Module 3

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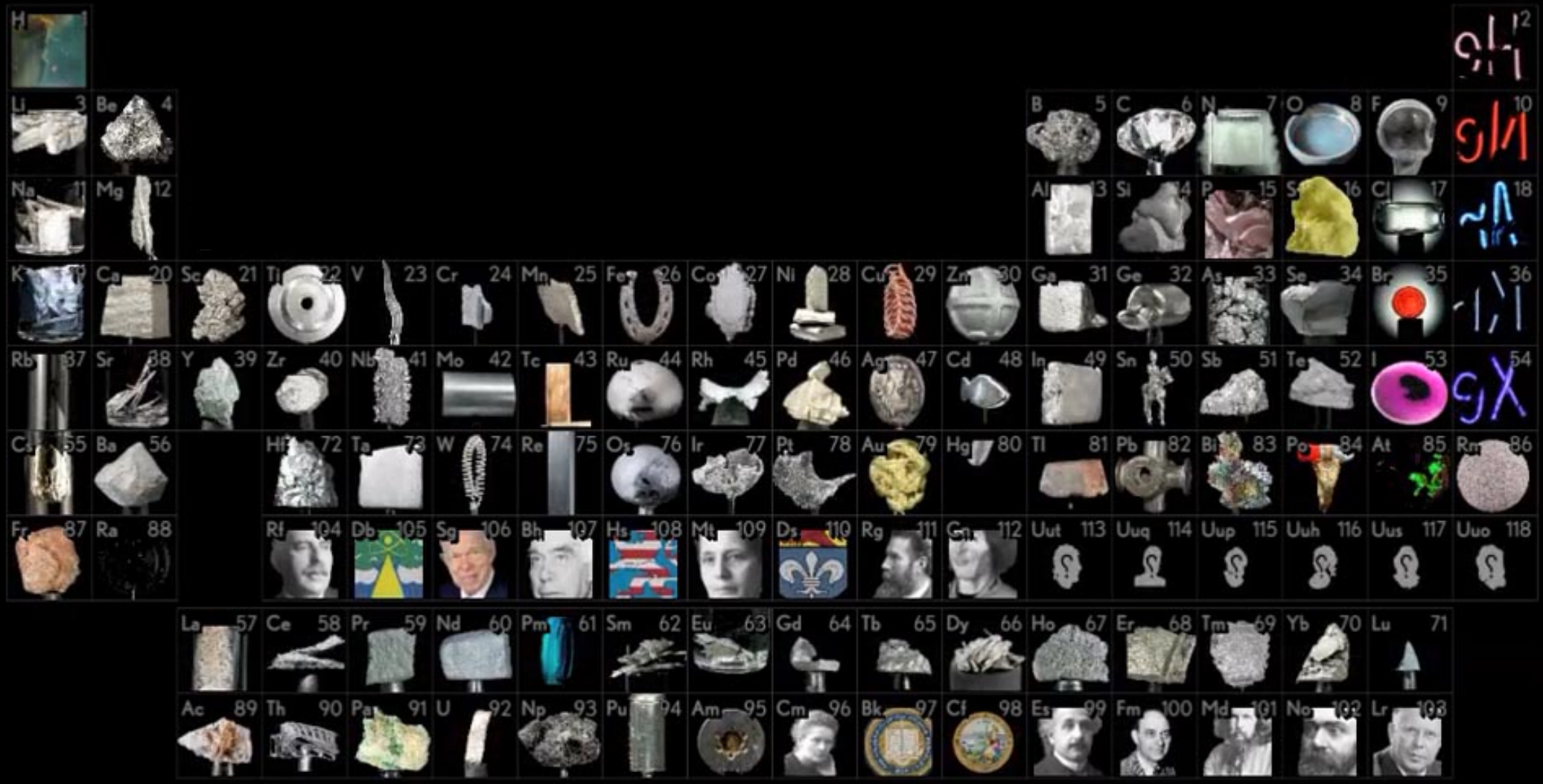
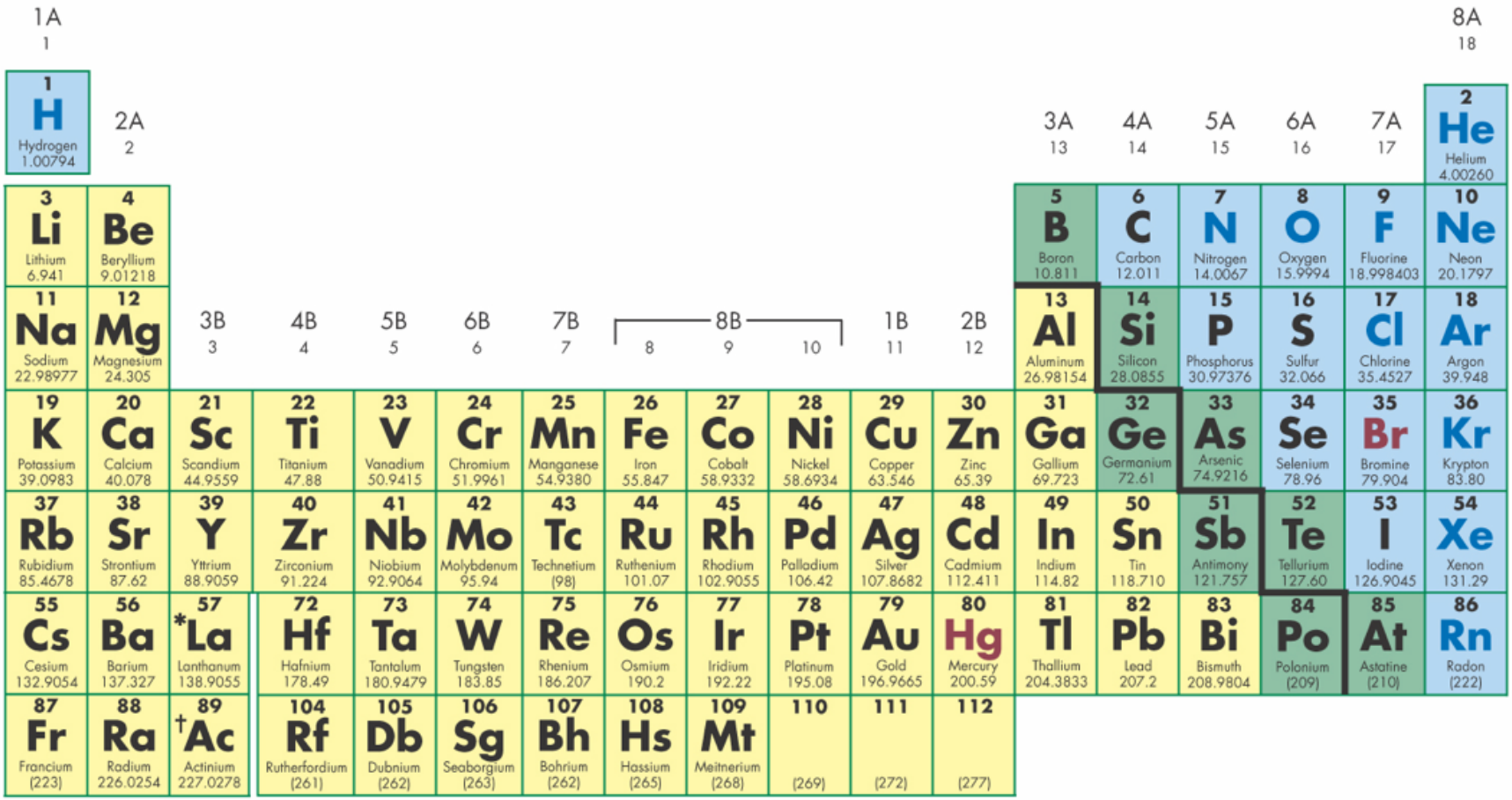
BIOC 141

