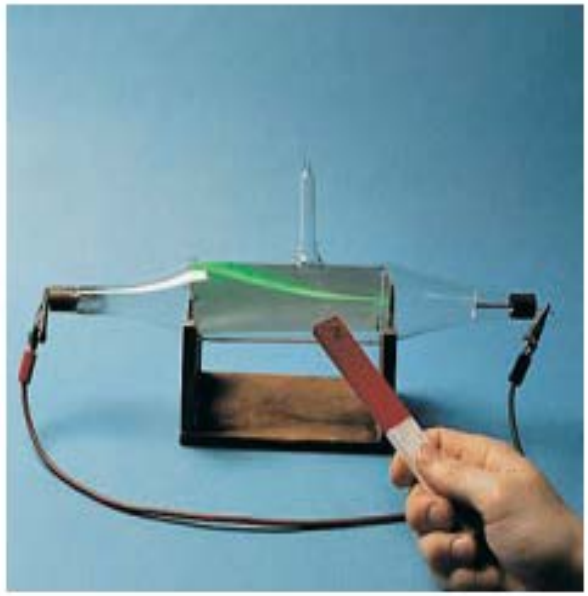
nil *(0)*, **un** *(1)*, bi *(2)*, **tri** *(3)*, **quad** *(4)*, **pent** *(5)*, **hex** *(6)*, **sept** *(7)*, **oct** *(8)*, *and* **enn** *(9) with the ending* **-ium.**

