Announcements – Lecture III – Tuesday, Sep 10th

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

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

a) Chemists tend to ignore the mass of the electron

b) # protons ... the atom determinator ... #p = Atomic Number (Z)

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

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

$^{A}_{Z}X$

X = symbol

A = Mass Number

Z = atomic number

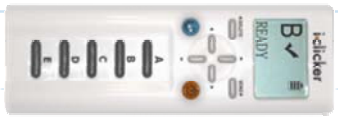
*1: Rounded to 1 significant figure

*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?



a) $^{47}_{24}Cr$ b) $^{24}Mg^{2+}$ c) $^{59}_{27}Co^{2+}$
d) $^{35}Cl^{-}$ e) $^{125}_{50}Sn$

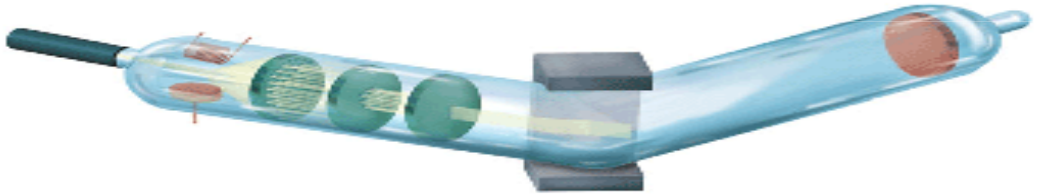
	# Protons	# Neutrons	# Electrons	
$^{47}_{24}Cr$	24	23	24	
$^{24}Mg^{2+}$	12	12	10	
$^{59}_{27}Co^{2+}$	27	32	25	
$^{35}Cl^{-}$	17	18	18	✓
$^{125}_{50}Sn$	50	75	50	

2.4 What Are Atoms Made Of? – *Isotopes*

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

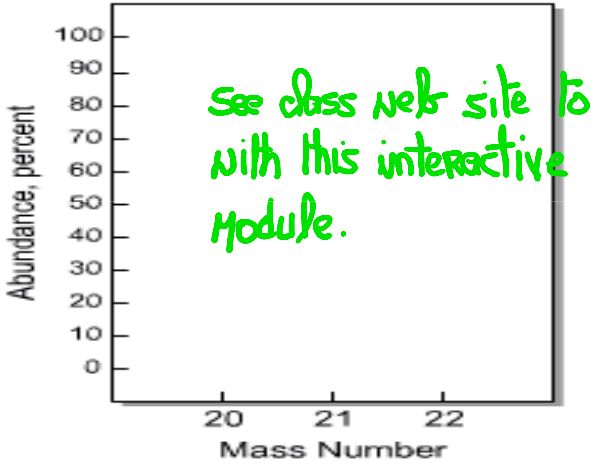
	#p	#n	#e
^{12}C	6	6	6
^{14}C	6	8	6

Active Figure 2.04: Mass Spectrometer



Gas
- F
- Ne
- Na

Magnet Strength



See class web site to play with this interactive module.

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 : simply the weighted average of the naturally occurring isotopes

$$0.7577(34.96885) + 0.2433(36.96590)$$

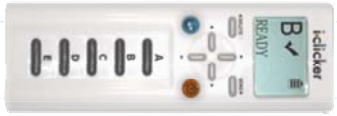
$$= 35.45271 \text{ amu}$$

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

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