UNIT 1:
FROM STRUCTURES TO PROPERTIES

CLASSIFICATION OF MATTER

Properties of Matter: Chapter 2, pages 38 – 52.
*The Periodic Table: Chapter 6.1 – 6.2, pages 154 - 169

UNIT 1: LEARNING TARGETS

I can…

- define and classify matter according to its composition (pure substances or mixtures).
- define and distinguish between, chemical and physical properties.
- define and classify matter as elements and compounds, and as heterogeneous mixtures and solutions.
- use the periodic law as illustrated by the periodic table to identify and distinguish metals and non-metals, periods and groups, representative and transition elements, and families.
- describe the factors which contribute to the unique position of hydrogen on the periodic table.
- identify the elements that are most prevalent in living systems.
- research ingredients and additives in consumer products.
- identify consumer products and investigate the claims made by companies about the products.

SECTION 6.1
ORGANIZING THE ELEMENTS

- A few elements, such as gold and copper, have been known for *thousands of years* - since ancient times.
- Yet, only about 13 had been identified by the year 1700.
- As more were discovered, chemists realized they needed a way to organize the elements.

ORGANIZING THE ELEMENTS

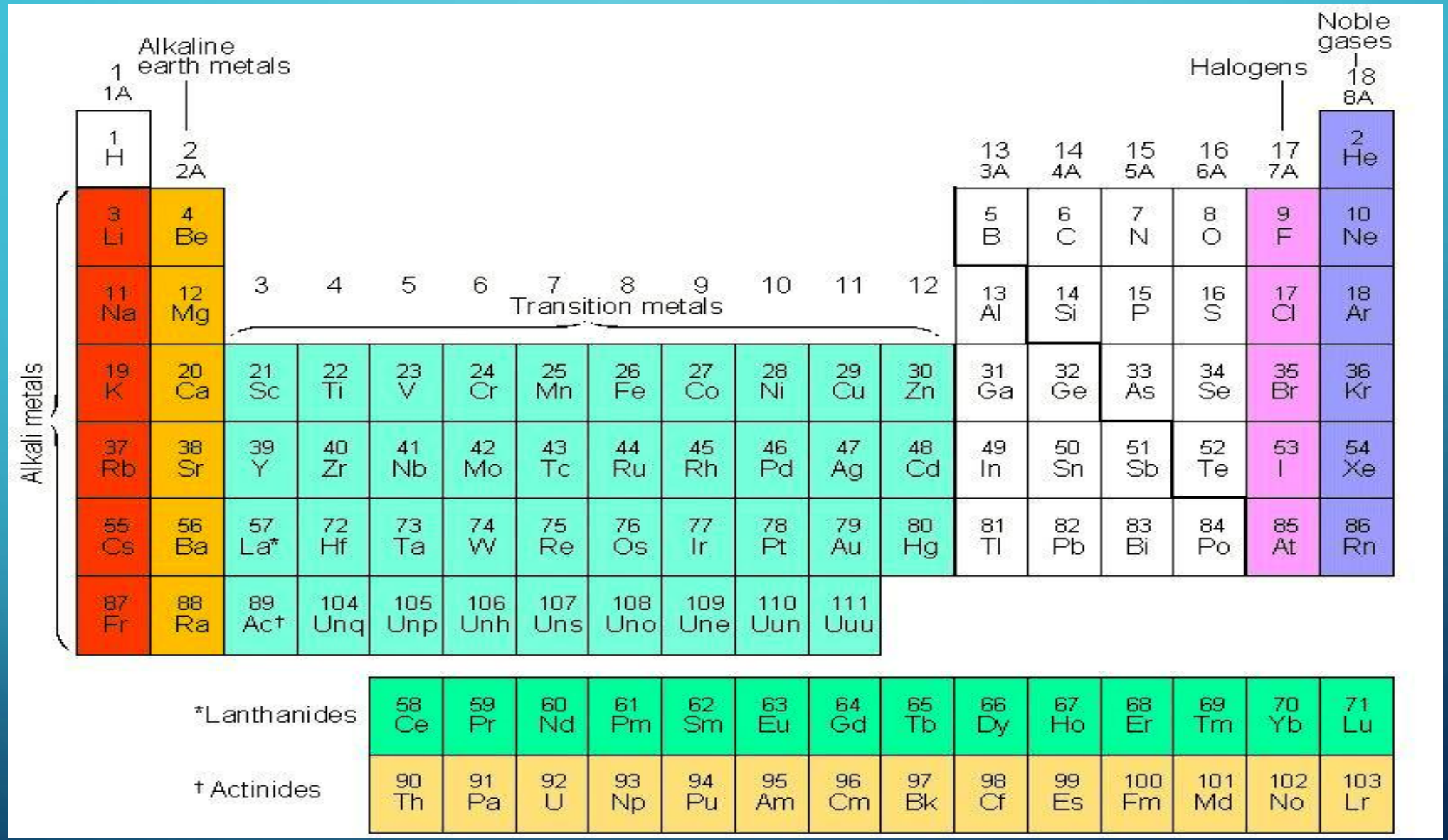
- Chemists used the *properties* of elements to sort them into groups.
- In 1829 J. W. Dobereiner arranged elements into triads – groups of three elements with similar properties
  - One element in each triad had *properties* intermediate of the other two elements