ununhexium_-- *its atomic symbol is* ***Uuh***

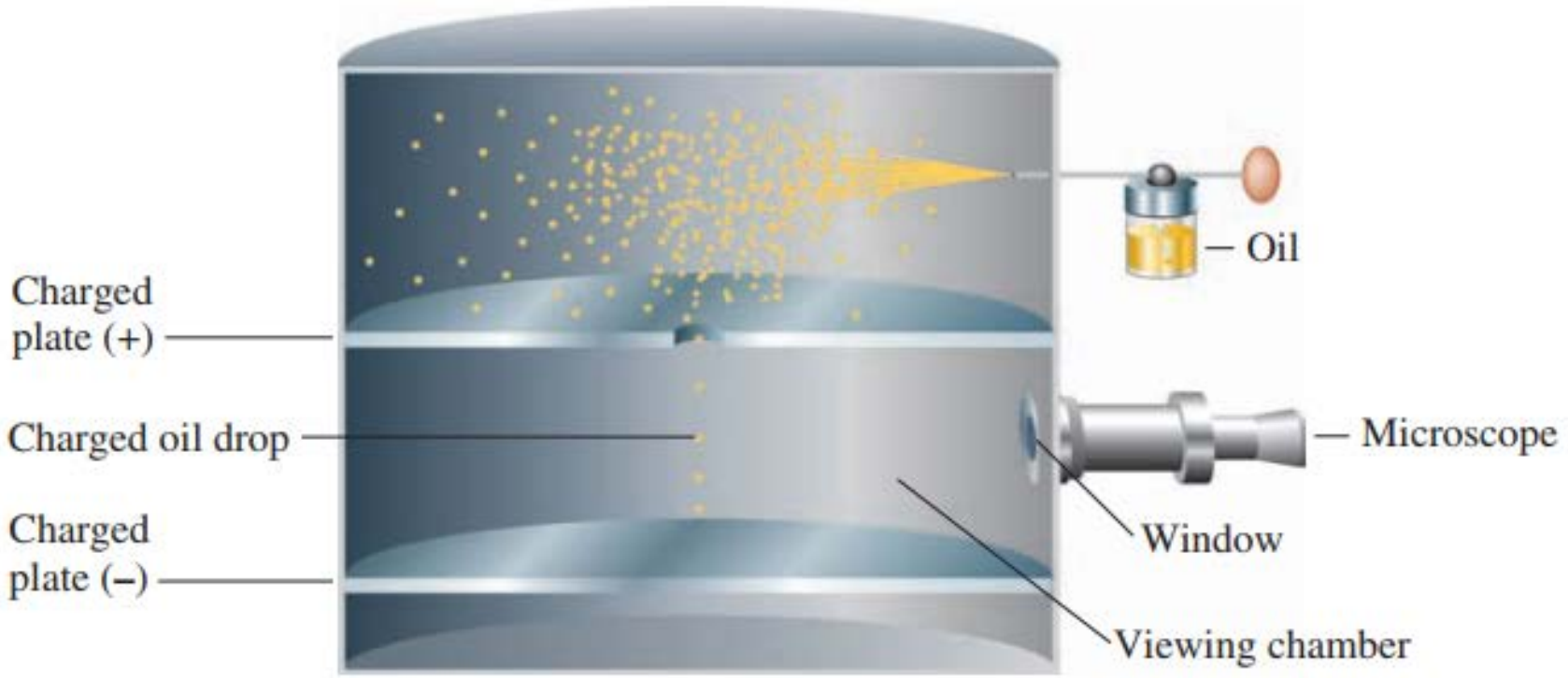
- Bending of Cathode Rays by a Magnet





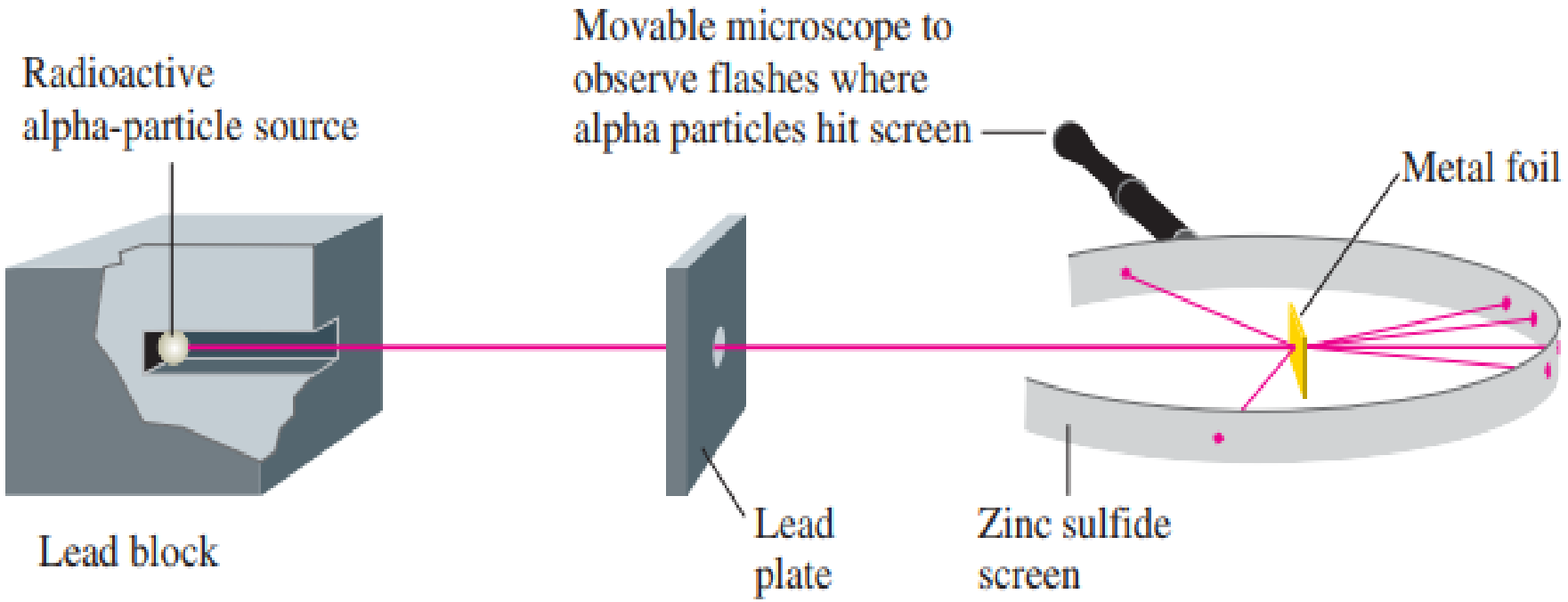


Ebbing, Gammon,2009



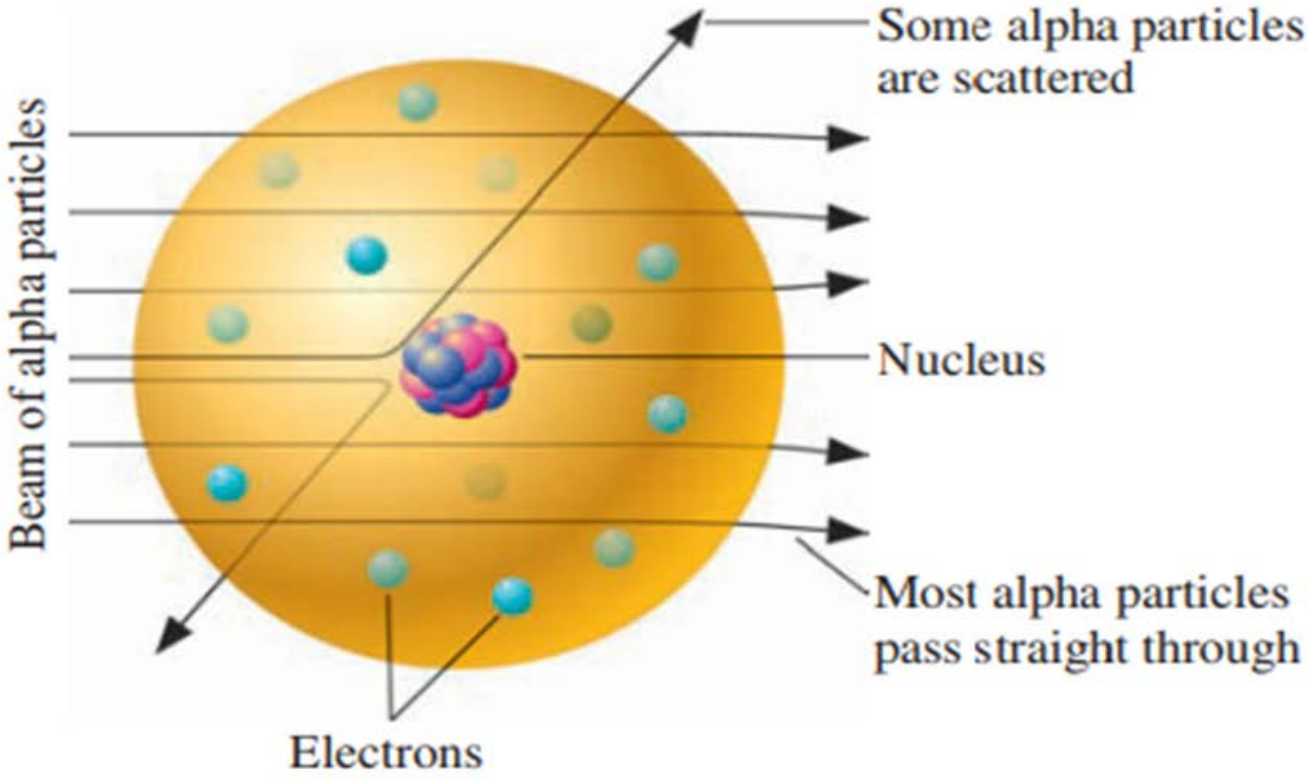
- Millikan's oil-drop experiment

Ebbing, Gammon,2009



- Alpha – particle scattering from metal foils

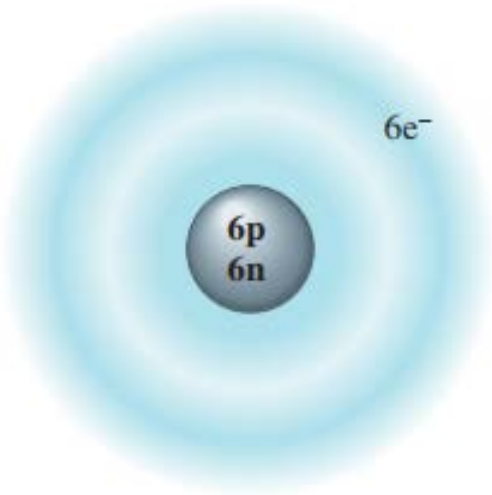
Ebbing, Gammon,2009

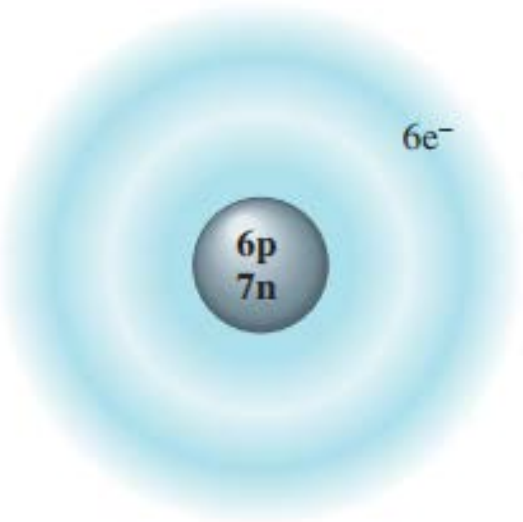


Representation of the scattering of alpha particles by a gold foils

Ebbing, Gammon,2009

Particle	Mass (kg)	Charge (C)	Mass (amu)*	Charge (*e*)
Electron	9.10939×10^{-31}	-1.60218×10^{-19}	0.00055	−1
Proton	1.67262×10^{-27}	$+1.60218 \times 10^{-19}$	1.00728	+1
Neutron	1.67493×10^{-27}	0	1.00866	0

