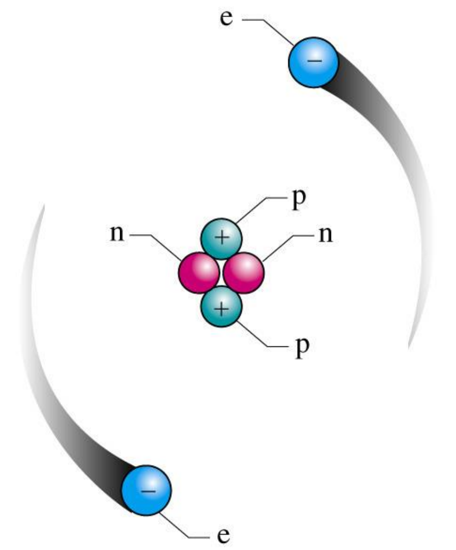
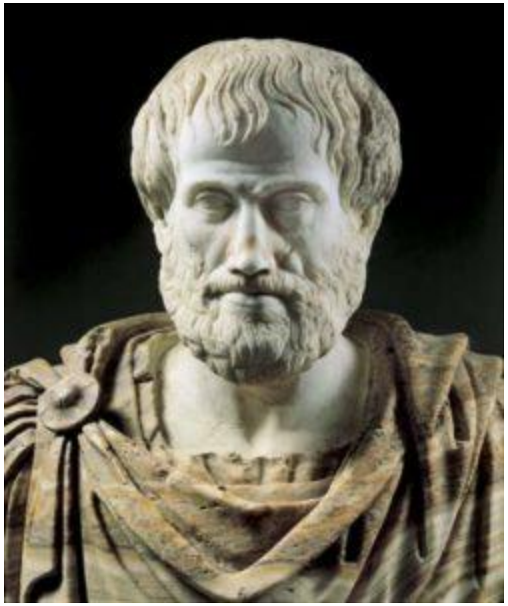
GENERAL CHEMISTRY I



Chapter 2
Atoms, Molecules, and Ions

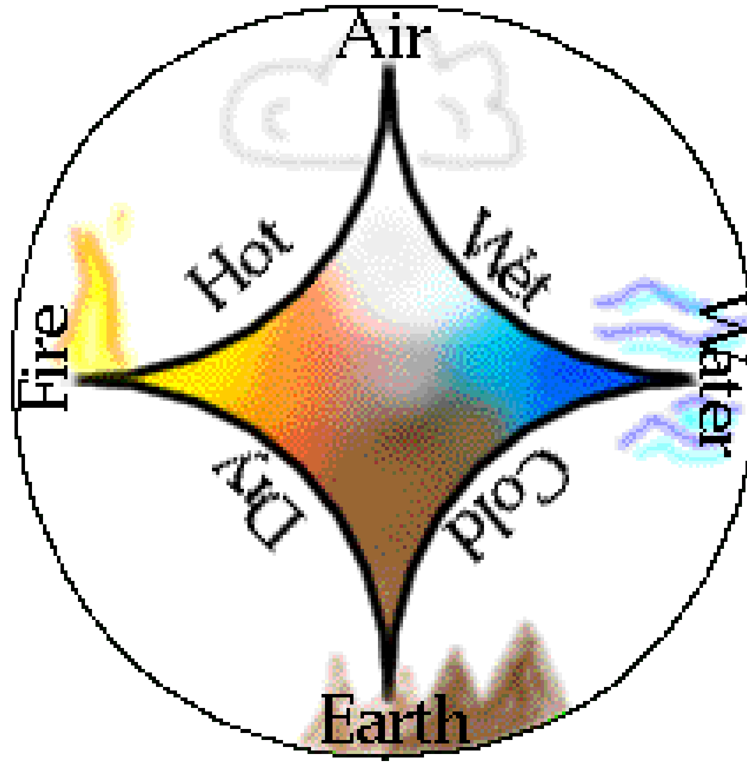
Contents

2-1 The Atomic Theory of Matter



Aristotle

(384 – 322 B.C.)

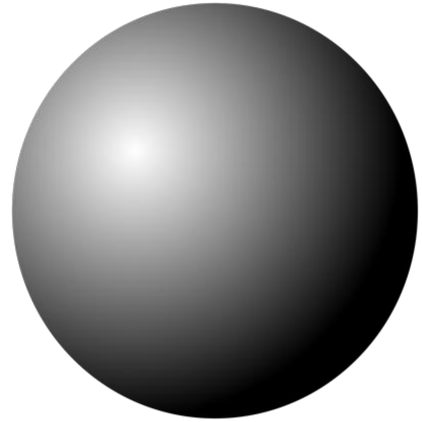


Four primary qualities of matter: hotness, coldness, wetness, and dryness

Their combinations appear as: fire (hot and dry), earth (dry and cold), water (cold and wet) and air (wet and hot)

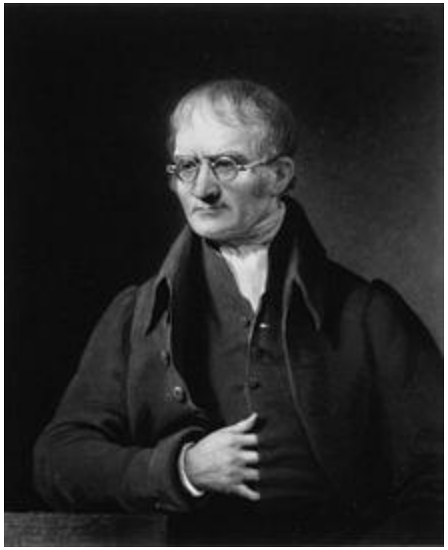
Democritus

(460 – 370 B.C.)



Atomos

- physically, but not geometrically, indivisible;
- indestructible;
- always in motion;
- there lies empty space between atoms;
- there is an infinite number of atoms and of kinds of atoms, which differ in shape and size;
- the more any indivisible exceeds, the heavier it is



John Dalton

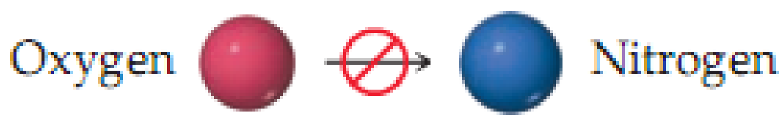
(1766 – 1844)

- Conservation of mass
- Constant composition

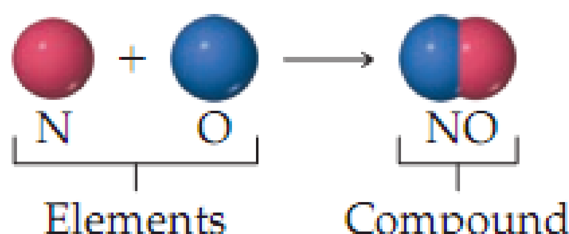
- Each element is composed of small particles called **atoms**.

- All atoms of a given element are **identical.**

- Atoms are **neither created nor destroyed nor changed from one type to another** in chemical reactions,



- **Compounds** are formed when atoms of **more than one element** combine.

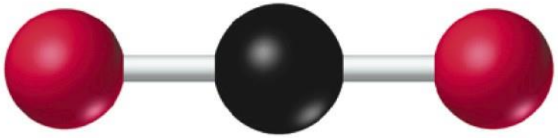


Consequences of Dalton's theory

- **Law of Definite Proportions: combinations of elements are in ratios of small whole numbers.**

☆ **In forming carbon monoxide, 1.33 g of oxygen combines with 1.0 g of carbon.**

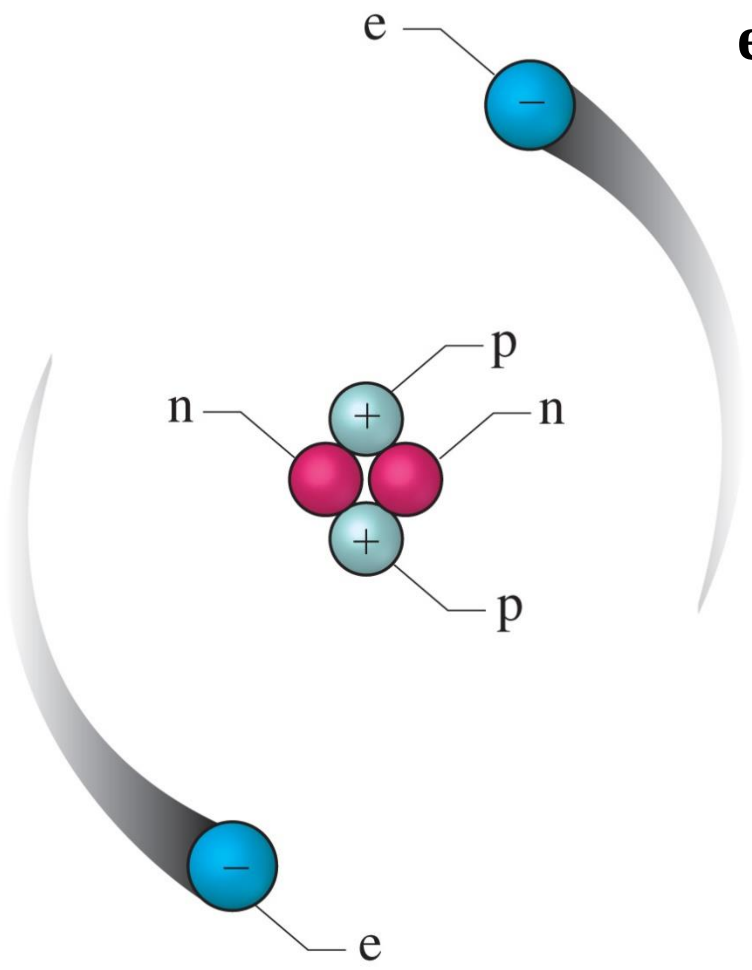
☆ **In the formation of hydrogen peroxide 2.66 g of oxygen combines with 1.0 g of hydrogen.**