The Elements (Section 2.1)

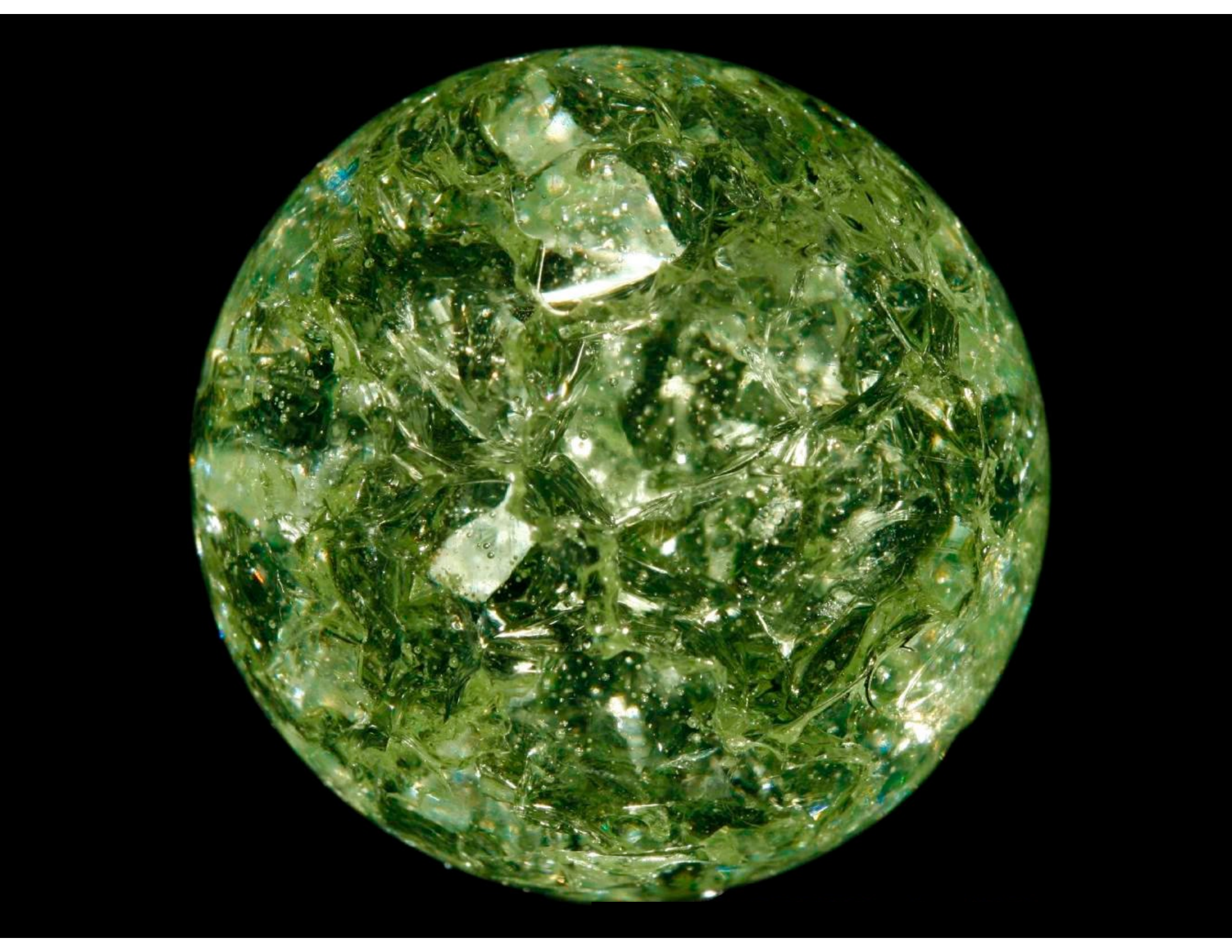


Element Names and Chemical Symbols



Odd Chemical Symbols

Element	Symbol	Latin Name
Antimony	Sb	Stibium
Copper	Cu	Cuprum
Gold	Au	Aurum
Iron	Fe	Ferrum
Lead	Pb	Plumbum
Mercury	Hg	Hydragyrum
Potassium	K	Kalium
Silver	Ag	Argentum
Sodium	Na	Natrium
Tin	Sn	Stannum
Tungsten	W	Wolfram



The Human Body

Element	Percentage by Mass

Elemental Composition

Concept Review (Section 2.1)