MENDELEEV'S PERIODIC TABLE

- By the mid-1800s, about 70 elements were known to exist
- Dmitri Mendeleev – a Russian chemist and teacher
- Arranged elements in order of increasing *atomic mass*
- Thus, the first "Periodic Table" (page 156)

A BETTER ARRANGEMENT

- In 1913, Henry Moseley – British physicist, arranged elements according to increasing *atomic number*
- The arrangement used today


Alkaline earth metals
Halogens
Noble gases
1 1A
2 2A
13 3A
14 4A
15 5A
16 6A
17 7A
18 8A
3 4 5 6 7 8 9 10 11 12
Transition metals
Alkali 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 Uun
111 Uuu
*Lanthanides
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
† Actinides
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

THE PERIODIC LAW SAYS:

- When elements are arranged in order of increasing atomic number, there is a *periodic repetition* of their physical and chemical properties.
- Horizontal rows = periods
  - There are 7 periods
- Vertical column = group (or family)
  - Similar physical & chemical prop.
  - Identified by number & letter (IA, IIA)

AREAS OF THE PERIODIC TABLE

- Three classes of elements are:
- 1) metals, 2) nonmetals, and 3) metalloids
  1) **Metals**: electrical conductors, have luster, ductile, malleable
  2) **Nonmetals**: generally brittle and non-lustrous, poor conductors of heat and electricity