2-2 Discovery in Atomic Structure

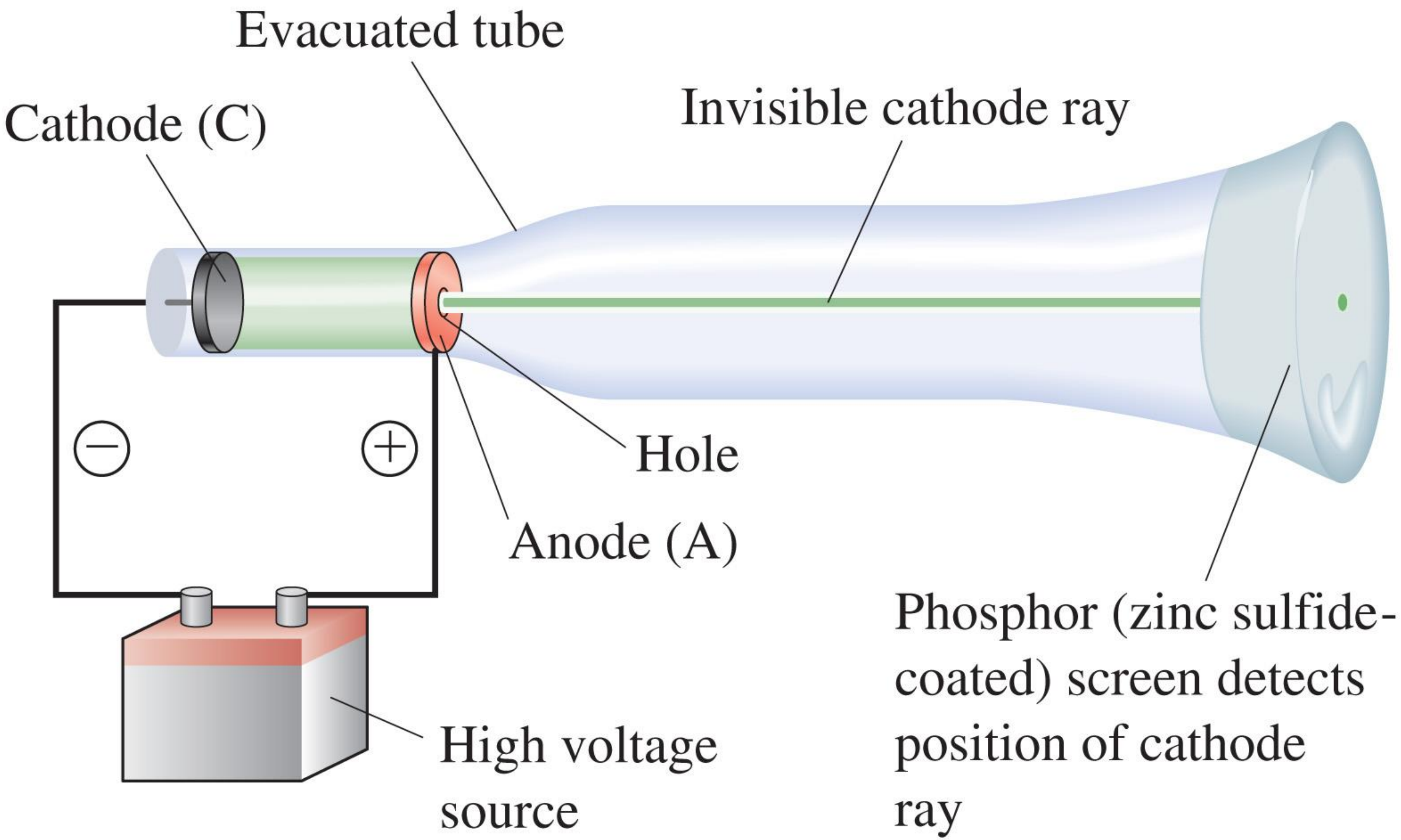
Thomson
electrons 1897

Rutherford
protons 1919

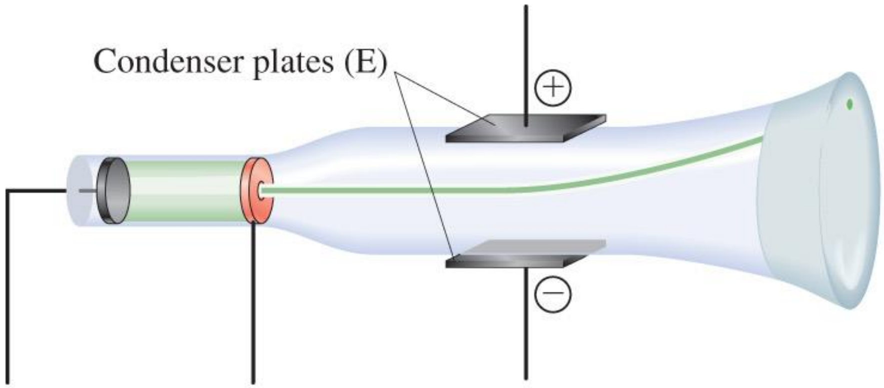


James Chadwick
neutrons 1932

Cathode rays and Electrons

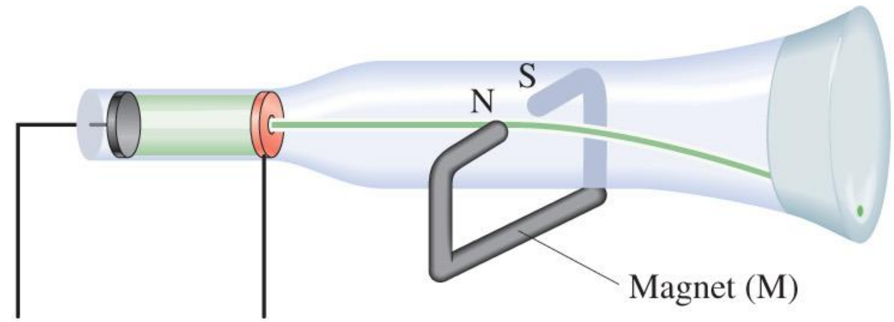


Properties of cathode rays & Discovery of electron



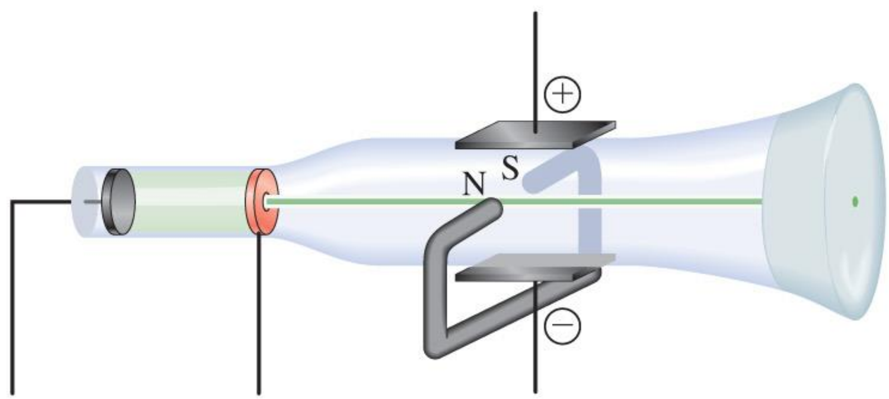
(a)

deflected by an electric field



(b)

deflected by a magnetic field

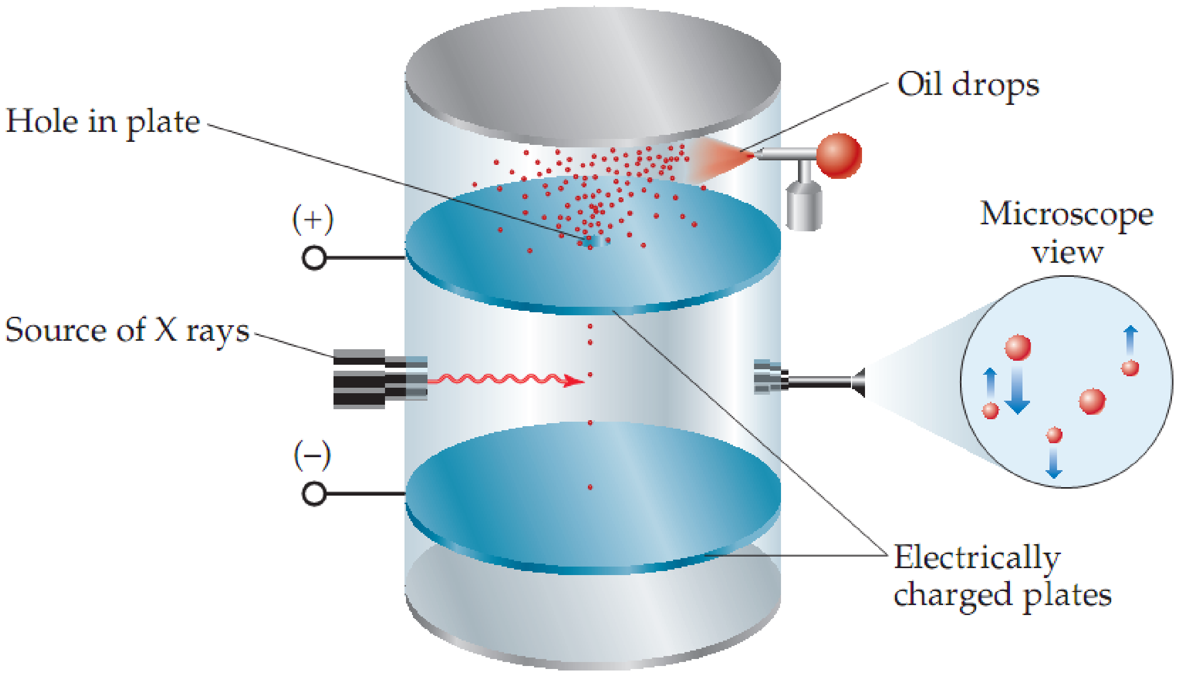


(c)

Thomson's charge-to-mass ratio e/m $= 1.76 \times 10^8$ coulombs/g

Charge on the electron

Would the masses of the oil drops be changed significantly by any electrons that accumulate on them?

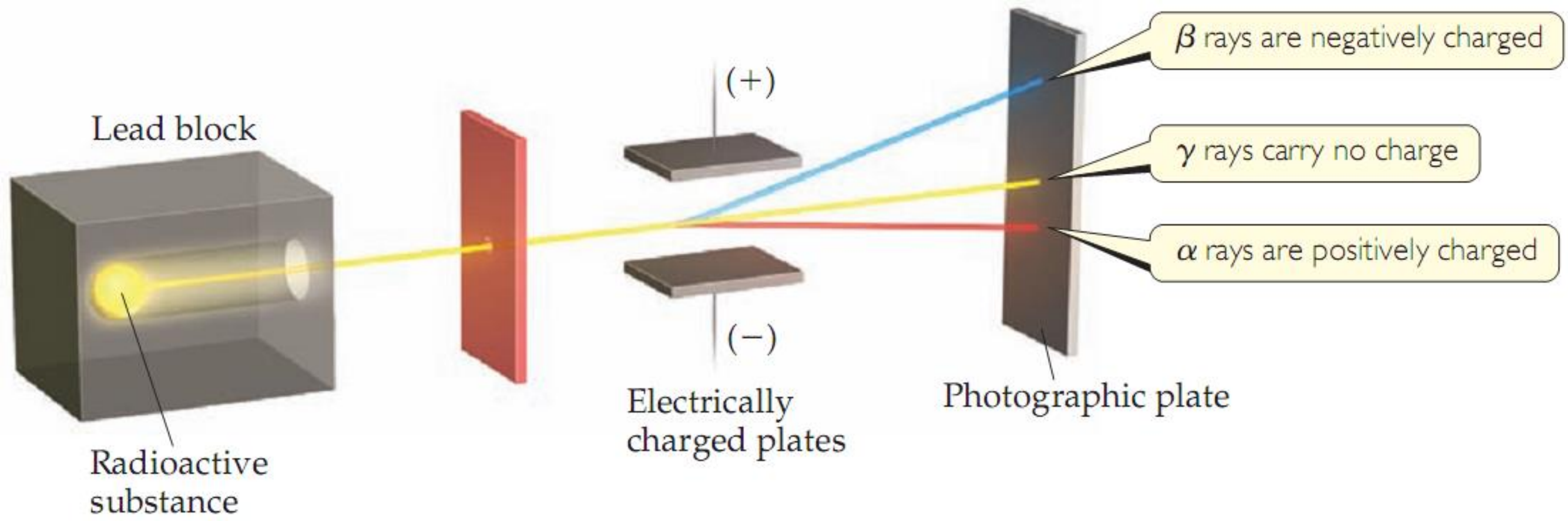


- ☆ The ionized oil drops can be balanced against the pull of gravity by an electric field.
- ☆The charge is an *integral* multiple of the electronic charge, 1.602×10^{-19} C.

