

Announcements – Lecture III – Tuesday, Sep 15th

1. Class Web Site: www.chem.umass.edu/genchem
2. iClicker for credit starts Thursday , September 17th

*Register your iClicker in Owl (a home work assignment) by tonight
Tuesday, September 15th*

3. First Lab – Saturday, September 26th ... 1-4pm ... ISB 155 /160 (A-E)



3.5 How Do We Name Ionic Compounds – An Early First Visit

+1												-1					
1A	2A											3A	4A	5A	6A	7A	8
H ⁺														N ³⁻	O ²⁻	H ⁻	
Li ⁺														P ³⁻	S ²⁻	F ⁻	
Na ⁺	Mg ²⁺	3B	4B	5B	6B	7B	8B	8B	8B	1B	2B	Al ³⁺			Se ²⁻	Cl ⁻	
K ⁺	Ca ²⁺														Te ²⁻	Br ⁻	
Rb ⁺	Sr ²⁺															I ⁻	
Cs ⁺	Ba ²⁺																

↳ single atom.

Monoatomic cations retain the parent name.

Na = Sodium

Na⁺ = Sodium

Monoatomic anions end in 'ide'

O = Oxygen

O²⁻ = Oxide

Convention : Cation placed first in name, then comes the anion.



2.4 What Are Atoms Made Of? – The Three Subatomic Particles

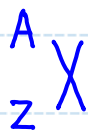
Name	Symbol	Mass (g)	Charge	Mass*1 (amu)*2
Proton	$\overset{+}{\underset{1}{p}}$	1.673×10^{-24}	+1	1
Neutron	$\overset{0}{\underset{1}{n}}$	1.675×10^{-24}	0	1
Electron	$\overset{-}{\underset{1}{e}}$	9.109×10^{-28}	-1	0.0005

a) Chemists tend to ignore the mass of the electron.

b) # Protons ... the atom determinant ... #p = Atomic Number (Z).

c) # Neutrons ... the other mass contributor ... #n + #p = Mass Number (A).

d) # Electrons ... determines the charge on the atom.



X = Symbol

A = Mass Number

Z = Atomic Number

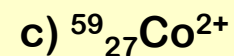
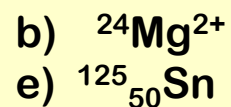
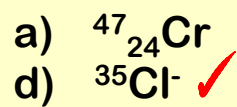
*1: Rounded to 1 sig fig

*2: 1 amu = 1.6605×10^{-24} g

2.4 What Are Atoms Made Of? – The Three Subatomic Particles

2.4 Example_1

Which if any of the following species has the same number of Neutrons as it does Electrons?



	<u># Protons</u>	<u># Neutrons</u>	<u># Electrons</u>	
${}^{47}_{24}\text{Cr}$	24	23	24	
${}^{24}_{12}\text{Mg}^{2+}$	12	12	10	
${}^{59}_{27}\text{Co}^{2+}$	27	32	25	
${}^{35}_{17}\text{Cl}^-$	17	18	18	✓
${}^{125}_{50}\text{Sn}$	50	75	50	

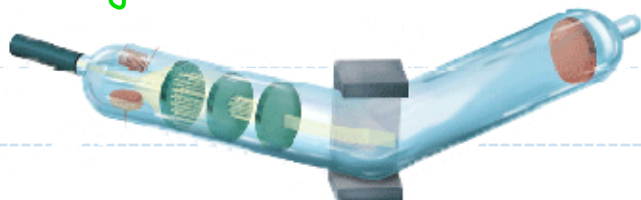


2.4 What Are Atoms Made Of? – Isotopes

Isotope: Atoms with the same number of protons but different number of neutrons

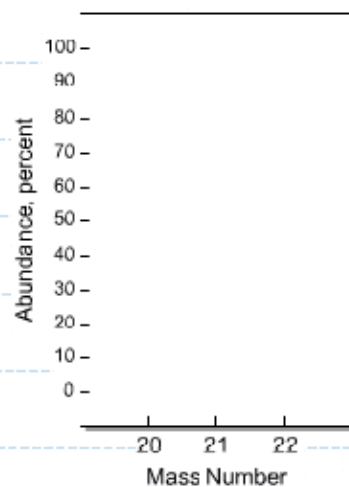
Active Figure 2.04: Mass Spectrometer

Interactive figure on class web site



- Gas
- F
 - Ne
 - Na

Magnet Strength



	#p	#n	#e
^{12}C	6	6	6
^{14}C	6	8	6



2.4 What Are Atoms Made Of? — Atomic Weight

2.4 Example_2

Chlorine has two naturally occurring isotopes:

^{35}Cl , 75.77% Abundant, Exact Mass 34.96885 amu

^{37}Cl , 24.23% Abundant, Exact Mass 36.96590 amu

What is the Atomic Weight of Chlorine?

Atomic Weight: the weighted average of the naturally occurring isotopes.

$$0.7577(34.96885) + 0.2423(36.96590) = 35.45271 \text{ amu}$$



2.4 What Are Atoms Made Of? — Atomic Weight

2.4 Example_3

Neon has 3 naturally occurring isotopes:

^{20}Ne , 90.92% Abundant, Exact Mass 19.9989 amu

^{21}Ne , 0.26% Abundant, Exact Mass 20.9975 amu

^{22}Ne , 8.82% Abundant, Exact Mass 21.9979 amu

What is the Atomic Weight of Neon?



The 4th decimal place in the answer is

- a) 5 b) 6 c) 7 d) 8 ✓ e) 9

$$0.9092(19.9989) + 0.0026(20.9975) + 0.0882(21.9979) = 20.1778$$

2.5 What Is the Periodic Table – Metals – Nonmetals – Metalloids

Periodic Table Structure

■ Metals ... like to lose electrons ... form cations

■ Metalloids

■ Nonmetals ... like to gain electrons ... form anions

Groups ▶

Main Group Elements ▶

Transition Group Elements ▶

Periods ▶

Lanthanides and Actinides ▶

Metals ▶

Nonmetals ▶

Metalloids ▶

Alkali Metals ▶

Alkaline Earth Metals ▶

Halogens ▶

Noble Gases ▶

1A																			8A
H	2A											3A	4A	5A	6A	7A			He
Li	Be											B	C	N	O	F			Ne
Na	Mg	3B	4B	5B	6B	7B	8B	1B	2B			Al	Si	P	S	Cl			Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br			Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I			Xe
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At			Rn
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	110	111									

See this interactive module on class web site.