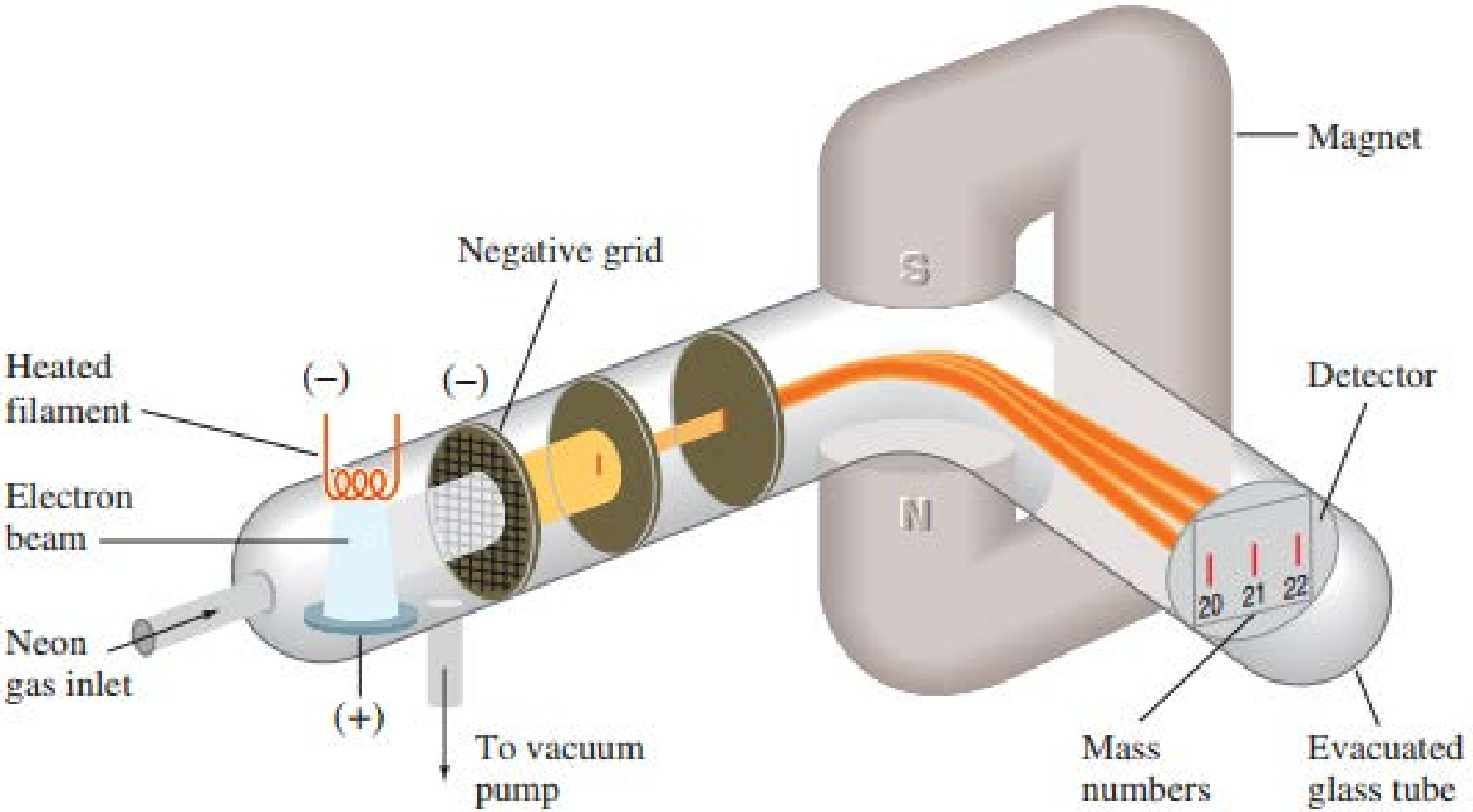




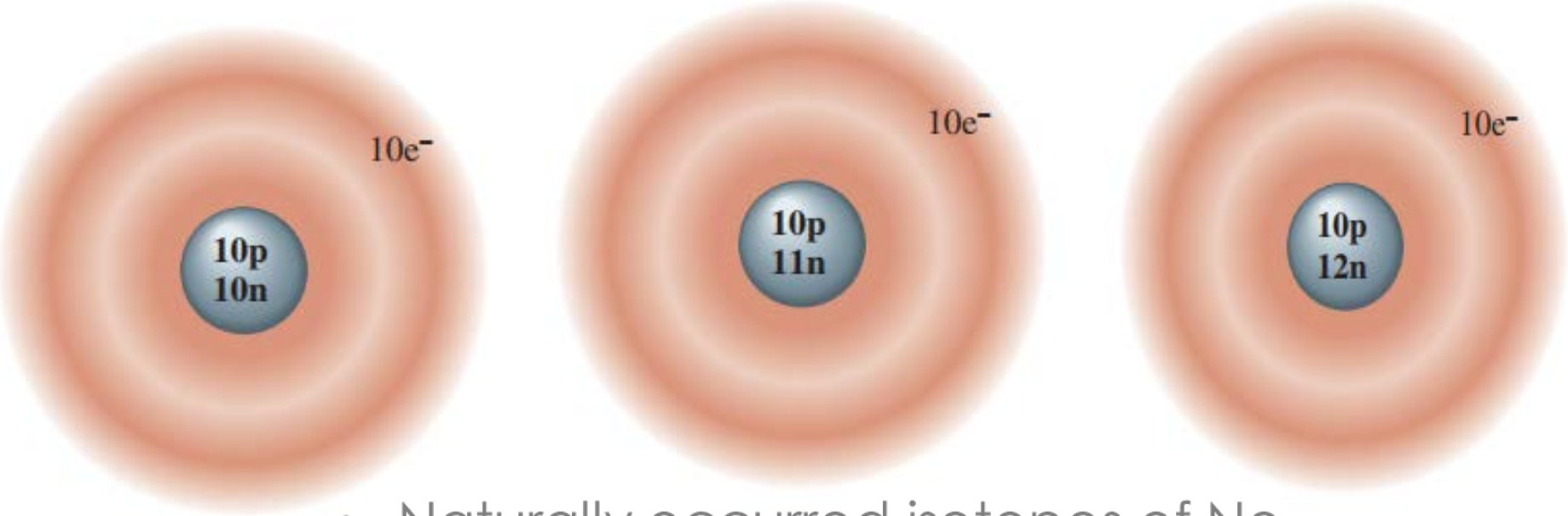
Mass number ⟶ ^{23}Na
Atomic number ⟶ 11