Mass of the electron

$$\text{Electron mass} = \frac{1.602 \times 10^{-19}\ \text{C}}{1.76 \times 10^{8}\ \text{C/g}} = 9.10 \times 10^{-28}\ \text{g}$$

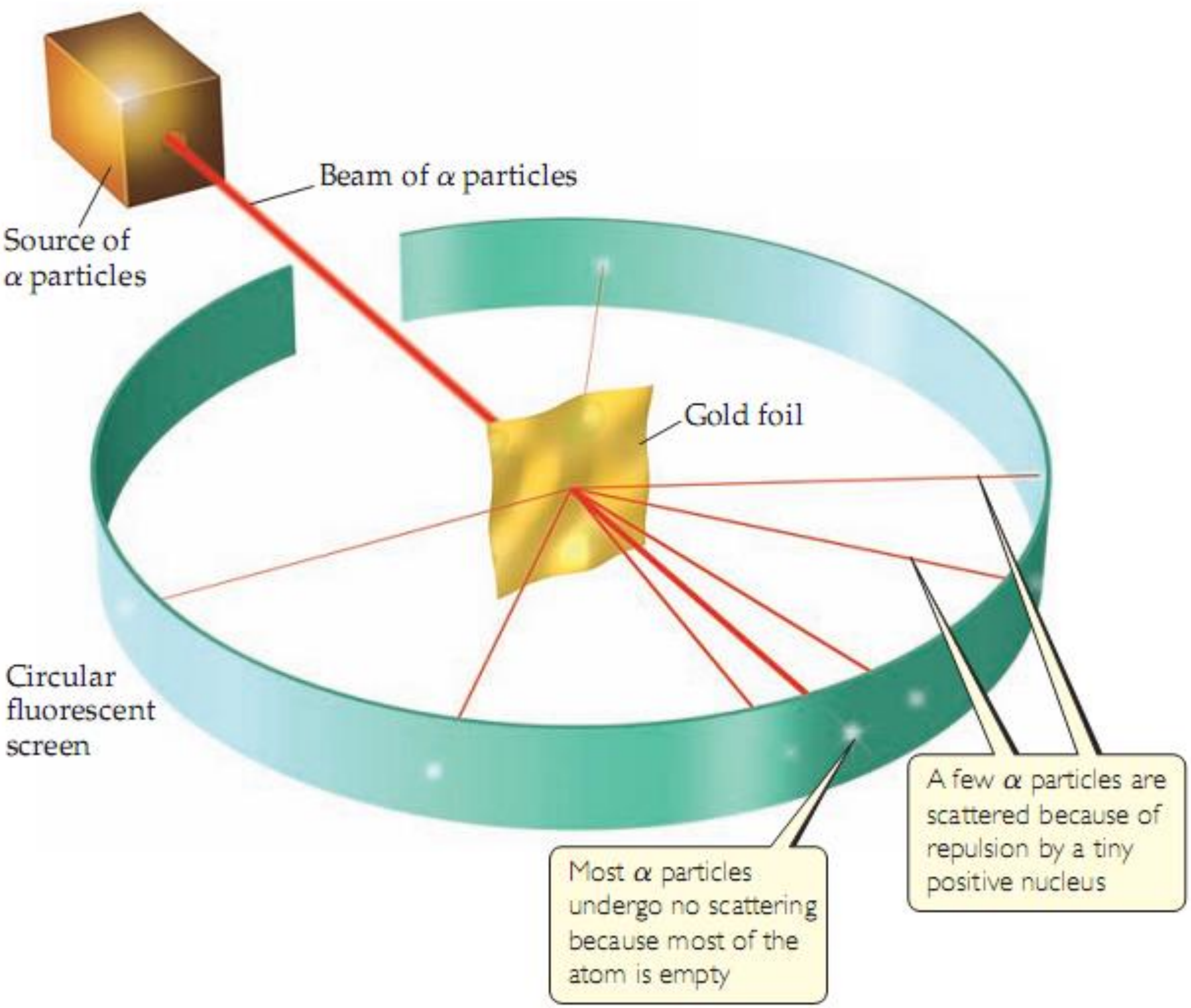
Radioactivity

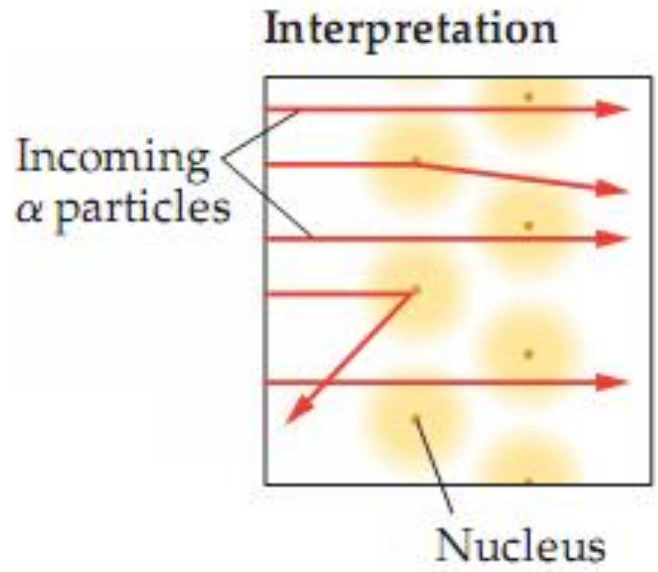


Radioactivity is the spontaneous emission of radiation from a substance.

- X-rays and γ-rays are high-energy light.
- α-particles are a stream of helium nuclei, He^{2+}.
- β-particles are a stream of high speed electrons that originate in the nucleus.

Geiger and Rutherford
1909

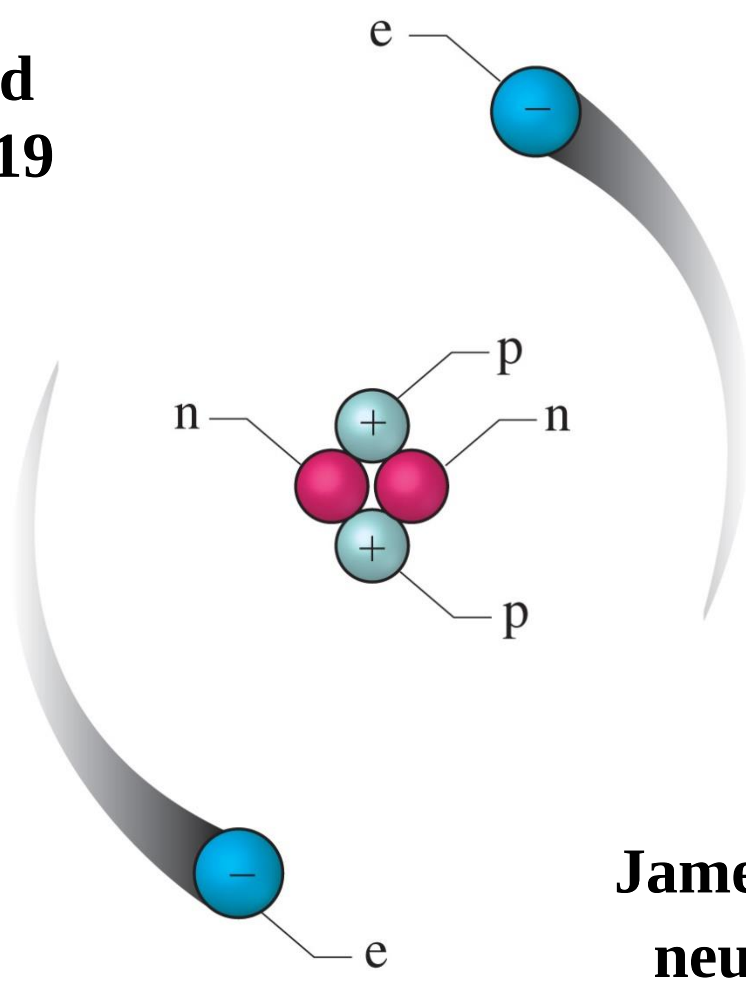




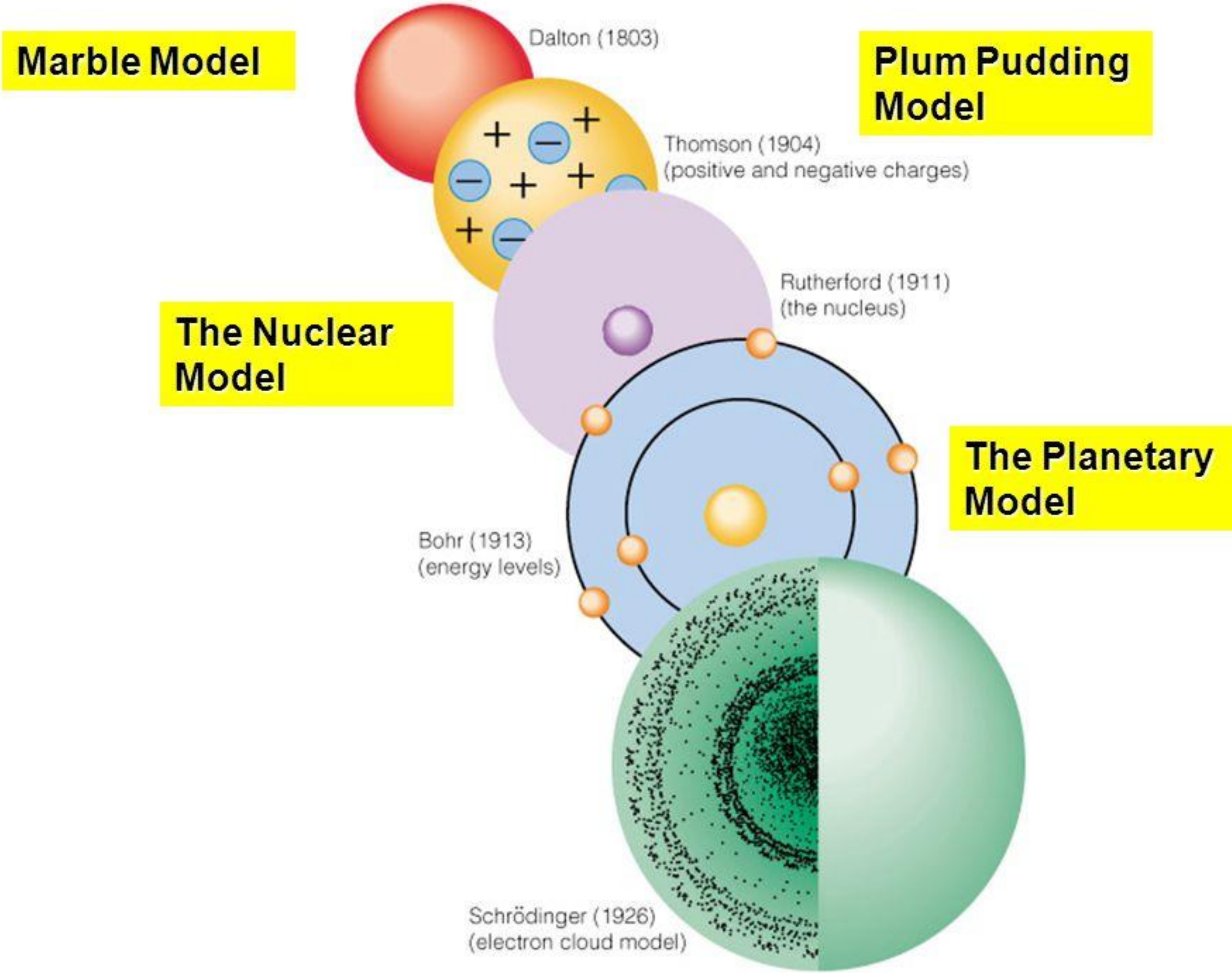
Most of the mass and all of the positive charge is concentrated in a small region called the nucleus .