CONCEPT REVIEW EXERCISES

1. What is an element?

2. Give some examples of how the abundance of elements varies.

3. Why are chemical symbols so useful? What is the source of the letter(s) for a chemical symbol?

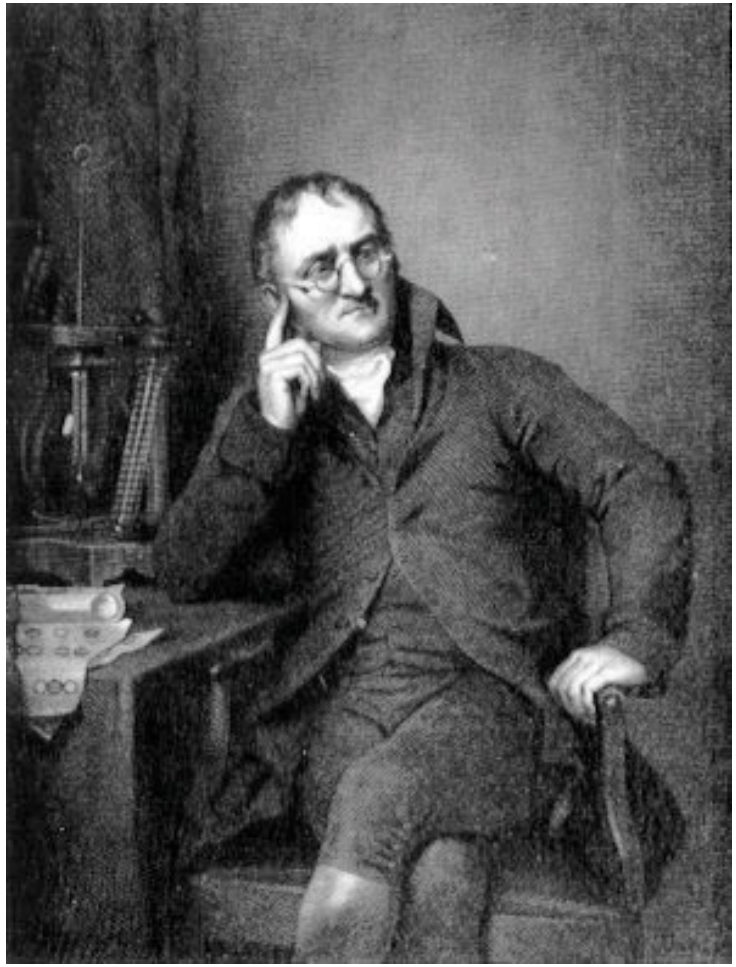
Practice Problems: 1-8 in Section 2.1

Modern Atomic Theory (Section 2.2)

All elements are composed of atoms.

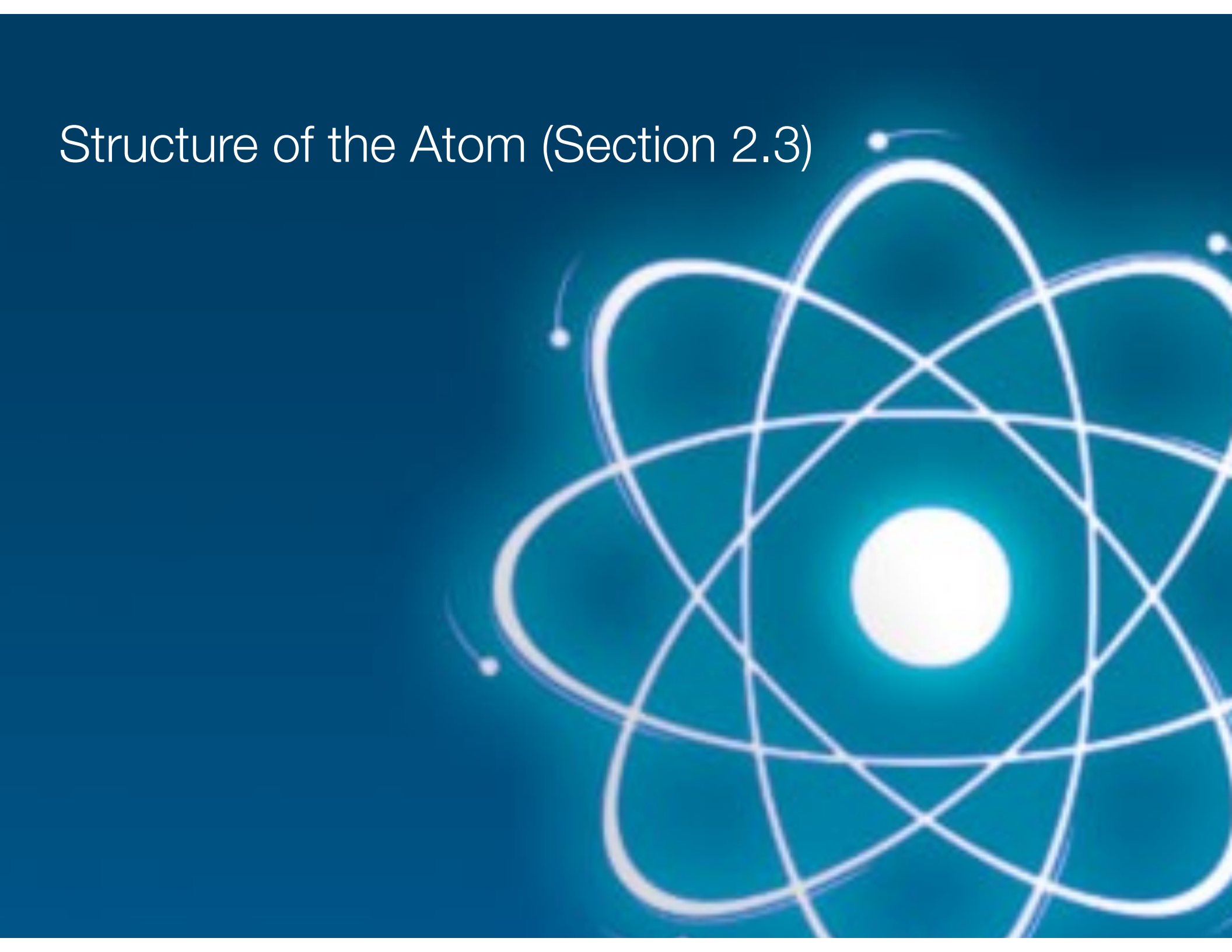
<u>Diatomic Molecules</u>

hydrogen (H_2)
oxygen (O_2)
nitrogen (N_2)
fluorine (F_2)
chlorine (Cl_2)
bromine (Br_2)
iodine (I_2)