Ebbing, Gammon,2009

Simple mass spectrometer, showing the separation of neon isotopes

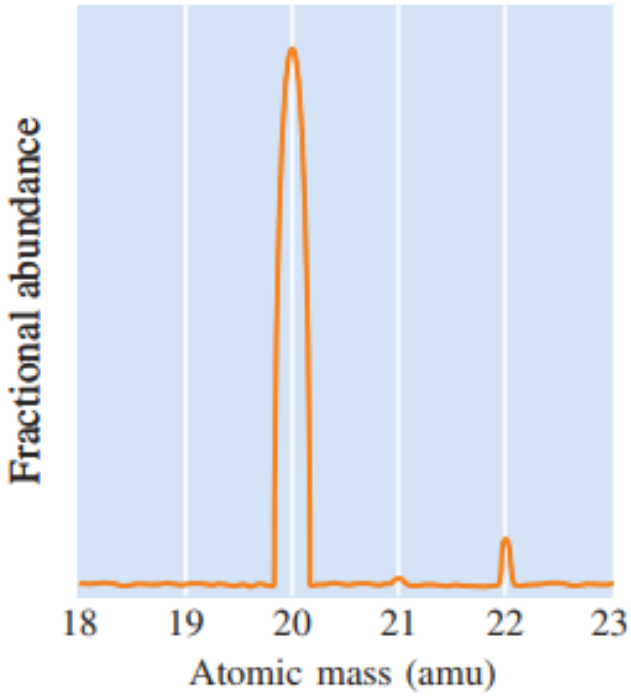


Ebbing, Gammon,2009

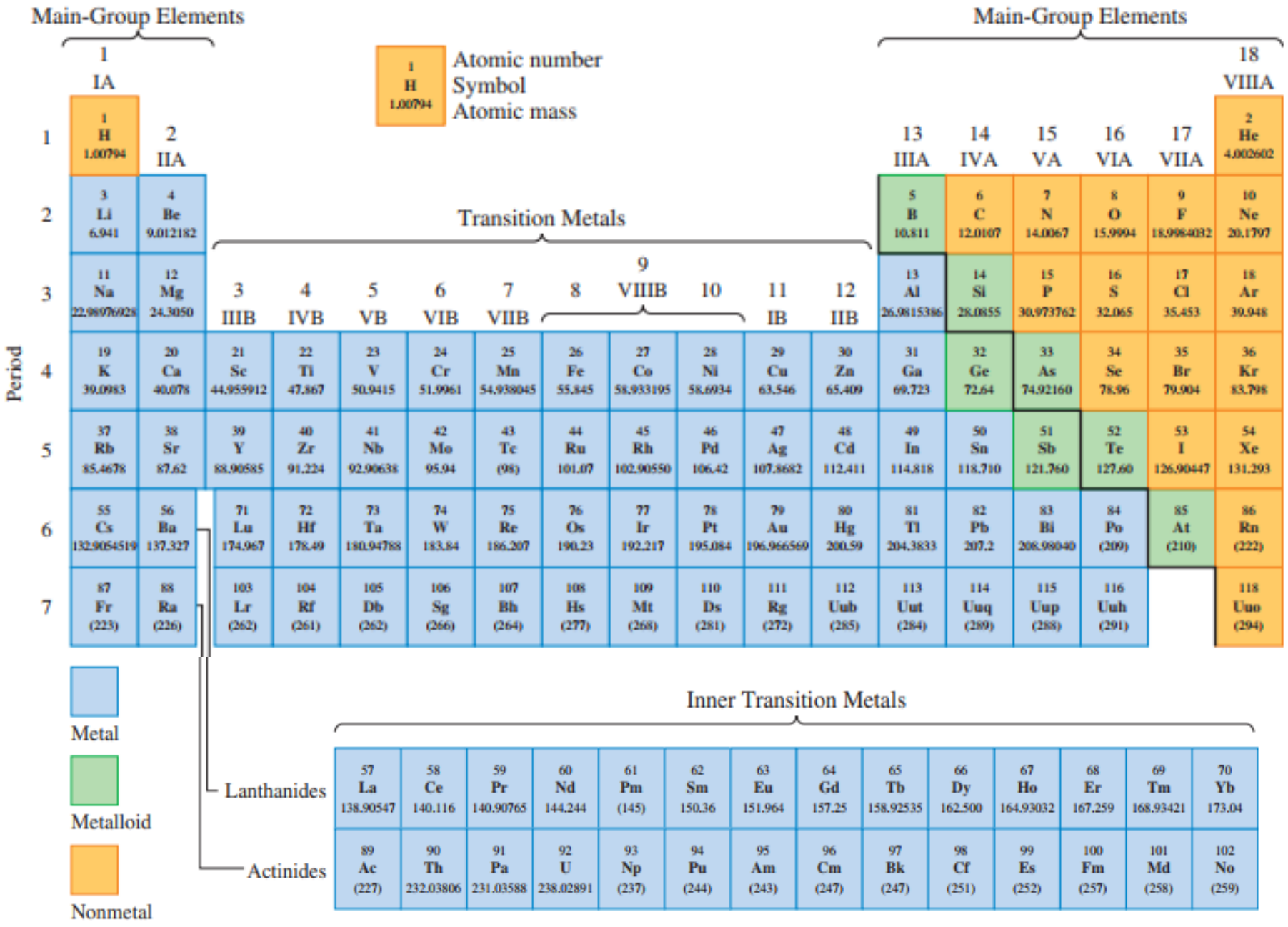


- Naturally occurred isotopes of Ne

- Mass spectrum of neon



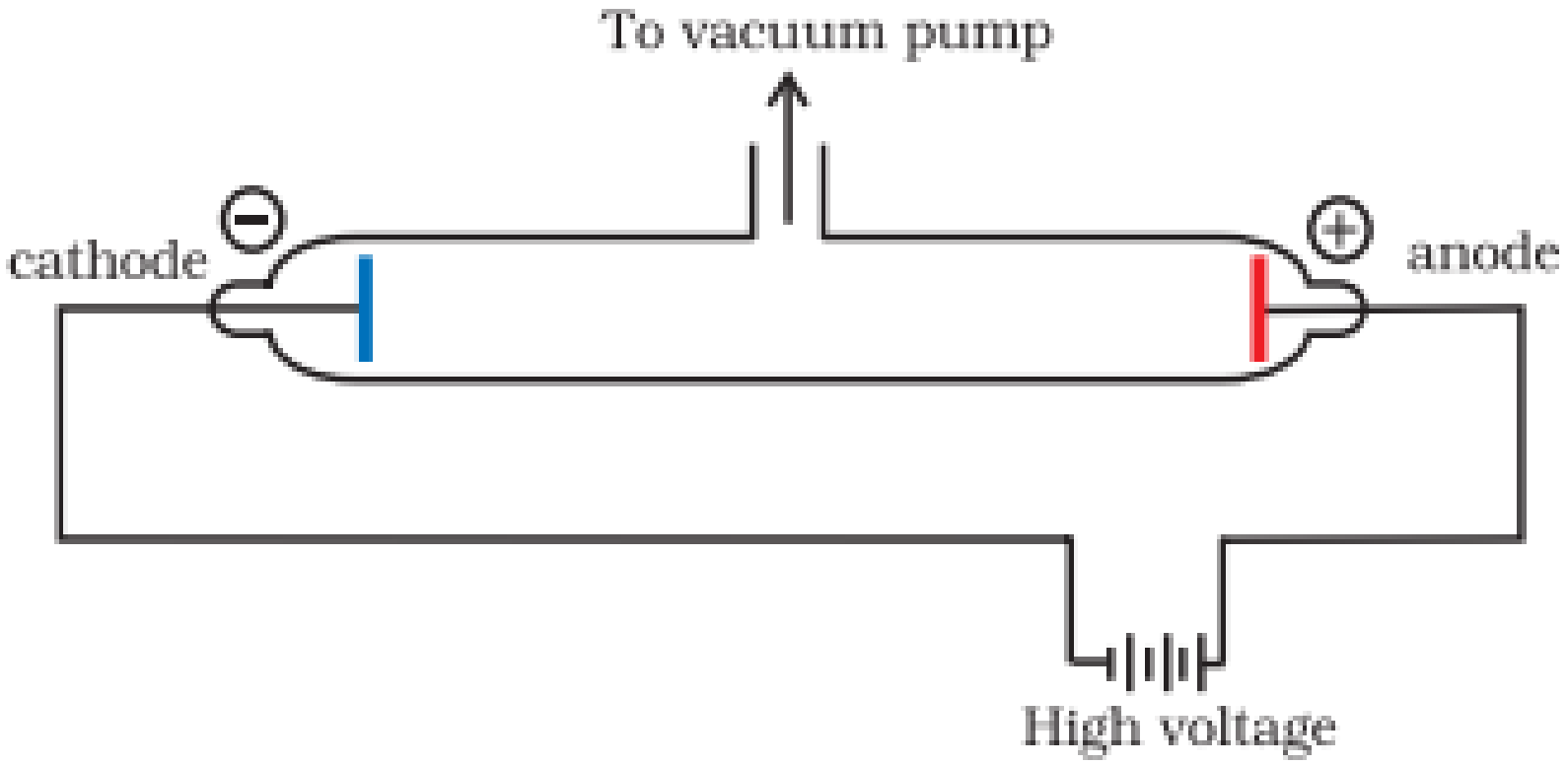
Ebbing, Gammon,2009



Ebbing, Gammon,2009

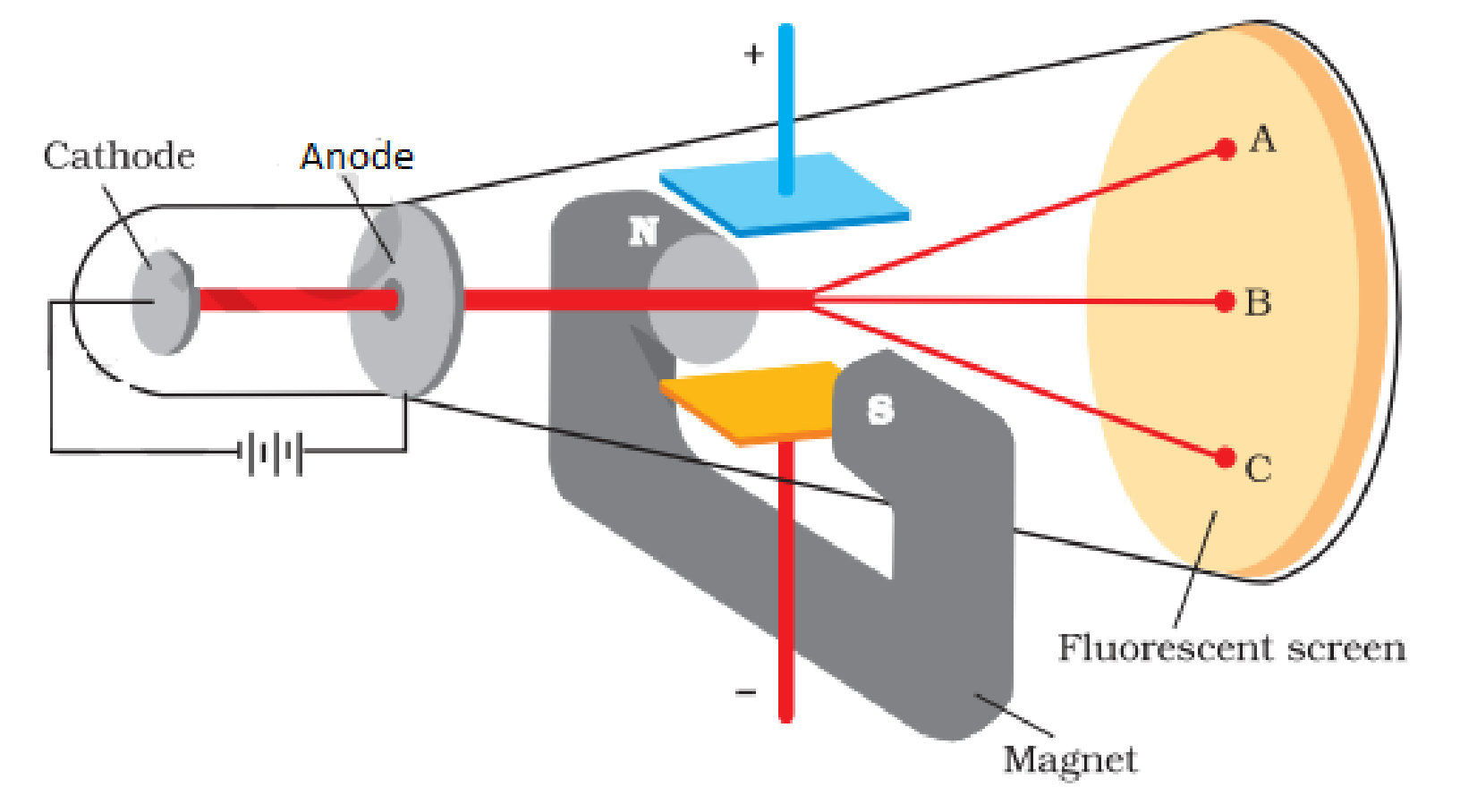
SUB-ATOMIC PARTICLES

Discovery of Electron