There are as many electrons outside the nucleus as there are units of positive charge on the nucleus

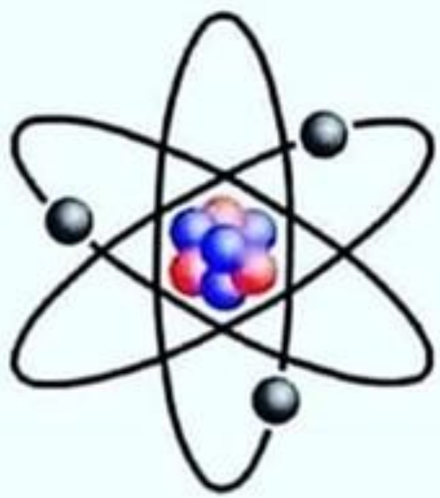
Rutherford
protons 1919



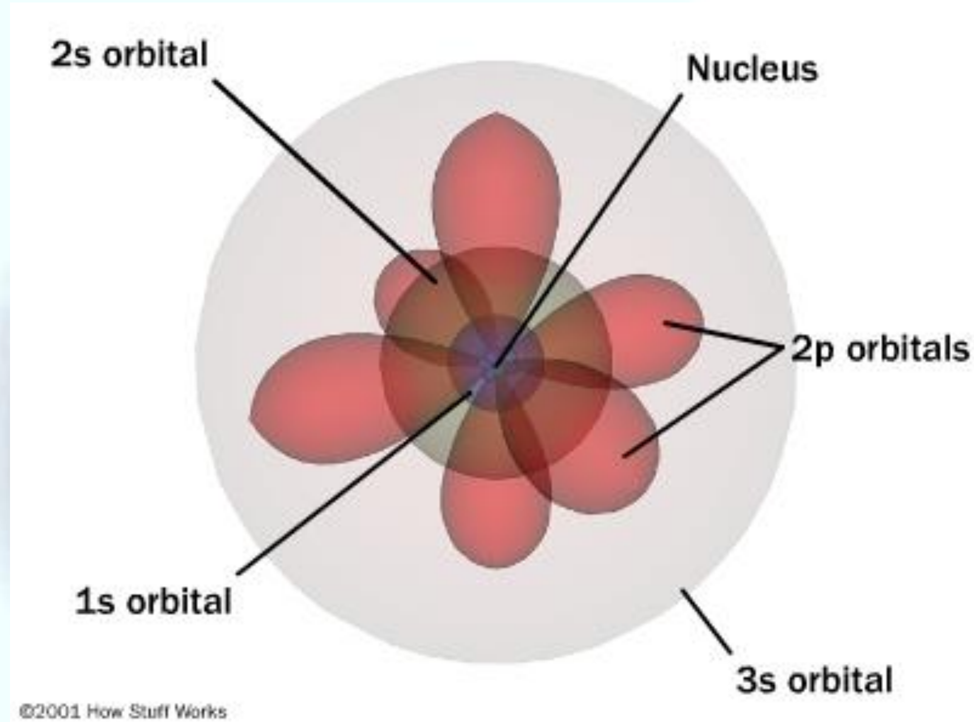
James Chadwick
neutrons 1932

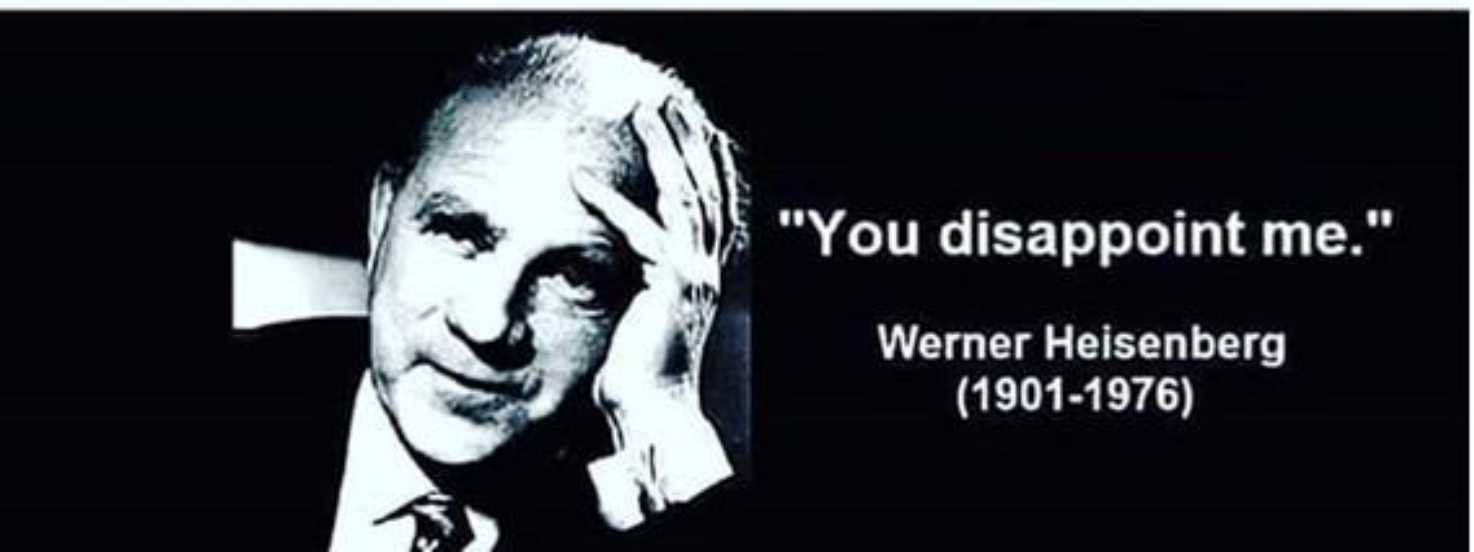

Marble Model
Dalton (1803)
Plum Pudding Model
Thomson (1904)
(positive and negative charges)
Rutherford (1911)
(the nucleus)
The Nuclear Model
The Planetary Model
Bohr (1913)
(energy levels)
Schrödinger (1926)
(electron cloud model)

When people still think that atoms look like this

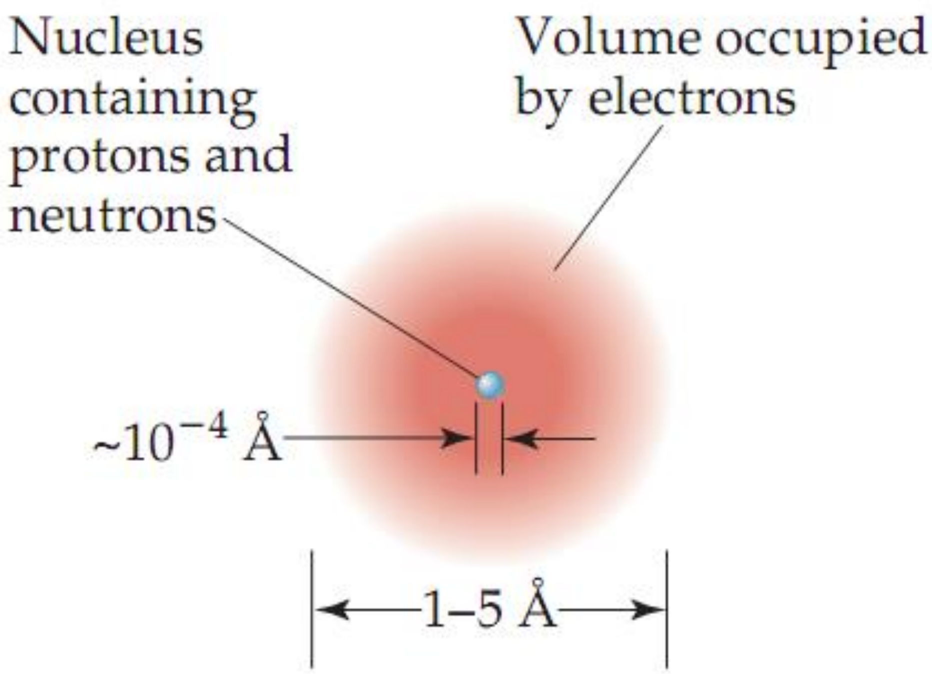


instead of this





2-3 The Modern View of Atomic Structure



Every atom has an equal number of electrons and protons, so atoms have no net electrical charge.

Chemical Elements

∗To represent a particular atom we use symbolism:

$$\text{number p} + \text{number n} \longrightarrow {}^{A}_{Z}\mathrm{E}^{\pm ?} \longleftarrow \text{number p} - \text{number e}$$

$$\text{number p} \longrightarrow Z$$

A= mass number Z = atomic number

Atomic Number & Mass Number

Symbol of carbon

Mass number

(# of protons plus neutrons)

Atomic number

(# of protons)

$$^{12}_{6}C$$

The **atomic number (Z) is always the same** for all atoms with same letter symbol

The **mass number (A) can change** for diferent atoms with the same letter symbol

Isotopes

Isotopes are atoms with the same **atomic number** but different atomic masses. This happens when two otherwise identical atoms have different numbers of **neutrons**.

$${}^{12}_{6}C \qquad {}^{13}_{6}C \qquad {}^{14}_{6}C$$

Carbon twelve	Carbon thirteen	Carbon fourteen
^{12}C	^{13}C	^{14}C
6 protons + 6 neutrons	6 protons + 7 neutrons	6 protons + 8 neutrons

2-4 Atomic Weights

∗The heaviest atom has a mass of only 4.8 × 10^{-22} g and a diameter of only 5 × 10^{-10} m.

Useful units:

- ☆ **1 amu (atomic mass unit) = 1.66054 × 10^{-27} kg**
- ☆ **1 pm (picometer) = 1 × 10^{-12} m**
- ☆ **1 Å (Angstrom) = 1 × 10^{-10} m = 100 pm = 1 × 10^{-8} cm**

Biggest atom is 240 amu and is 50 **Å** across.

Typical C-C bond length 154 pm (1.54 **Å**)

Molecular models are 1 **Å** /inch or about 0.4 **Å** /cm

Atomic mass unit (amu)

one twelfth of the mass of an unbound neutral atom of carbon 12 in its nuclear and electronic ground state and at rest, and has a value of $1.660539040(20)\times10^{-27}$ kg,

Particle	Mass		Electric Charge	
	kg	**amu**	**Coulombs**	**(*e*)**
Electron	9.1094×10^{-31}	0.00054858	-1.6022×10^{-19}	–1
Proton	1.6726×10^{-27}	1.0073	$+1.6022 \times 10^{-19}$	+1
Neutron	1.6749×10^{-27}	1.0087	0	0

Atomic Weight vs Atomic Mass

- Most of carbon atoms have just 6 protons and 6 neutrons

Atomic mass of ^{12}C = 6+6 =12

- Some carbon atoms have 6 protons and 7 neutrons

Atomic mass of ^{13}C = 6+7 =13

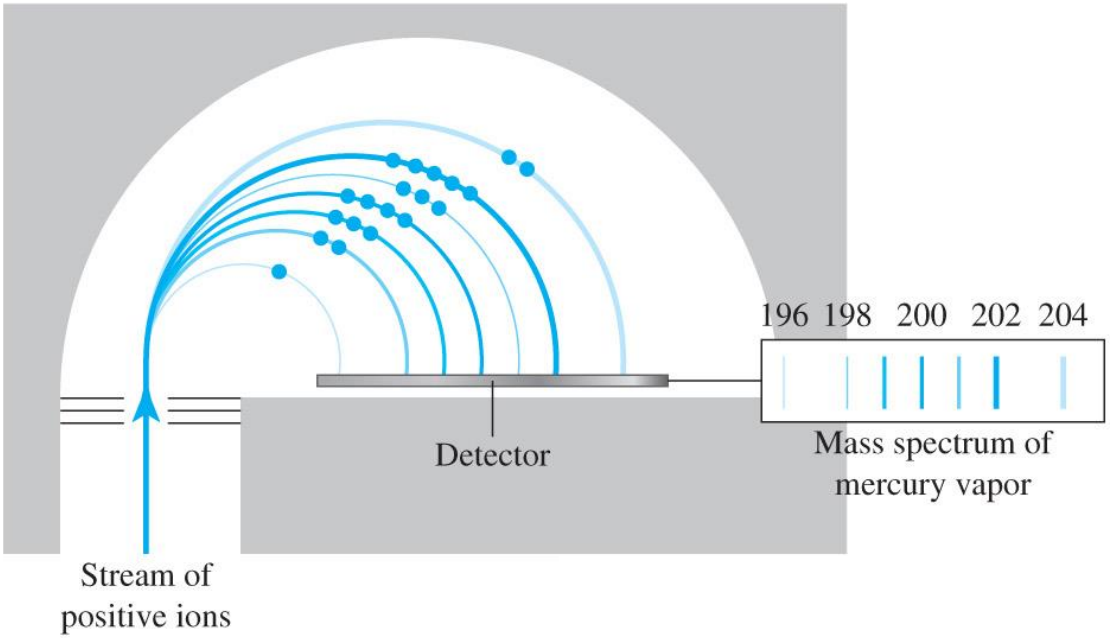
- Even fewer number of carbon atoms have 6 protons and 8 neutrons