Practice Problems: 1-4 in Section 2.2

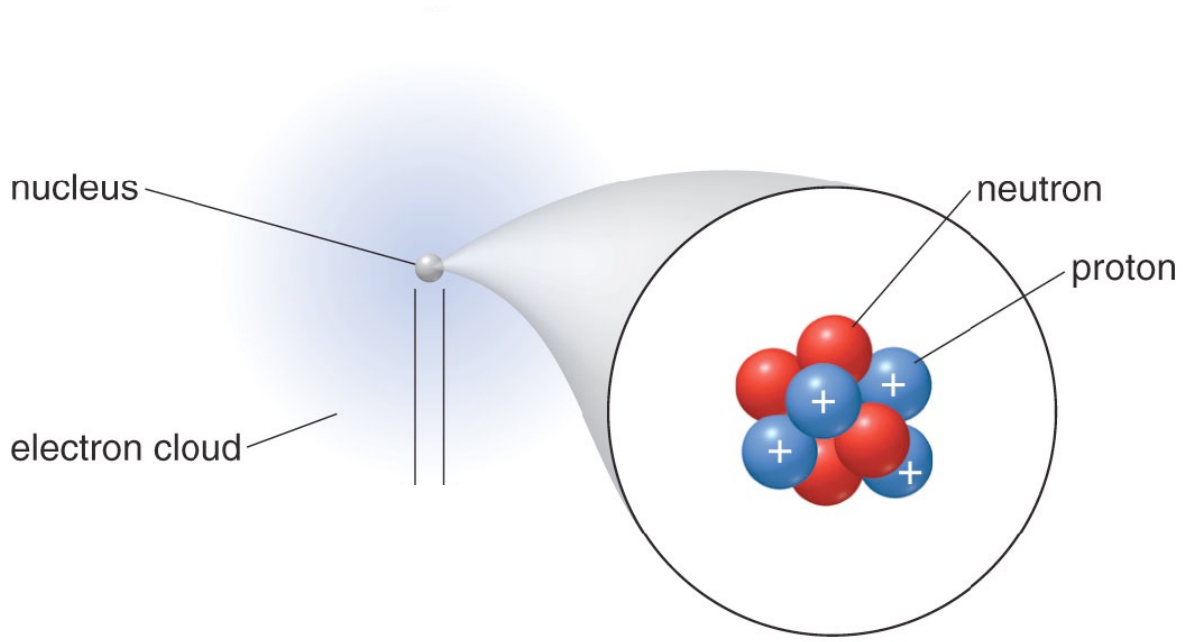
Structure of the Atom (Section 2.3)



Structure of the Atom

	Mass (in amu)	**Charge**
Proton	1	+1
Electron	0	-1
Neutron	1	0

Structure of the Atom



Nucleus: Location of protons & neutrons.

Electron Cloud: Location of electrons.

Concept Review (Section 2.3)