A cathode ray discharge tube

Charge to Mass Ratio of Electron

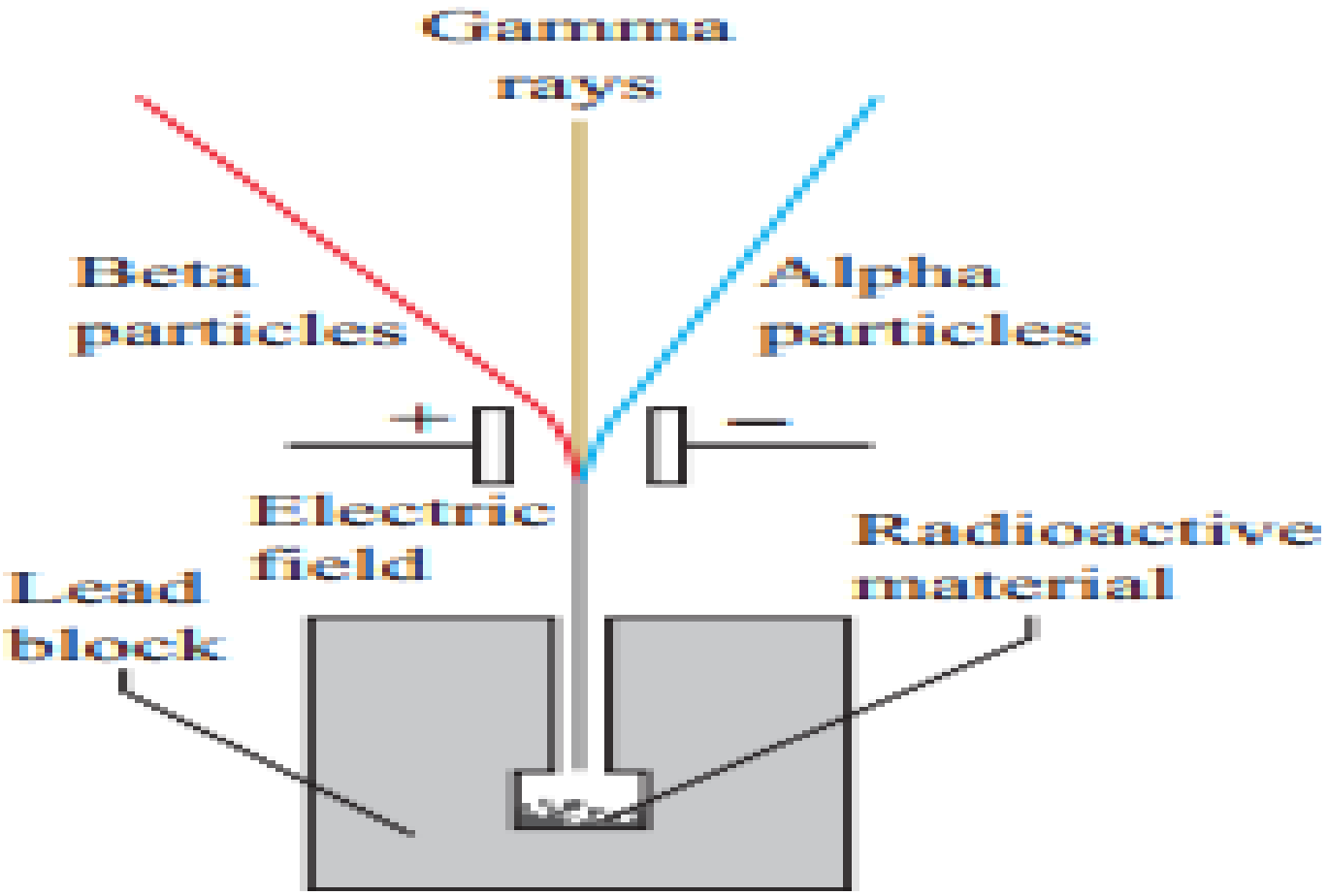


The apparatus to determine the charge to the mass ratio of electron

TOWARDS QUANTUM MECHANICAL MODEL OF THE ATOM

1. Dual behavior of matter,
2. Heisenberg uncertainty principle

X-Rays and Radioactivity



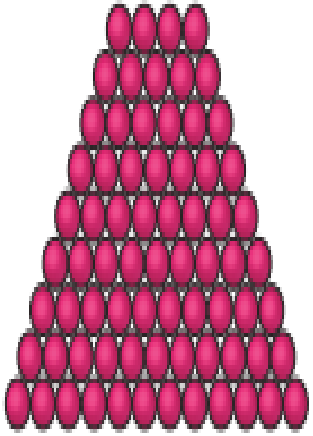
Three types of radiation from radioactive materials