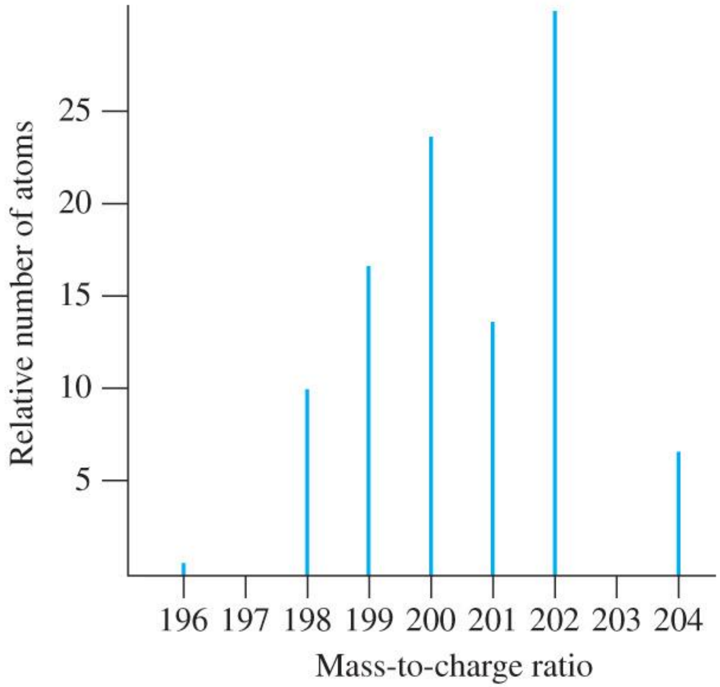
Atomic mass of ^{14}C = 6+8 =14

Which one is most representative?

$$\text{Atomic weight} = \sum_{\substack{\text{over all}\\ \text{isotopes of}\\ \text{the element}}} \left[(\text{isotope mass}) \times (\text{fractional isotope abundance}) \right]$$

Fractional Isotope Abundance





EXAMPLE

Naturally occurring carbon is composed of 98.93% ^{12}C and 1.07% ^{13}C.

The atomic mass of ^{12}C is (exactly) 12 u, and

the atomic mass of ^{13}C is 13.00335 u,

making the atomic weight of carbon:

$$\left(\frac{98.93}{100}\right)12u + \left(\frac{1.07}{100}\right)13.00335u = 12.01u$$

The sum of the percent natural abundances must be 100%.

EXAMPLE

Naturally occurring chlorine is 75.78% ^{35}Cl (atomic mass 34.969 u) and 24.22% ^{37}Cl (atomic mass 36.966 u). Calculate the atomic weight of chlorine.

$$\begin{aligned}\text{Atomic weight} &= (0.7578)(34.969\ \text{u}) + (0.2422)(36.966\ \text{u}) \\ &= 26.50\ \text{u} + 8.953\ \text{u} \\ &= 35.45\ \text{u}\end{aligned}$$

EXAMPLE

Relating the Masses and Natural Abundances of Isotopes to the Atomic Mass of an Element.

Bromine has two naturally occurring isotopes, bromine-79 and bromine-81. Bromine-79 has a mass of 78.9183 u and an abundance of 50.69%. Use the atomic weight of bromine found in the periodic table to determine the mass and percent of natural abundance of bromine-81?

EXAMPLE

Solution

Write the general equations

$$100\% = \chi_1 + \chi_2 + \chi_3 \ldots$$

$$\text{Atomic mass} = \chi_1 \times m_1 + \chi_2 \times m_2 + \chi_3 \times m_3 \ldots$$

EXAMPLE

Identify the knowns and unknowns in the specific equations

$$\text{Atomic mass} = \chi_{Br\text{-}79} \times m_{Br\text{-}79} + \chi_{Br\text{-}81} \times m_{Br\text{-}81}$$

Solve

$$100\% = \chi_{79} + \chi_{81}$$

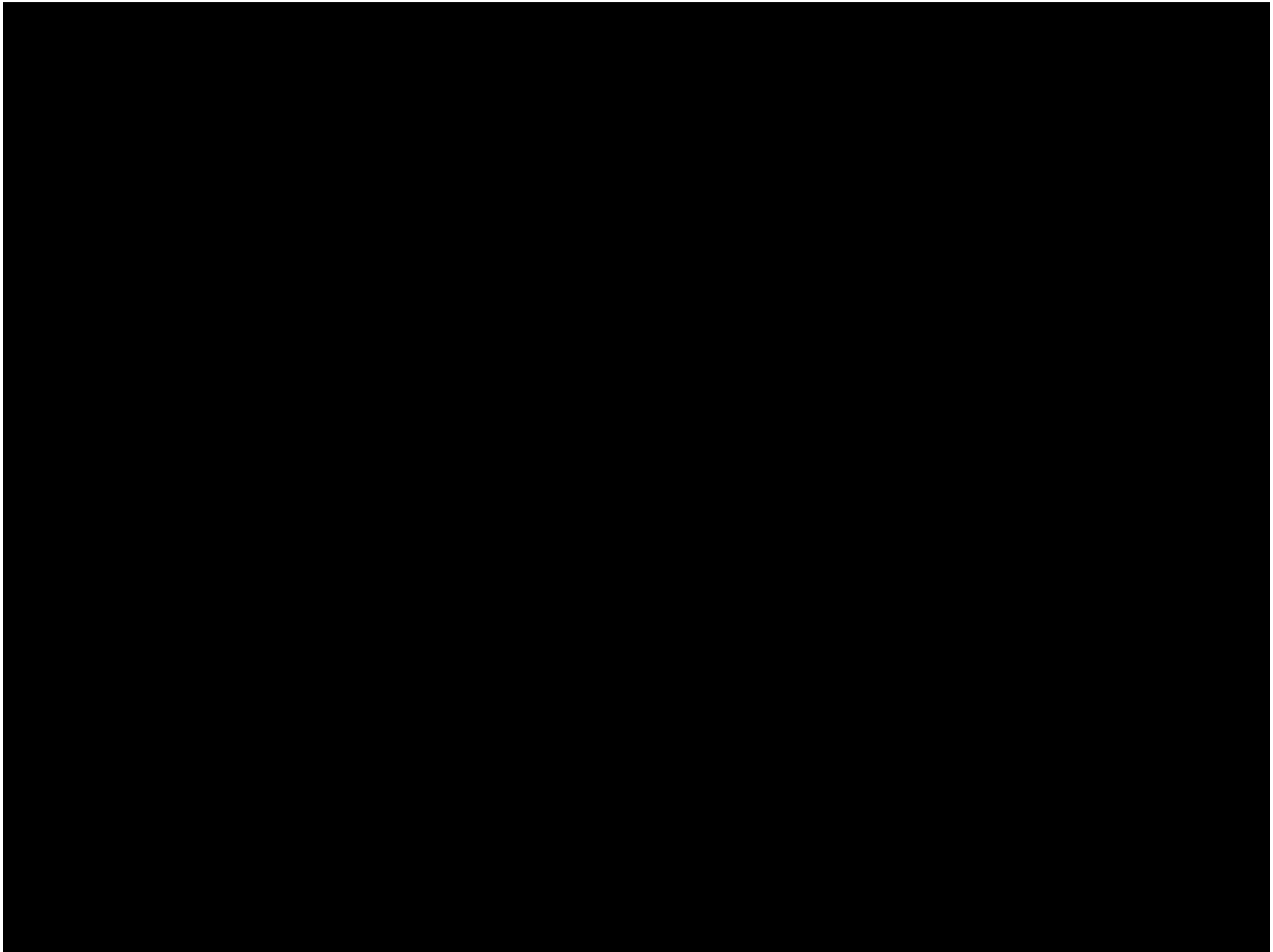
$$\chi_{81} = 100\% - \chi_{79}$$

$$m_{Br\text{-}81} = \frac{\text{Atomic mass} - (\chi_{Br\text{-}79} \times m_{Br\text{-}79})}{\chi_{Br\text{-}81}}$$

Calculate

$$m_{Br\text{-}81} = \frac{79.904\ \text{u} - (0.5069 \times 78.9183\ \text{u})}{0.4931} = 80.92\ \text{u}$$

2-5 The Periodic Table



- C Solid
- Hg Liquid
- H Gas
- Rf Unknown

Metals: Alkali metals | Alkaline earth metals | Lanthanoids (Lanthanides) | Actinoids (Actinides) | Transition metals | Post-transition metals

Metalloids

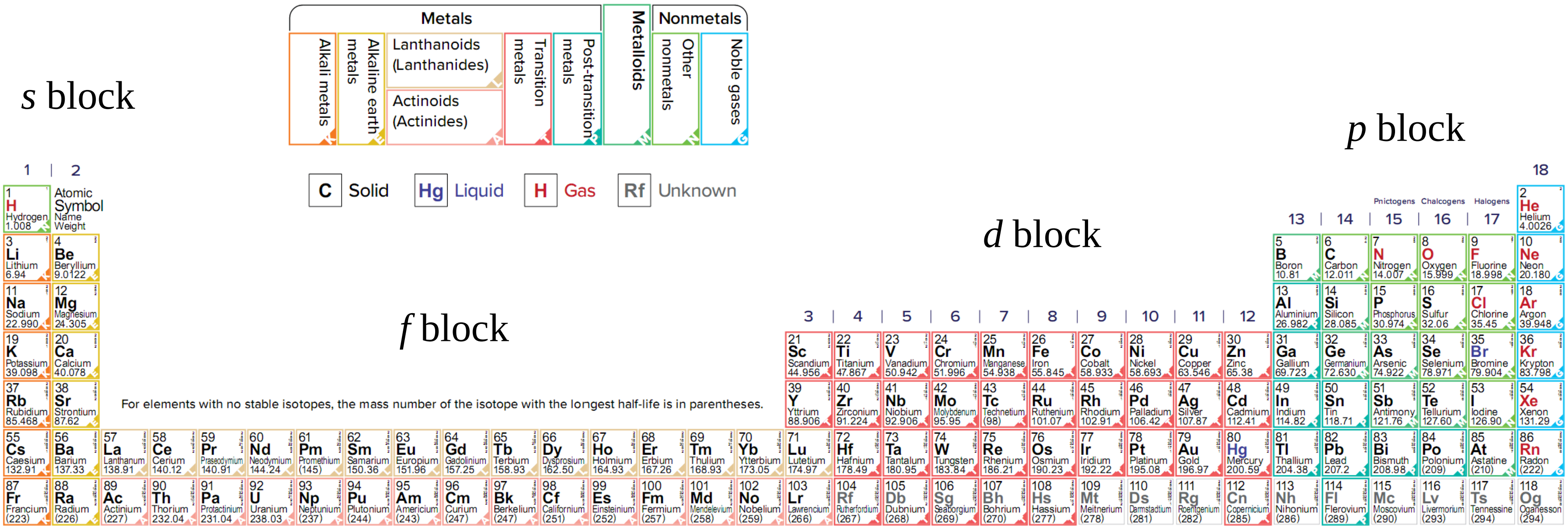
Nonmetals: Other nonmetals | Noble gases