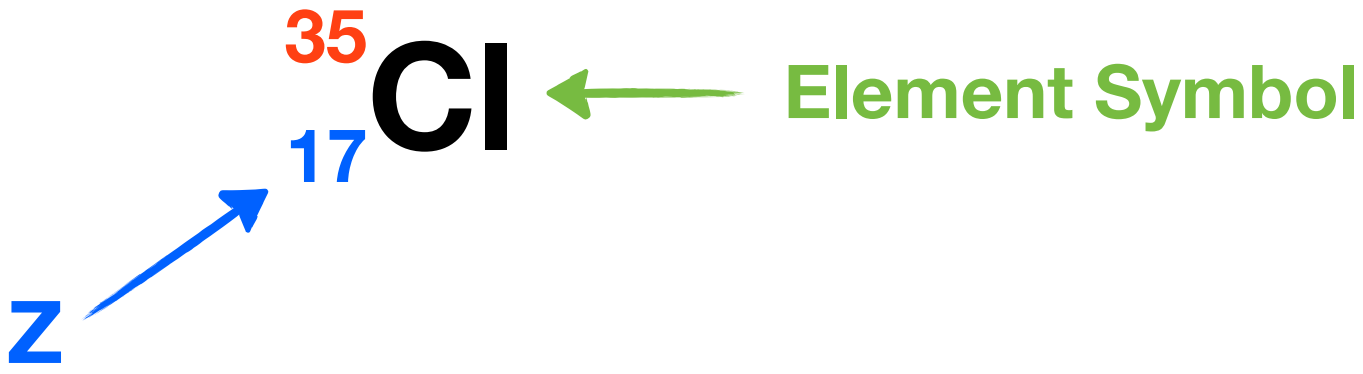
CONCEPT REVIEW EXERCISES

1. What are the charges and the relative masses of the three subatomic particles?

2. Describe the structure of an atom in terms of its protons, neutrons, and electrons.

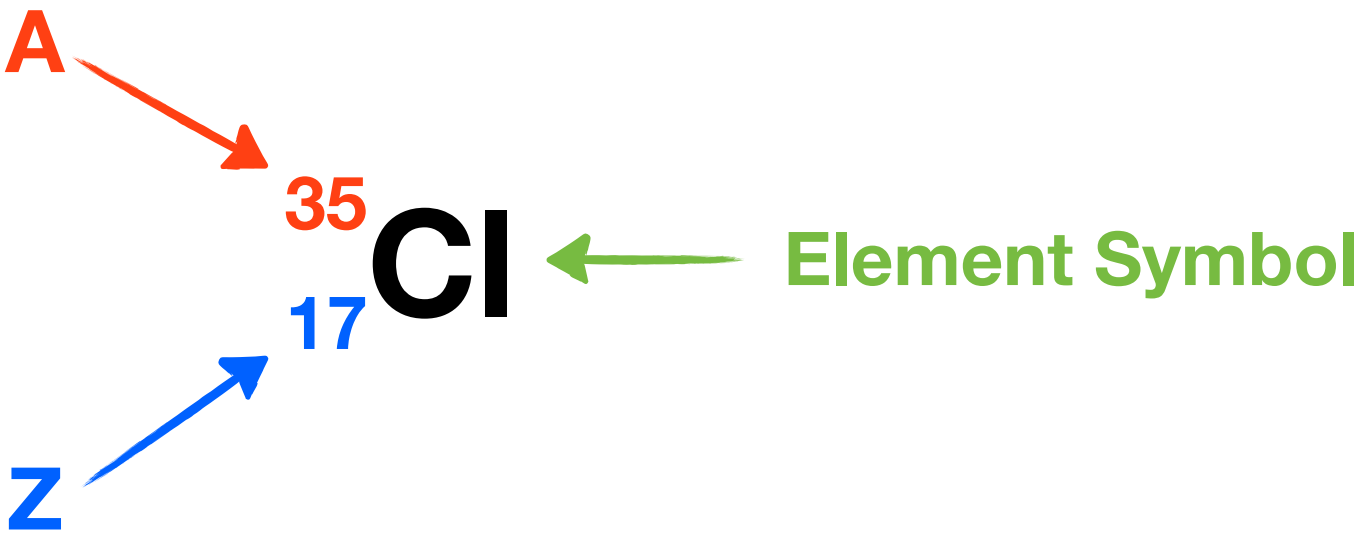
Practice Problems: 1-10 in Section 2.3

The Nuclei of Atoms (Sections 2.4 and 2.5)



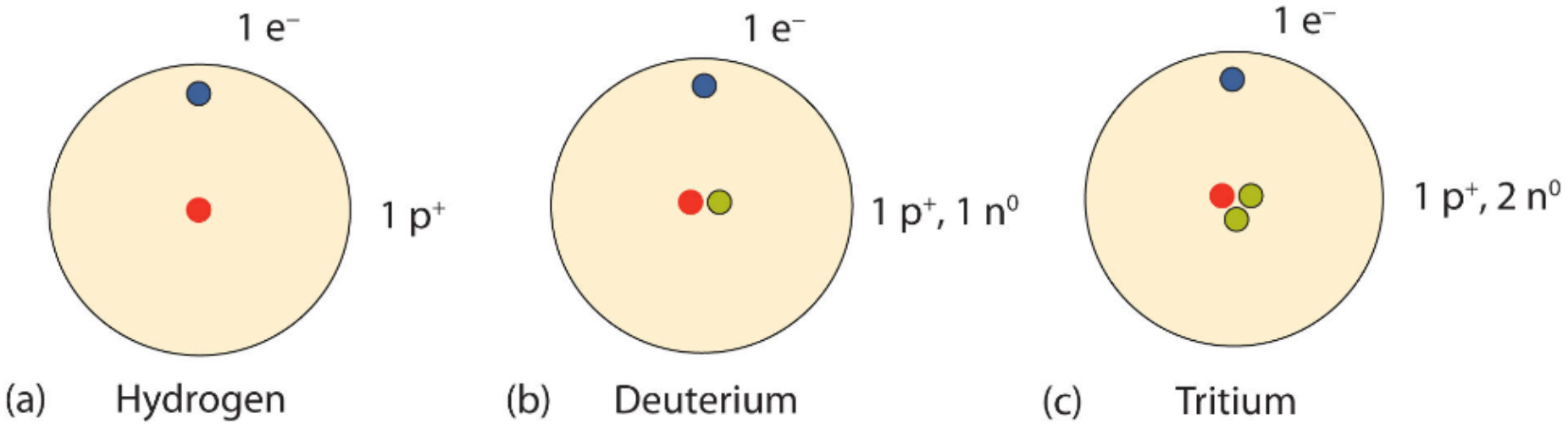
Atomic Number (Z) = # of protons = # of electrons