The Concept of the Mole and the Avogadro Constant

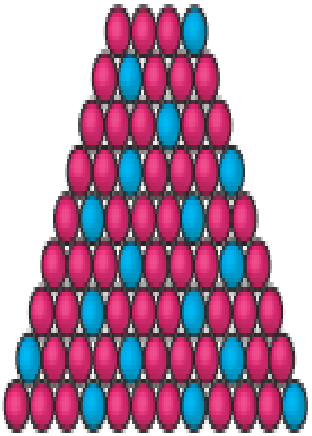
$$N_A = 6.02214179 \times 10^{23}\ \text{mol}^{-1}$$

Year	Avogadro's Number
1986	6.0221367×10^{23}
1998	$6.02214199 \times 10^{23}$
2002	6.0221415×10^{23}
2006	$6.02214179 \times 10^{23}$

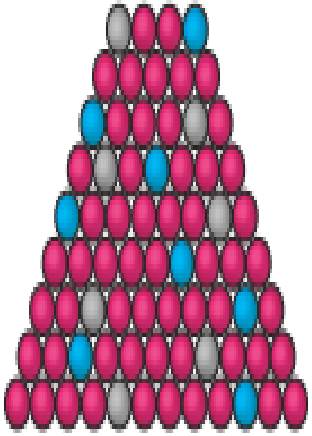
Distribution of isotopes in four elements



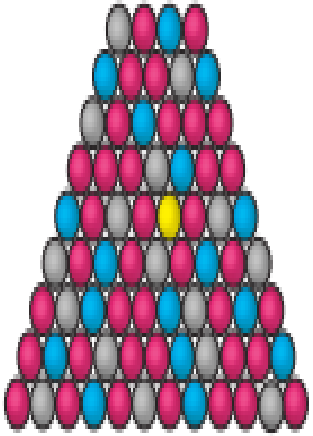
(a) 6.02214×10^{23} F atoms = 18.9984 g



(b) 6.02214×10^{23} Cl atoms = 35.4527 g



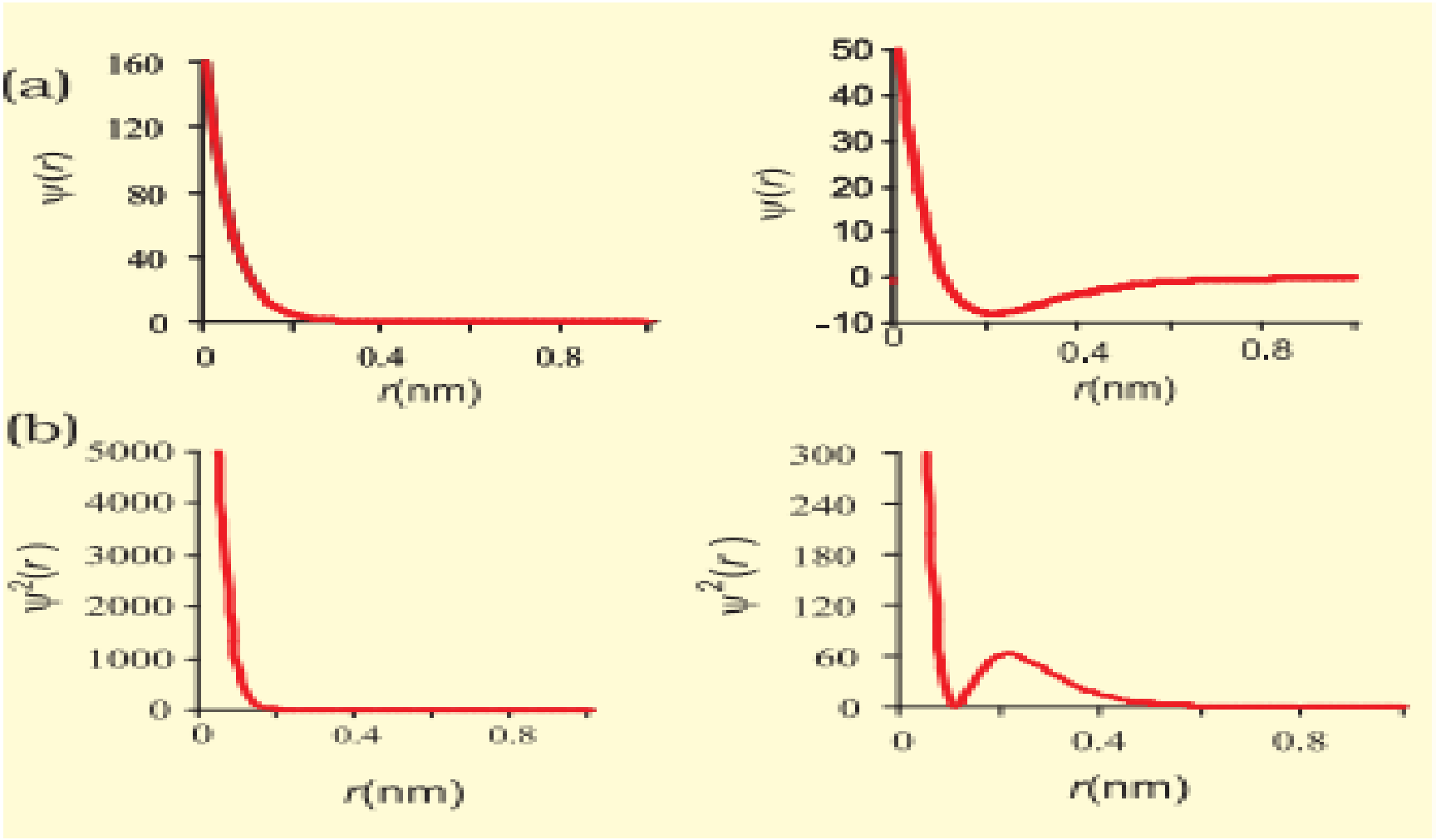
(c) 6.02214×10^{23} Mg atoms = 24.3050 g