	1 IA	2 IIA	3 IIIB	4 IVB	5 VB	6 VIB	7 VIIB	8 VIIIB	9 VIIIB	10 VIIIB	11 IB	12 IIB	13 IIIA	14 IVA	15 VA Pnictogens	16 VIA Chalcogens	17 VIIA Halogens	18 VIIIA
1	1 H Hydrogen 1.008																	2 He Helium 4.0026
2	3 Li Lithium 6.94	4 Be Beryllium 9.0122											5 B Boron 10.81	6 C Carbon 12.011	7 N Nitrogen 14.007	8 O Oxygen 15.999	9 F Fluorine 18.998	10 Ne Neon 20.180
3	11 Na Sodium 22.990	12 Mg Magnesium 24.305											13 Al Aluminium 26.982	14 Si Silicon 28.085	15 P Phosphorus 30.974	16 S Sulfur 32.06	17 Cl Chlorine 35.45	18 Ar Argon 39.948
4	19 K Potassium 39.098	20 Ca Calcium 40.078	21 Sc Scandium 44.956	22 Ti Titanium 47.867	23 V Vanadium 50.942	24 Cr Chromium 51.996	25 Mn Manganese 54.938	26 Fe Iron 55.845	27 Co Cobalt 58.933	28 Ni Nickel 58.693	29 Cu Copper 63.546	30 Zn Zinc 65.38	31 Ga Gallium 69.723	32 Ge Germanium 72.630	33 As Arsenic 74.922	34 Se Selenium 78.971	35 Br Bromine 79.904	36 Kr Krypton 83.798
5	37 Rb Rubidium 85.468	38 Sr Strontium 87.62	39 Y Yttrium 88.906	40 Zr Zirconium 91.224	41 Nb Niobium 92.906	42 Mo Molybdenum 95.95	43 Tc Technetium (98)	44 Ru Ruthenium 101.07	45 Rh Rhodium 102.91	46 Pd Palladium 106.42	47 Ag Silver 107.87	48 Cd Cadmium 112.41	49 In Indium 114.82	50 Sn Tin 118.71	51 Sb Antimony 121.76	52 Te Tellurium 127.60	53 I Iodine 126.90	54 Xe Xenon 131.29
6	55 Cs Caesium 132.91	56 Ba Barium 137.33	57–71	72 Hf Hafnium 178.49	73 Ta Tantalum 180.95	74 W Tungsten 183.84	75 Re Rhenium 186.21	76 Os Osmium 190.23	77 Ir Iridium 192.22	78 Pt Platinum 195.08	79 Au Gold 196.97	80 Hg Mercury 200.59	81 Tl Thallium 204.38	82 Pb Lead 207.2	83 Bi Bismuth 208.98	84 Po Polonium (209)	85 At Astatine (210)	86 Rn Radon (222)
7	87 Fr Francium (223)	88 Ra Radium (226)	89–103	104 Rf Rutherfordium (267)	105 Db Dubnium (268)	106 Sg Seaborgium (269)	107 Bh Bohrium (270)	108 Hs Hassium (277)	109 Mt Meitnerium (278)	110 Ds Darmstadtium (281)	111 Rg Roentgenium (282)	112 Cn Copernicium (285)	113 Nh Nihonium (286)	114 Fl Flerovium (289)	115 Mc Moscovium (290)	116 Lv Livermorium (293)	117 Ts Tennessine (294)	118 Og Oganesson (294)

For elements with no stable isotopes, the mass number of the isotope with the longest half-life is in parentheses.

6	57 La Lanthanum 138.91	58 Ce Cerium 140.12	59 Pr Praseodymium 140.91	60 Nd Neodymium 144.24	61 Pm Promethium (145)	62 Sm Samarium 150.36	63 Eu Europium 151.96	64 Gd Gadolinium 157.25	65 Tb Terbium 158.93	66 Dy Dysprosium 162.50	67 Ho Holmium 164.93	68 Er Erbium 167.26	69 Tm Thulium 168.93	70 Yb Ytterbium 173.05	71 Lu Lutetium 174.97
7	89 Ac Actinium (227)	90 Th Thorium 232.04	91 Pa Protactinium 231.04	92 U Uranium 238.03	93 Np Neptunium (237)	94 Pu Plutonium (244)	95 Am Americium (243)	96 Cm Curium (247)	97 Bk Berkelium (247)	98 Cf Californium (251)	99 Es Einsteinium (252)	100 Fm Fermium (257)	101 Md Mendelevium (258)	102 No Nobelium (259)	103 Lr Lawrencium (266)

The Long Periodic table



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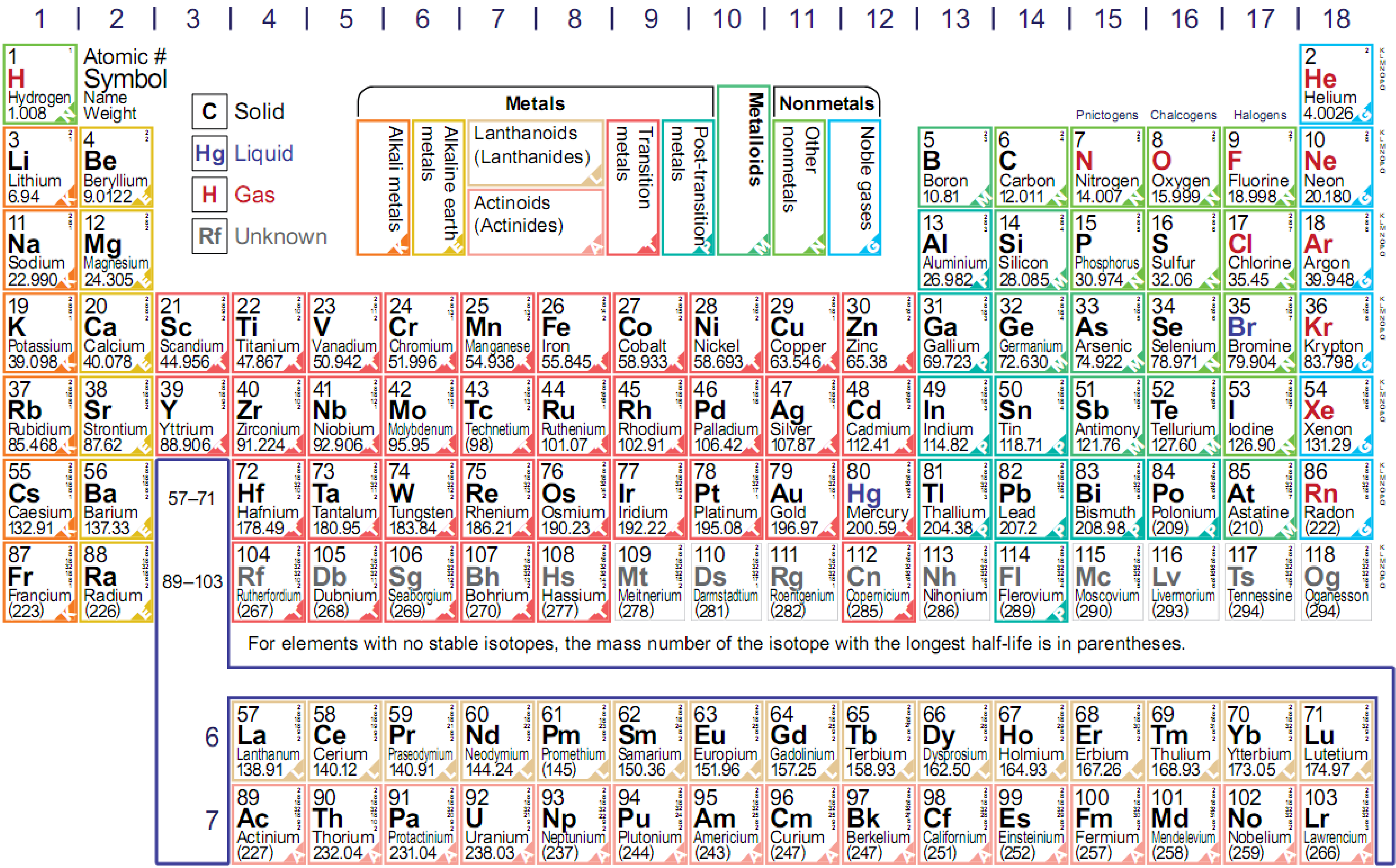


- Read atomic masses.
- Read the ions formed by main group elements.
- Read the electron configuration.
- Learn trends in physical and chemical properties.

EXAMPLE

1. Which two of these elements would you expect to show the greatest similarity in chemical and physical properties: B, Ca, F, He, Mg, P?

Your answer: ___________________________________

2. A biochemist who is studying the properties of certain sulfur (S)–containing compounds in the body wonders whether trace amounts of another nonmetallic element might have similar behavior. To which element should she turn her attention?

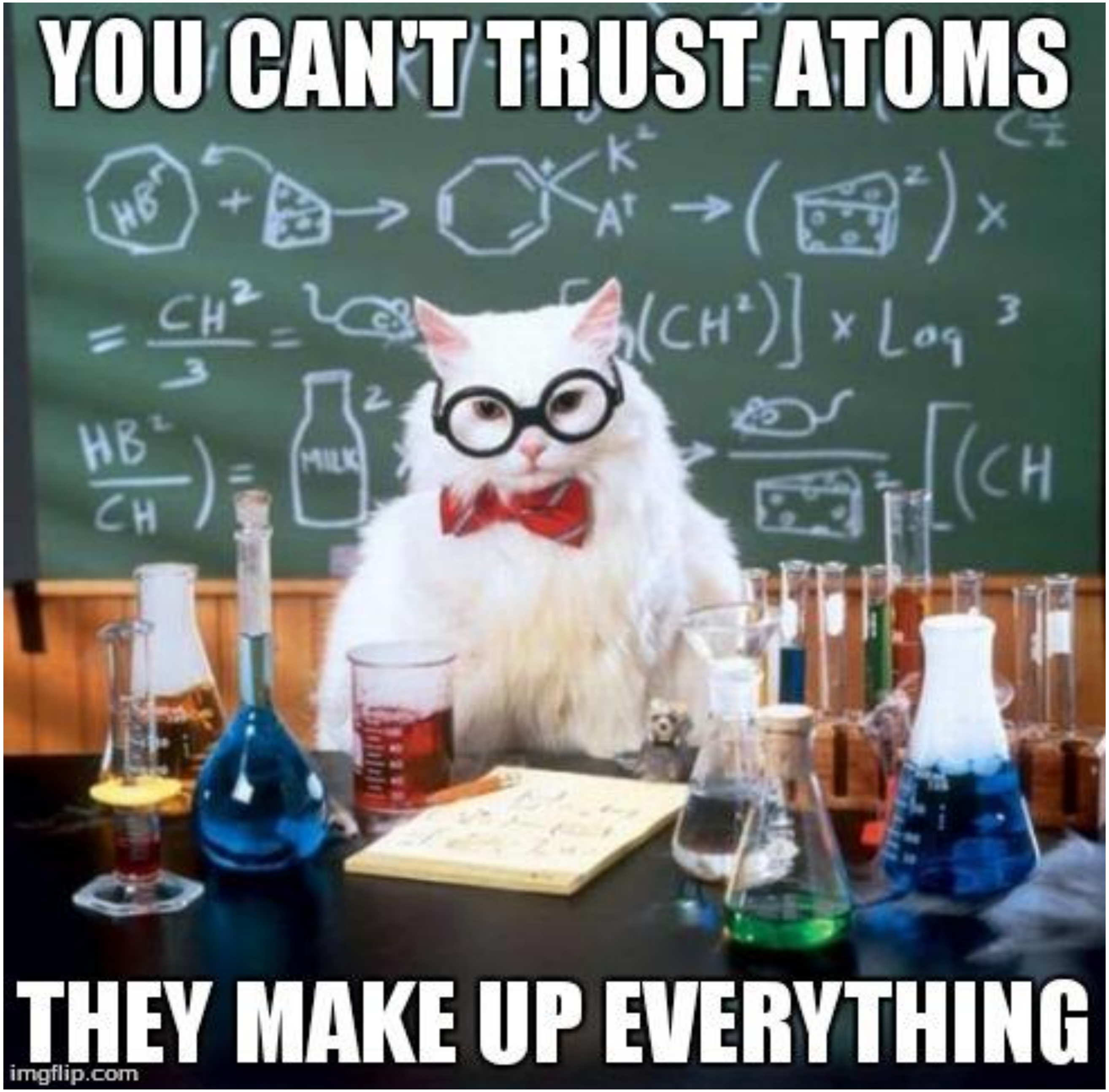
(a) O,

(b) As,

(c) Se,

(d) Cr,

(e) P


YOU CAN'T TRUST ATOMS
THEY MAKE UP EVERYTHING
imgflip.com

2-6 Molecules and Molecular Compounds

- Only the noble-gas elements are normally found in nature as isolated atoms.
- Most matter is composed of molecules or ions.