The Nuclei of Atoms (Section 2.4 and 2.5)



Mass Number (A) = # of protons + # of neutrons

Isotopes



Atomic mass is the average mass of all isotopes of element

Concept Check

List the subatomic particles in each atom below:

Z = 12, A = 24

Z = 14, A = 28

Z = 44, A = 101

Give the **Z** and **A** for each atom below:

protons = 9, electrons = 9, neutrons = 10

protons = 11, electrons = 11, neutrons = 12

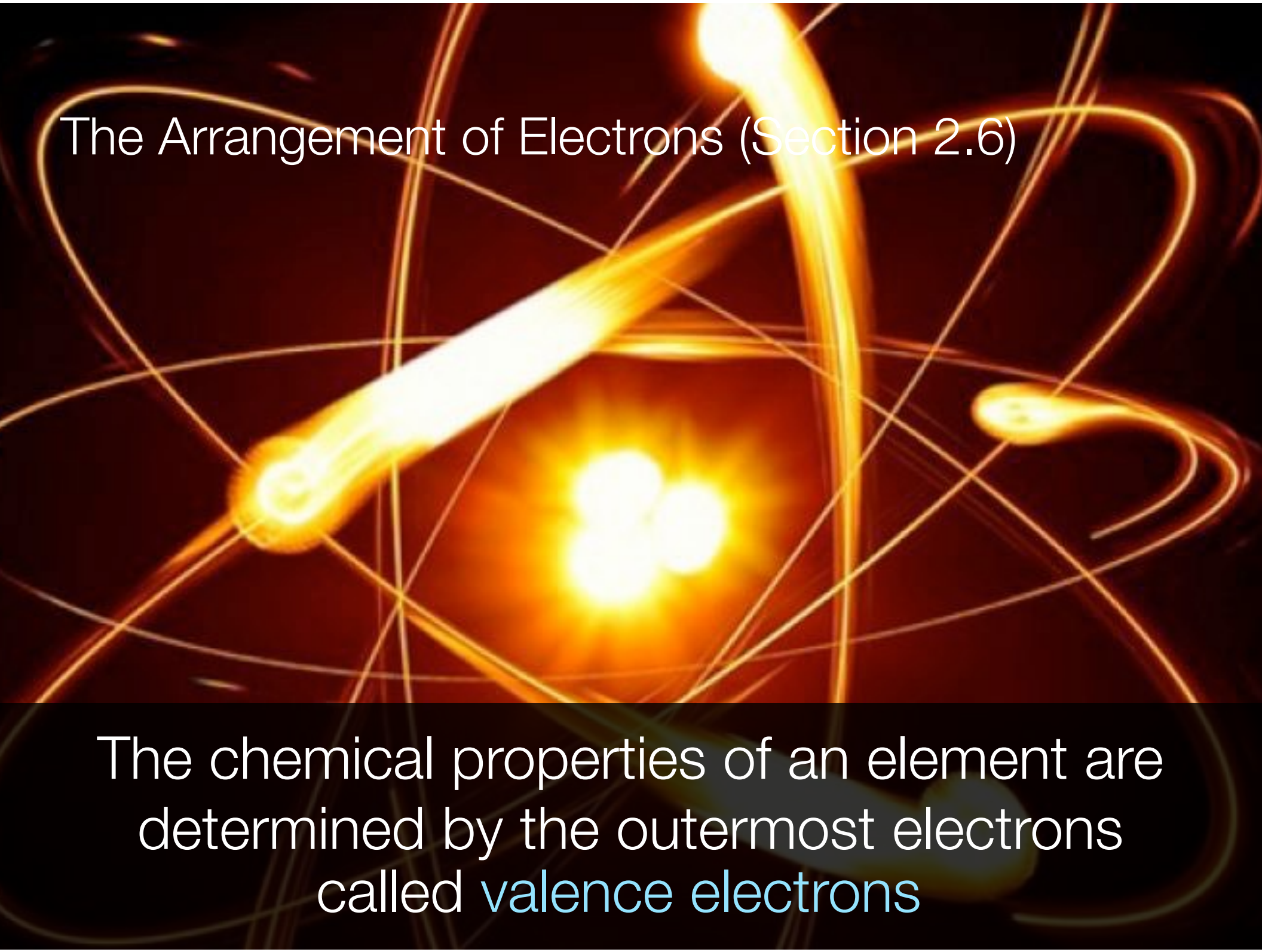
Concept Review (Sections 2.4 and 2.5)

CONCEPT REVIEW EXERCISES

1. Why is the atomic number so important to the identity of an atom?
2. What is the relationship between the number of protons and the number of electrons in an atom?
3. How do isotopes of an element differ from each other?
4. What is the mass number of an element?