(d) 6.02214×10^{23} Pb atoms = 207.2 g

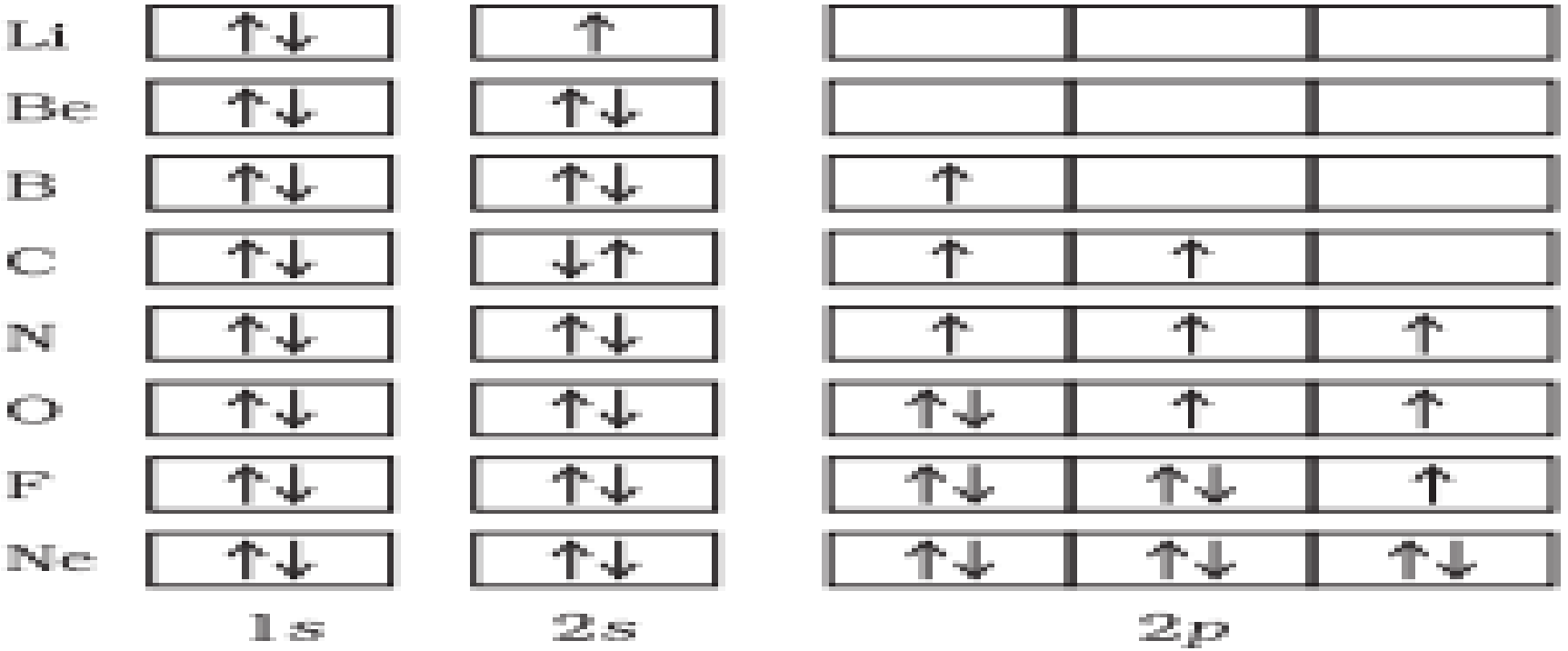
Orbit, orbital and its importance

Shapes of Atomic Orbitals



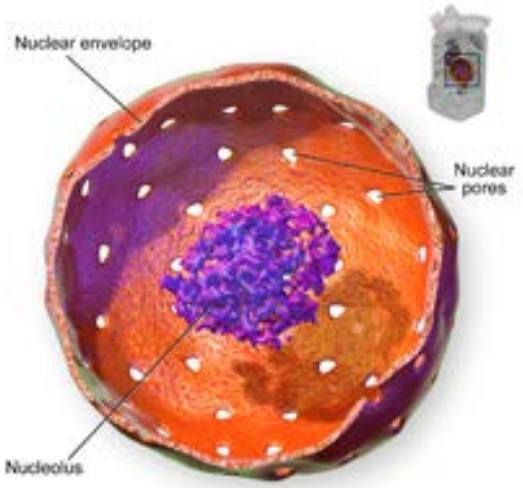
Electronic Configuration of Atoms

In the next six elements-boron (B, $1s^2 2s^2 2p^1$), carbon (C, $1s^2 2s^2 2p^2$), nitrogen (N, $1s^2 2s^2 2p^3$), oxygen (O, $1s^2 2s^2 2p^4$), fluorine (F, $1s^2 2s^2 2p^5$) and neon (Ne, $1s^2 2s^2 2p^6$), the 2p orbitals get progressively filled. This process is completed with the neon atom. The orbital picture of these elements can be represented as follows :

