

# Chapter 4

## Part 2

# Periodic Table of the Elements

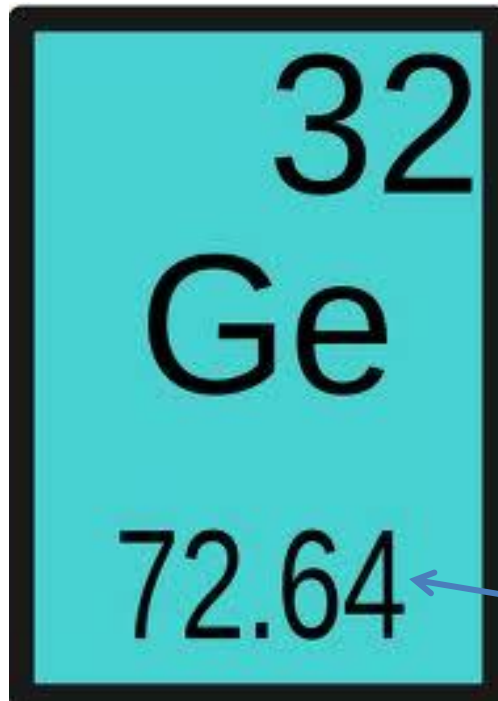
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- hydrogen
- alkali metals
- alkali earth metals
- transition metals
- poor metals
- nonmetals
- noble gases
- rare earth metals

1 H																	2 He
3 Li	4 Be											5 B	6 C	7 N	8 O	9 F	10 Ne
11 Na	12 Mg											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
19 K	20 Ca	21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga	32 Ge	33 As	34 Se	35 Br	36 Kr
37 Rb	38 Sr	39 Y	40 Zr	41 Nb	42 Mo	43 Tc	44 Ru	45 Rh	46 Pd	47 Ag	48 Cd	49 In	50 Sn	51 Sb	52 Te	53 I	54 Xe
55 Cs	56 Ba	57 La	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn
87 Fr	88 Ra	89 Ac	104 Unq	105 Unp	106 Unh	107 Uns	108 Uno	109 Une	110 Unn								

58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er	69 Tm	70 Yb	71 Lu
90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm	101 Md	102 No	103 Lr

# Properties of Atoms



Atomic #

# of Protons =  
# of Electrons  
(in neutral atom)

Atomic mass

# Protons + # neutrons

# Practice

**Atomic Number** Complete the following table.

Composition of Several Elements				
	Element	Atomic Number	Protons	Electrons
a.	Pb	82		
b.			8	
c.				30

What is the isotopic symbol for each?

# Isotopes and Ions

- Isotope – Atoms with the same number of protons but different number of neutrons.
- Things to remember –
  - The # of protons of an element **NEVER** changes, and is **ALWAYS** the same as the Atomic #.
  - If the # neutrons is different = ISOTOPE
  - If the # electrons is different = ION
    - + = cation Less electrons
    - - = anion More electrons

Isotopic symbol :



# Mass of Atoms

- Mass of electron =  $1/1840^{\text{th}}$  of a proton
- Mass of proton  $\approx$  mass of neutron
- 1 atomic mass unit (amu)  $\approx$  mass of proton

Carbon 12 atom = 12 amu

Why aren't the masses of elements in whole numbers?

# Atomic Mass = Average of Isotopes

- Weighted average mass – mass of each isotope contributes to total mass according to *how much* of that isotope exists.

K

Potassium

Three isotopes =  ${}_{19}^{39}\text{K}$      ${}_{19}^{40}\text{K}$      ${}_{19}^{41}\text{K}$   
Percent Composition: 93.26%    0.01%    6.73%

# Calculate the Atomic Mass of K

1. Use % composition and convert to relative abundance (divide by 100)

93.26% composition = .9326 relative abundance

2.  $\text{Amu} = ((\text{Mass of Isotope}_1) \times (\text{Relative Abundance}_1)) + ((\text{Mass of Isotope}_2) \times (\text{Relative Abundance}_2)) \dots$

$$((0.9326) \times (39)) + ((0.0001) \times (40)) + ((0.0673) \times (41)) = 39.1347 \text{ amu}$$



# Warm Up!

<u>Element</u>	<u>Atomic #</u>	<u>Mass #</u>
Calcium	20	46
Oxygen	8	17
Mercury	80	204

What is the number of protons, electrons, and neutrons for each?

What is the isotope symbol (shorthand notation) for each?

# Today's Agenda

- Question for today: What does radioactive mean and what makes certain atoms radioactive?
- Isotope calcs
- Radioactive particles
- Decay practice
- Homework set 2 due date TBD. **Don't wait until the last minute!!** Final background paper due Friday!

$$A_{\text{mu}} = (\text{R.A.}) \times (\text{Mass}) + ((\text{R.A.}) \times (\text{Mass})) \dots$$

- What element is this?

Isotope	Mass of Isotope	Percent abundance
${}^6\text{X}$	6.015 amu	7.59%
${}^7\text{X}$	7.016 amu	92.41%

Find the atomic mass

What element is this? (Use the Periodic Table)

- Boron has two isotopes: Boron-10 (% abundance – 19.8%, mass = 10.013 amu) and Boron-11 (% abundance – 80.2%, mass – 11.009 amu). Calculate the atomic mass of Boron.

- Bromine has two isotopes with the first having a mass of 78.918336 amu and occupying 50.69% and the second isotope having a mass of 80.916289 amu and occupying 49.31%. What is the average atomic mass of bromine?
- Verify the atomic mass of Magnesium:  
 $^{24}\text{Mg} = 23.985042$  amu and percent abundance of 78.99% ,  $^{25}\text{Mg} = 24.985837$  amu and percent abundance of 10.00%,  $^{26}\text{Mg} = 25.982593$  amu and percent abundance of 11.01%.

# One more...

- Copper has two naturally occurring isotopes, Cu-63 and Cu-65. The atomic mass of Cu is 63.55 amu. Calculate the percent abundances of the two isotopes.