Diatomic molecules

Hydrogen, H_2

Oxygen, O_2

Molecular compounds

Water, H_2O

Methane, CH_4

Carbon monoxide, CO

Ethylene, C_2H_4

Molecular compounds are generally composed of nonmetals only

Molecular and Empirical Formulas

- Chemical formulas that indicate the **actual numbers of atoms** in a molecule are called **molecular formulas**
- Chemical formulas that give only the **relative number of atoms of each type** in a molecule are called **empirical formulas**

Example:

	Hydrogen peroxide	Ethylene
Molecular formula	H_2O_2	C_2H_4
Empirical formula	HO	CH_2

- For many substances, the molecular formula and the empirical formula are identical, as in the case of water, H2O

EXAMPLE

Write the empirical formulas for

(a) glucose, a substance also known as either blood sugar or dextrose—molecular, whose molecular formula is $C_6H_{12}O_6$;

(b) nitrous oxide, a substance used as an anesthetic and commonly called laughing gas—molecular, whose molecular formula is N_2O

(c) decaborane, whose molecular formula is $B_{10}H_{14}$

PRACTICE 1

Tetracarbon dioxide is an unstable oxide of carbon with the following molecular structure:

What are the molecular and empirical formulas of this substance?

(a) C_2O_2, CO_2,

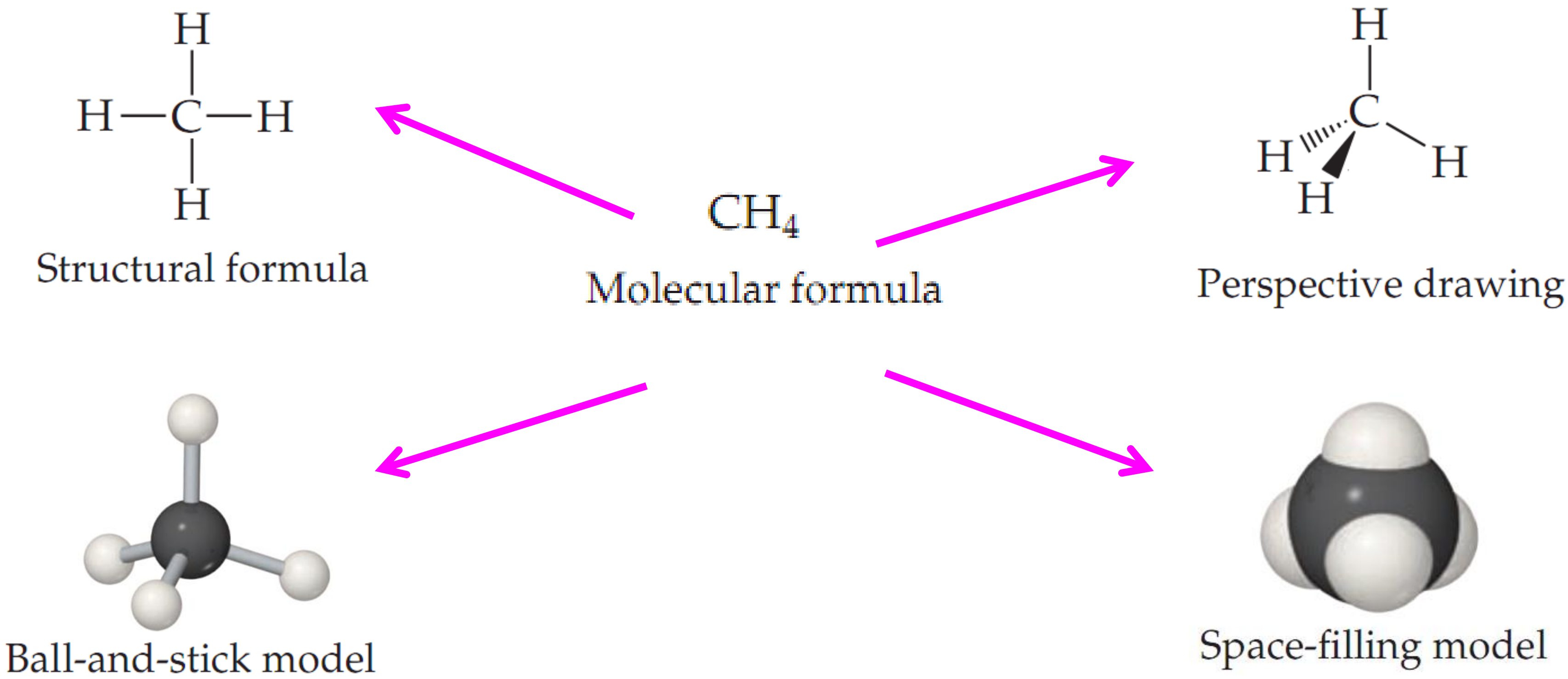
(b) C_4O, CO,

(c) CO_2, CO_2,

(d) C_4O_2, C_2O,

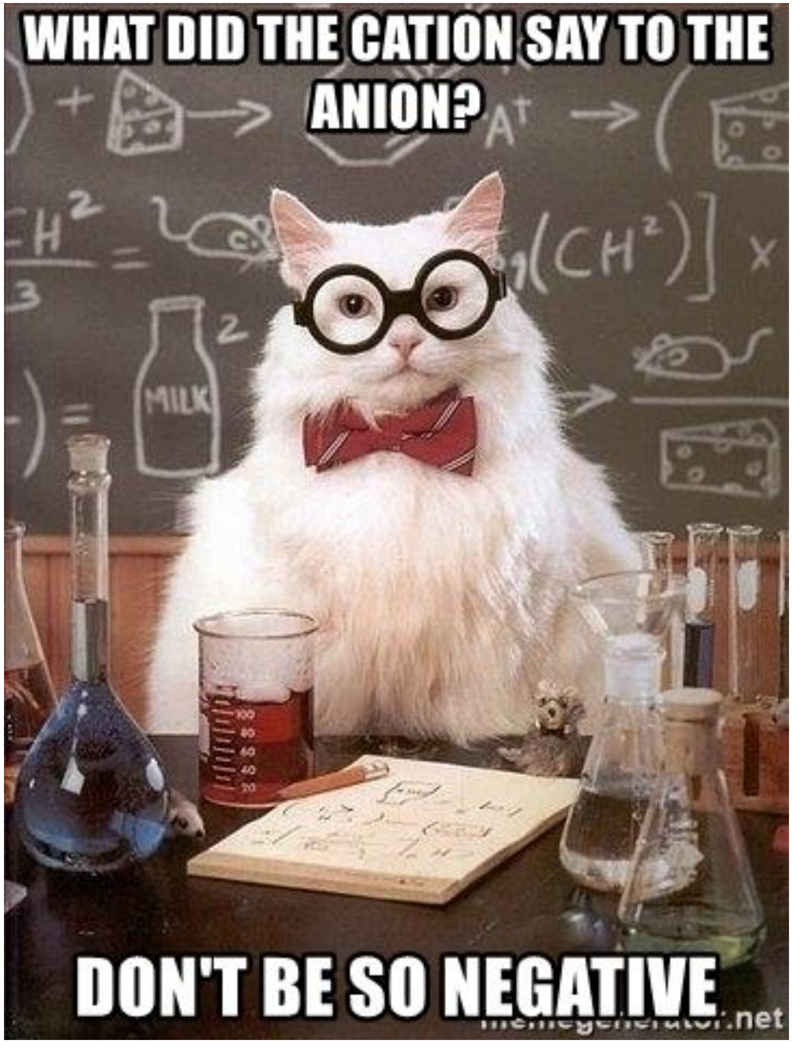
(e) C_2O, CO_2.

Picturing Molecules

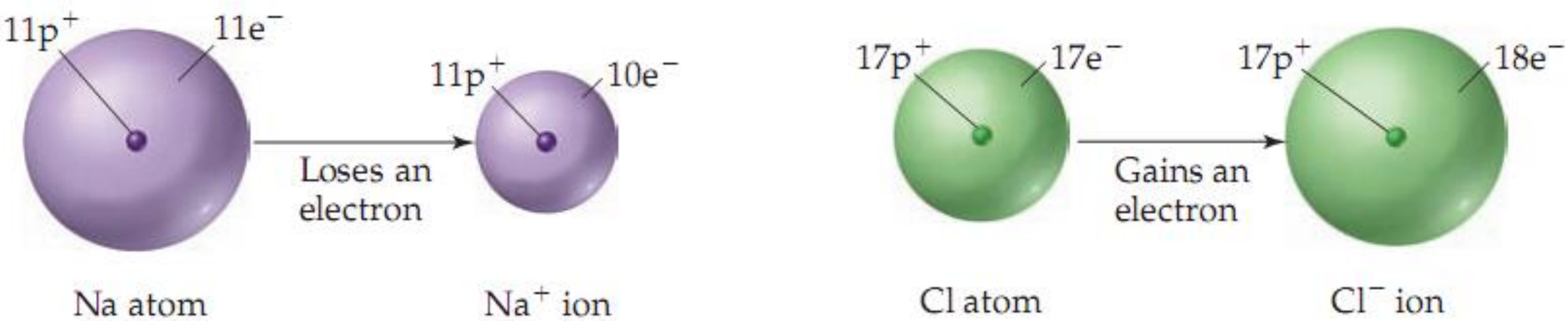


- A **symbol-and-line formula** usually does not show the actual angles between atoms
- A **perspective drawing** shows the three-dimensional shape
- A **ball-and-stick model** represents the angles beween atoms
- A **space-filling model** show the relative sizes of the atoms, but the angles between atoms

2-7 Ions and Ionic Compounds



How do ions form?



- A **positive** charge ion is a **cation** (pronounced CAT-ion);
- A **negatively** charged ion is an **anion** (AN-ion)

EXAMPLE

Give the chemical symbol, including superscript indicating mass number, for

(a) the ion with 22 protons, 26 neutrons, and 19 electrons;

(b) the ion of sulfur that has 16 neutrons and 18 electrons.

EXAMPLE

1. In which of the following species is the number of protons less than the number of electrons?

(a) Ti^{2+},

(b) P^{3-},

(c) Mn,

(d) Se_4^{2-}

(e) Ce^{4+}.

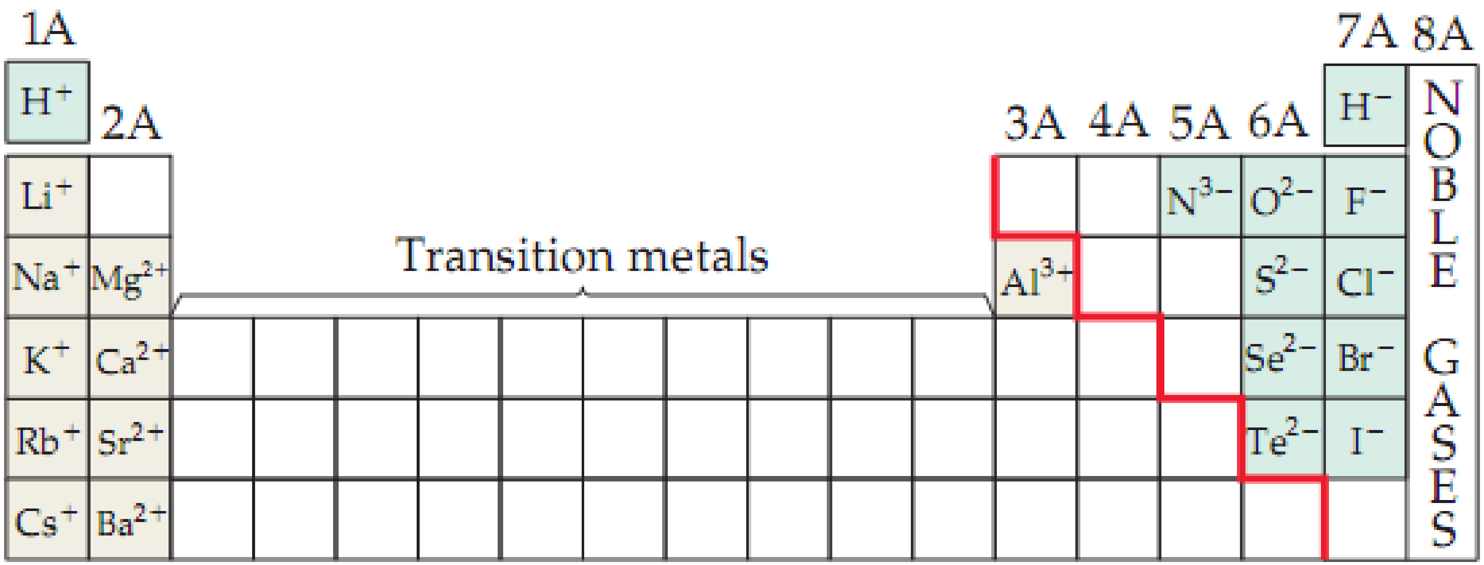
Your answer: ______________________________________

2. How many protons, neutrons, and electrons does the $^{79}Se^{2-}$ *ion possess?*

Your answer: _____ protons, ______ neutrons, ______ electrons

Predicting Ionic Charges

- The noble gases are chemically nonreactive elements that form very few compounds.
- Many atoms gain or lose electrons to end up with **the same number of electrons as the noble gas closest to them** in the periodic table.