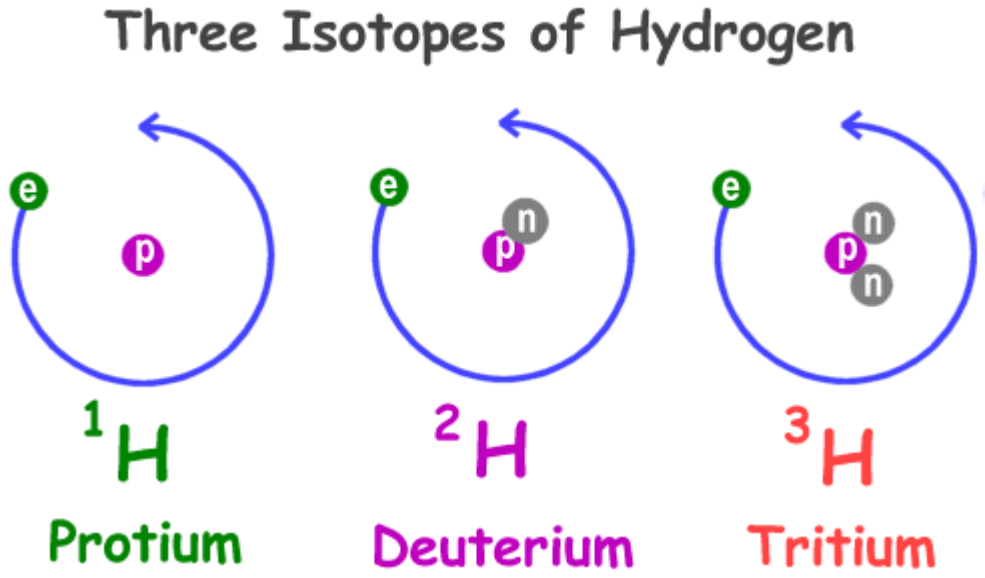


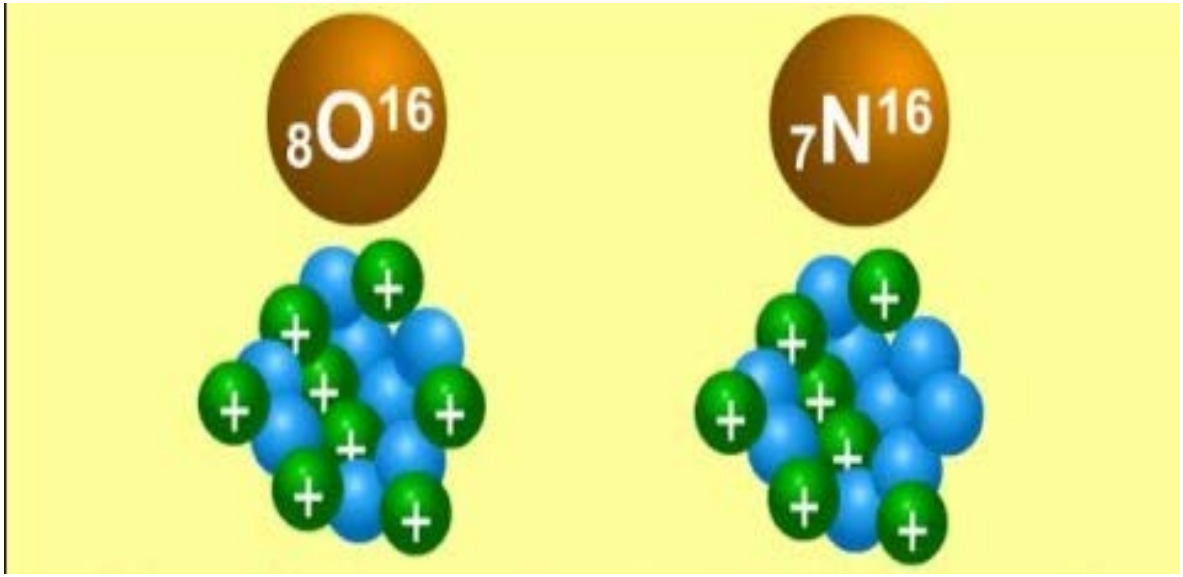
List of the Atomic Theories

- Ancient Greek Beliefs
- Dalton's Theory
- J.J. Thomson's Theory
- Rutherford's Hypothesis
- Bohr's Theory
- Einstein, Heisenberg and Quantum Mechanics
- Quark Theory

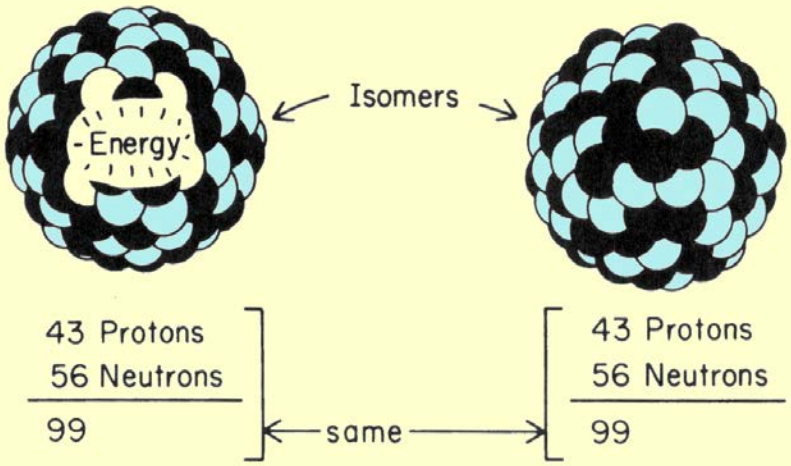


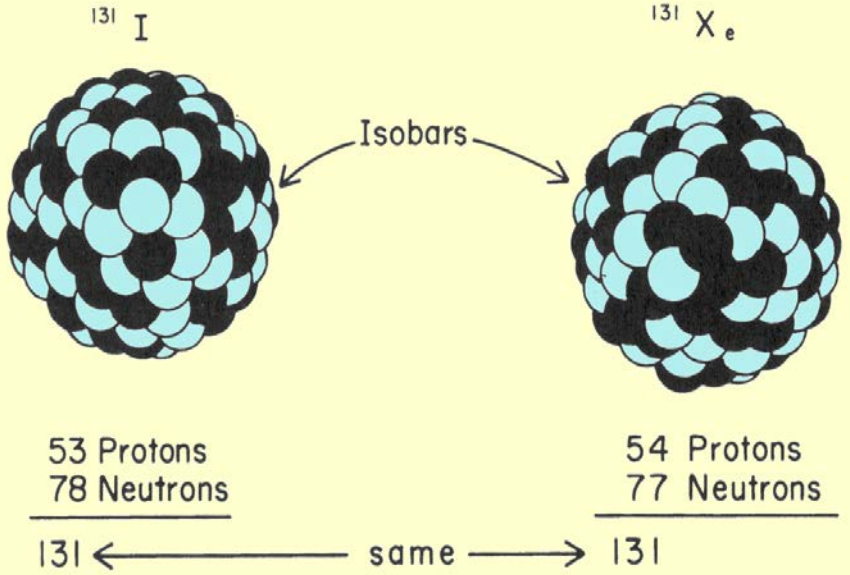
Nucleus

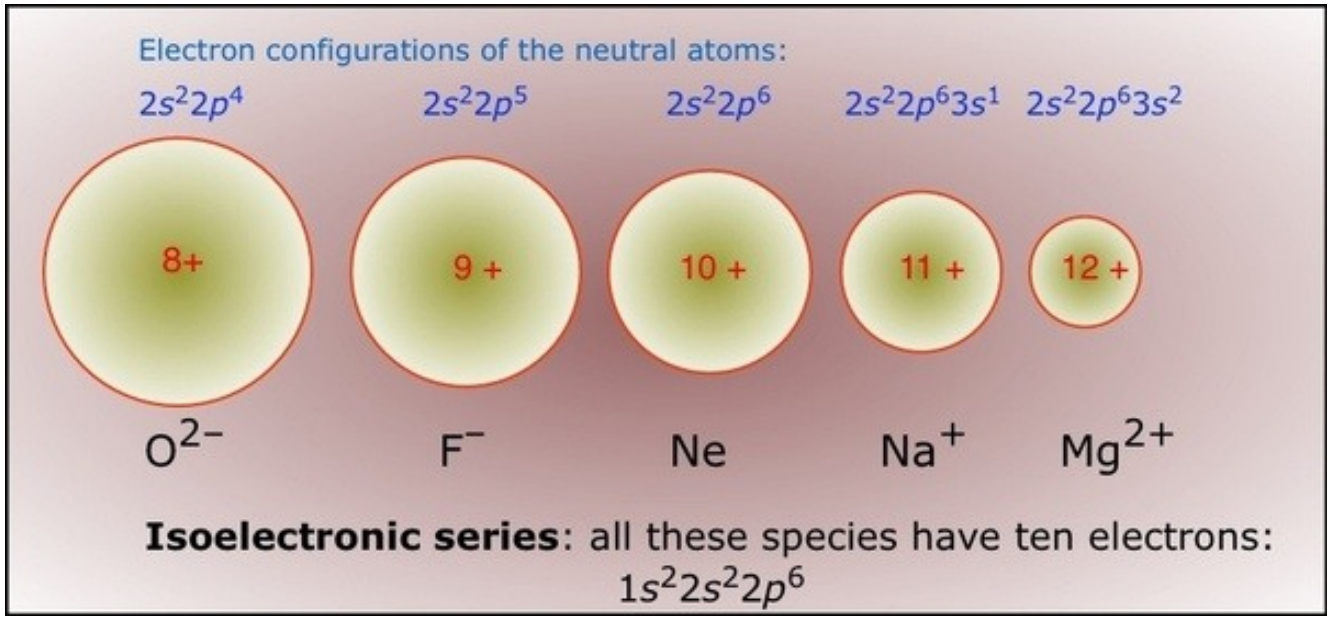




Isotones


^{99m}Tc
^{99}Tc
Energy
Isomers
43 Protons
56 Neutrons
99
same
43 Protons
56 Neutrons
99


^{131}I
^{131}Xe
Isobars
53 Protons
78 Neutrons
131
same
54 Protons
77 Neutrons
131


Electron configurations of the neutral atoms:
$2s^2 2p^4$
$2s^2 2p^5$
$2s^2 2p^6$
$2s^2 2p^6 3s^1$
$2s^2 2p^6 3s^2$
8+
9 +
10 +
11 +
12 +
O^{2-}
F^-
Ne
Na^+
Mg^{2+}
Isoelectronic series: all these species have ten electrons:
$1s^2 2s^2 2p^6$

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