AREAS OF THE PERIODIC TABLE

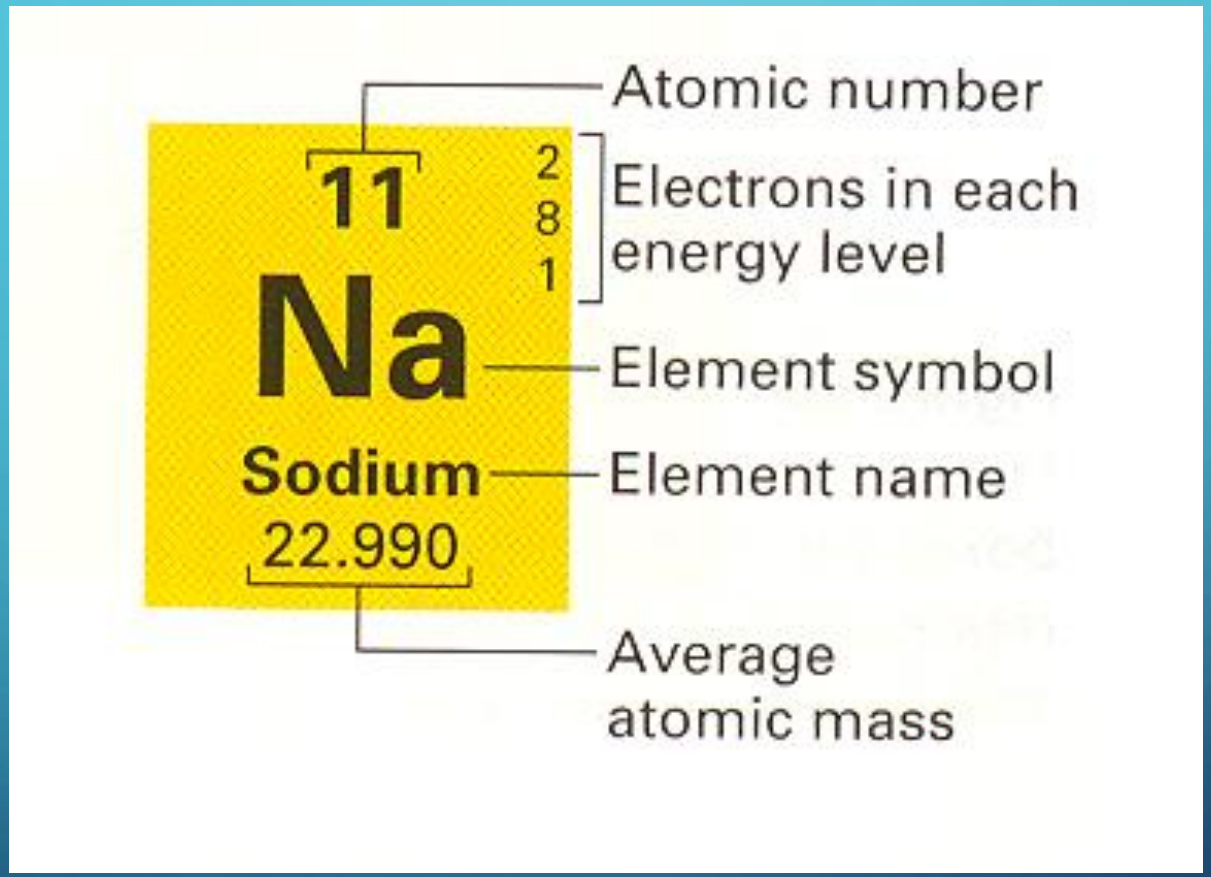
- Some nonmetals are gases (O, N, Cl); some are brittle solids (S); one is a fuming dark red liquid (Br)
- Notice the heavy, stair-step line?

3) Metalloids: border the line-2 sides
   - Properties are *intermediate* between metals and nonmetals

SECTION 6.2
CLASSIFYING THE ELEMENTS

- The periodic table displays the symbols and names of the elements, along with information about the structure of their atoms:
  - Atomic number and atomic mass

PERIODIC TABLE IN THE BACK OF YOUR TEXTBOOK AND PAGE 162-163



GROUPS OF ELEMENTS - FAMILY NAMES

- Group IA – alkali metals
  - Forms a "base" (or alkali) when *reacting* with water (not just dissolved!)
- Group 2A – alkaline earth metals
  - Also form bases with water; do not dissolve well, hence "earth metals"
- Group 7A – halogens
  - Means "salt-forming"

ELECTRON CONFIGURATIONS IN GROUPS

- Elements can be sorted into 4 different groupings *based on their electron configurations*:
  1) Noble gases
  2) Representative elements
  3) Transition metals
  4) Inner transition metals

CHAPTER 6 WORKSHEET

- Section 6.1 # 1 – 12.
- Section 6.2 # 1 & 2.

CLASSIFICATION OF MATTER TEST REVIEW

Learning Target	Description	Pages	Questions
CMLT1	define and classify matter according to its composition (pure substances or mixtures).	58-60	35, 49, 58
CMLT2	define and distinguish between, chemical and physical properties.	58-60	37, 41, 43, 64, 67
CMLT3	define and classify matter as elements and compounds, and as heterogeneous mixtures and solutions.	58-60	44, 46, 48
CMLT4	use the periodic law as illustrated by the periodic table to identify and distinguish metals and non-metals, periods and groups, representative and transition elements, and families.	181	24, 26 - 29