- *The red stepped line that divides metals from nonmetals also separates cations from anions.*
- *Hydrogen forms both 1+ and 1- ions.*

EXAMPLE

1. Predict the charge expected for the most stable ion of

(a) barium

(b) Oxygen

(c) Aluminum

(d) fluorine.

EXAMPLE

3. Use the periodic table to determine which of the following ions has a noble–gas electron arrangement, and which do not. For those that do, indicate the noble–gas arrangement they match:

(a) Ti^{4+},

(b) Mn^{2+},

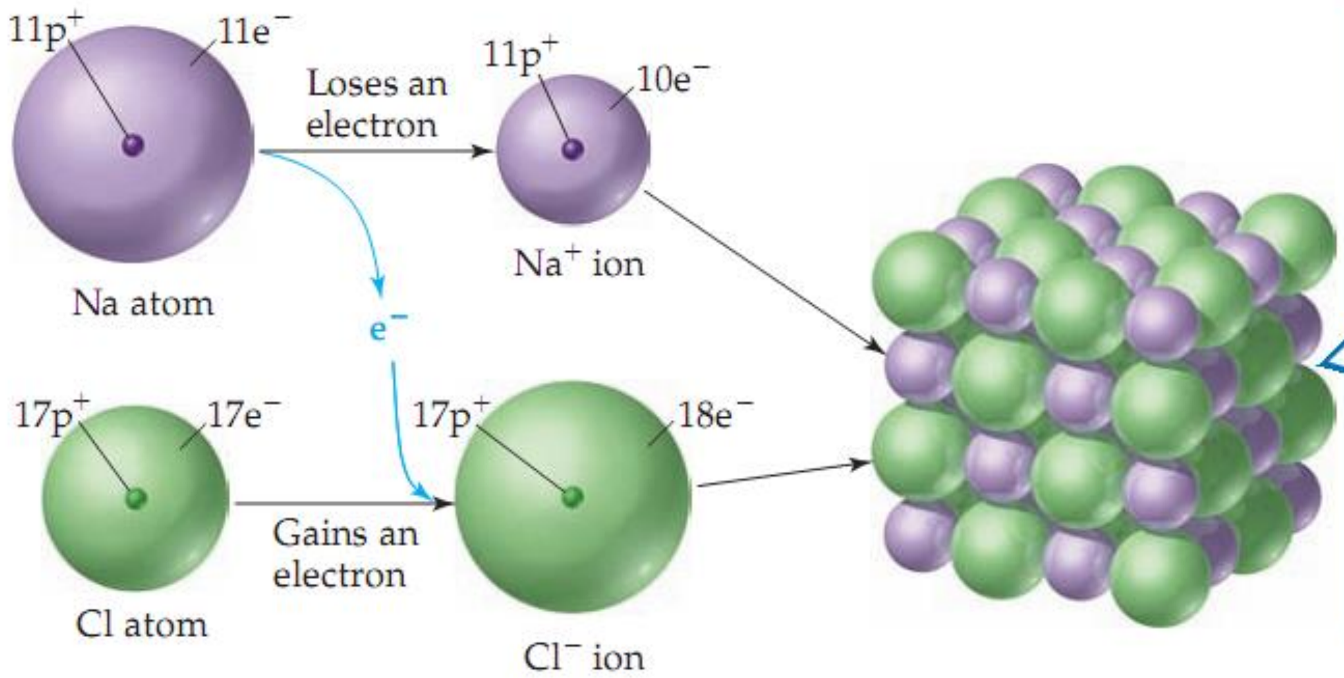
(c) Pb^{2+},

(d) Te^{2-} ,

(e) Zn^{2+}.

Ionic Compounds

- A great deal of chemical activity involves the transfer of electrons from one substance to another



Ionic compounds are generally combinations of metals and nonmetals

EXAMPLE

1. Which of these compounds would you expect to be ionic: N_2O, Na_2O, $CaCl_2$, SF_4?

Your answer:____

2. Which of these compounds are molecular: CBr_4, FeS, P_4O_6, PbF_2

Yout answer: ____

EXAMPLE

Give a reason why each of the following statements is a safe prediction:

(a) Every compound of Rb with a nonmetal is ionic in character.

(b) Every compound of nitrogen with a halogen element is a molecular compound.

(c) The compound $MgKr_2$ *does not exist.*

(d) Na and K are very similar in the compounds they form with nonmetals.

(e) If contained in an ionic compound, calcium (Ca) will be in the form of the doubly charged ion, Ca^{2+} *.*

EXAMPLE

Write the empirical formula of the compound formed by

(a) Al^{3+} and Cl^{-} ions,

(b) Al^{3+} and O^{2-} ions,

(c) Mg^{2+} and NO_3^{-} ions.

2-8 Naming Inorganic Compounds

Different ions of the same element have different properties

Naming Cation

a. Cations formed from metal atoms have the same name as the metal:

Na^{+}	sodium ion	Zn^{2+}	zinc ion	Al^{3+}	aluminum ion

b. If a metal can form cations with different charges, the positive charge is indicated by a Roman numeral in parentheses following the name of the metal:

Fe^{2+}	iron(II) ion	(ferrous ion)	Cu^{+}	copper(I) ion	(cuprous ion)
Fe^{3+}	iron(III) ion	(ferric ion)	Cu^{2+}	copper(II) ion	(cupric ion)

c. Cations formed from nonmetal atoms have names that end in ***-ium***:

NH_4^{+}	ammonium ion	H_3O^{+}	hydronium ion

Naming Anion

a. The names of monatomic anions are formed by replacing the ending of the name of the element with ***-ide***

H^-	hydride ion	O^{2-}	oxide ion	N^{3-}	nitride ion

A few polyatomic anions also have names ending in ***-ide***

OH^-	hydroxide ion	CN^-	cyanide ion	O_2^{2-}	peroxide ion

Naming Anion *(cont.)*

b. Polyatomic anions containing oxygen are called ***oxyanions***,

subfixes

-ate for the most common or representative oxyanion of an element

-ite for an oxyanion that has the same charge but one O atom fewer

NO_3^-	nitrate ion	SO_4^{2-}	sulfate ion
NO_2^-	nitrite ion	SO_3^{2-}	sulfite ion

prefixes

per- indicates one more O atom than the oxyanion ending in ***–ate***

hypo- indicates one O atom fewer than the oxyanion ending in ***-ite***

ClO_4^-	perchlorate ion (one more O atom than chlorate)
ClO_3^-	chlorate ion
ClO_2^-	chlorite ion (one O atom fewer than chlorate)
ClO^-	hypochlorite ion (one O atom fewer than chlorite)

Naming Ionic Compounds

Names of ionic compounds consist of the cation name followed by the anion name

$CaCl_2$	calcium chloride
$Al(NO_3)_3$	aluminum nitrate
$Cu(ClO_4)_2$	copper(II) perchlorate (or cupric perchlorate)

EXAMPLE

Name the ionic compounds

(a) K_2SO_4,

(b) $Ba(OH)_2$,

(c) $FeCl_3$.

EXAMPLE

*Which of the following ionic compounds is **incorrectly** named?*

(a) $Zn(NO_3)_2$, zinc nitrate;

(b) $TeCl_4$, tellurium(IV) chloride;

(c) Fe_2O_3, diiron oxide;

(d) BaO, barium oxide;

(e) $Mn_3(PO4)_2$, manganese (II) phosphate.

EXAMPLE

Name the ionic compounds

(a) NH_4Br,

(b) Cr_2O_3,

(c) $Co(NO_3)_2$.

Names and Formulas of Acids

1. Acids containing anions whose names end in ***-ide*** are named by changing the ***-ide*** ending to ***-ic***, adding the prefix ***hydro-*** to this anion name, and then following with the word acid:

Anion	Corresponding Acid
Cl^- (chloride)	HCl (hydrochloric acid)
S^{2-} (sulfide)	H_2S (hydrosulfuric acid)

2. Acids containing anions whose names end in ***-ate*** or ***-ite*** are named by changing ***-ate*** to ***-ic*** and ***-ite*** to ***-ous*** and then adding the word acid. Prefixes in the anion name are retained in the name of the acid:

Anion		Corresponding Acid	
ClO_4^-	(perchlorate)	$HClO_4$	(perchloric acid)
ClO_3^-	(chlorate)	$HClO_3$	(chloric acid)
ClO_2^-	(chlorite)	$HClO_2$	(chlorous acid)
ClO^-	(hypochlorite)	$HClO$	(hypochlorous acid)

Anion		Acid
____________ide (chloride, Cl^-)	add H^+ ions →	hydro________ic acid (hydrochloric acid, HCl)
____________ate (chlorate, ClO_3^-) (perchlorate, ClO_4^-)	add H^+ ions →	____________ic acid (chloric acid, $HClO_3$) (perchloric acid, $HClO_4$)
____________ite (chlorite, ClO_2^-) (hypochlorite, ClO^-)	add H^+ ions →	____________ous acid (chlorous acid, $HClO_2$) (hypochlorous acid, $HClO$)

EXAMPLE

1. Name the acids

(a) HCN,

(b) HNO_3,

(c) H_2SO_4,

(d) H_2SO_3.

EXAMPLE

Which of the following acids are ***incorrectly*** *named? For those that are, provide a correct name or formula.*

(a) hydrocyanic acid, HCN;

(b) nitrous acid, HNO_3;

(c) perbromic acid, $HBrO_4$;

(d) iodic acid, HI;

(e) selenic acid, $HSeO_4$.

Names and Formulas of Binary Molecular Compounds

1. ***The name of the element farther to the left in the periodic table (closest to the metals) is usually written first***. An exception occurs when the compound contains oxygen and chlorine, bromine, or iodine (any halogen except fluorine), in which case oxygen is written last.

2. ***If both elements are in the same group, the one closer to the bottom of the table is named first***.

3. ***The name of the second element is given an -ide ending***.

4. ***Greek prefixes indicate the number of atoms of each element***.

Cl_2O	dichlorine monoxide	NF_3	nitrogen trifluoride
N_2O_4	dinitrogen tetroxide	P_4S_{10}	tetraphosphorus decasulfide

EXAMPLE

Name the compounds

(a) SO_2,

(b) PCl_5,

(c) Cl_2O_3,

(d) CS_2,

(e) CO,

(f) C_3O_2,

(g) CBr_4,

(h) CF

EXAMPLE

Give the chemical formulas for

(a) silicon tetrabromide,

(b) disulfur dichloride,

(c) diphosphorus hexaoxide.

2-9 Some Simple Organic Compounds

This is a self-reading section

Homeworks

Excercises:

2.6,

2.13,

2.23,

2.35,

2.49,

2.53,

2.63,

2.71,

Chemistry

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You will have a quizz next week

What can you use for assistance?

- A pen
- A calculator
- A periodic table
- An A4-sized sheet of hand written notes

No other devices are allowed!