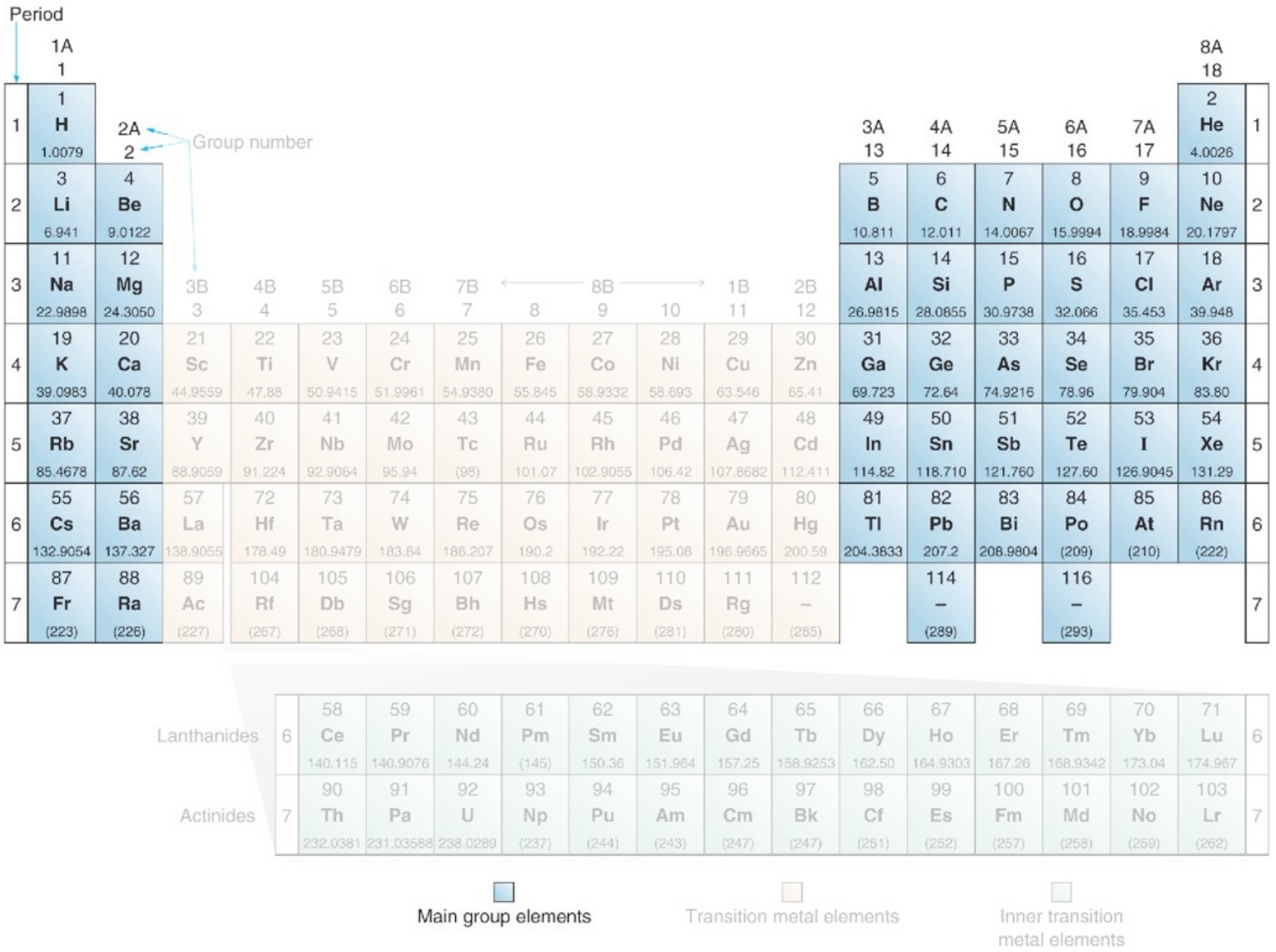
Practice Problems: 1-14 in Section 2.4

The Arrangement of Electrons (Section 2.6)



The chemical properties of an element are determined by the outermost electrons called valence electrons

Valence Electrons



Electron Dot Structures

Dots are placed on each side of an element symbol.

Each dot represents **one valence electron**.

Element:	H	C	O	Cl
# of Valence electrons:				
Electron dot symbol:				

Concept Check

Draw the electron dot symbol for each element:

Mg

N

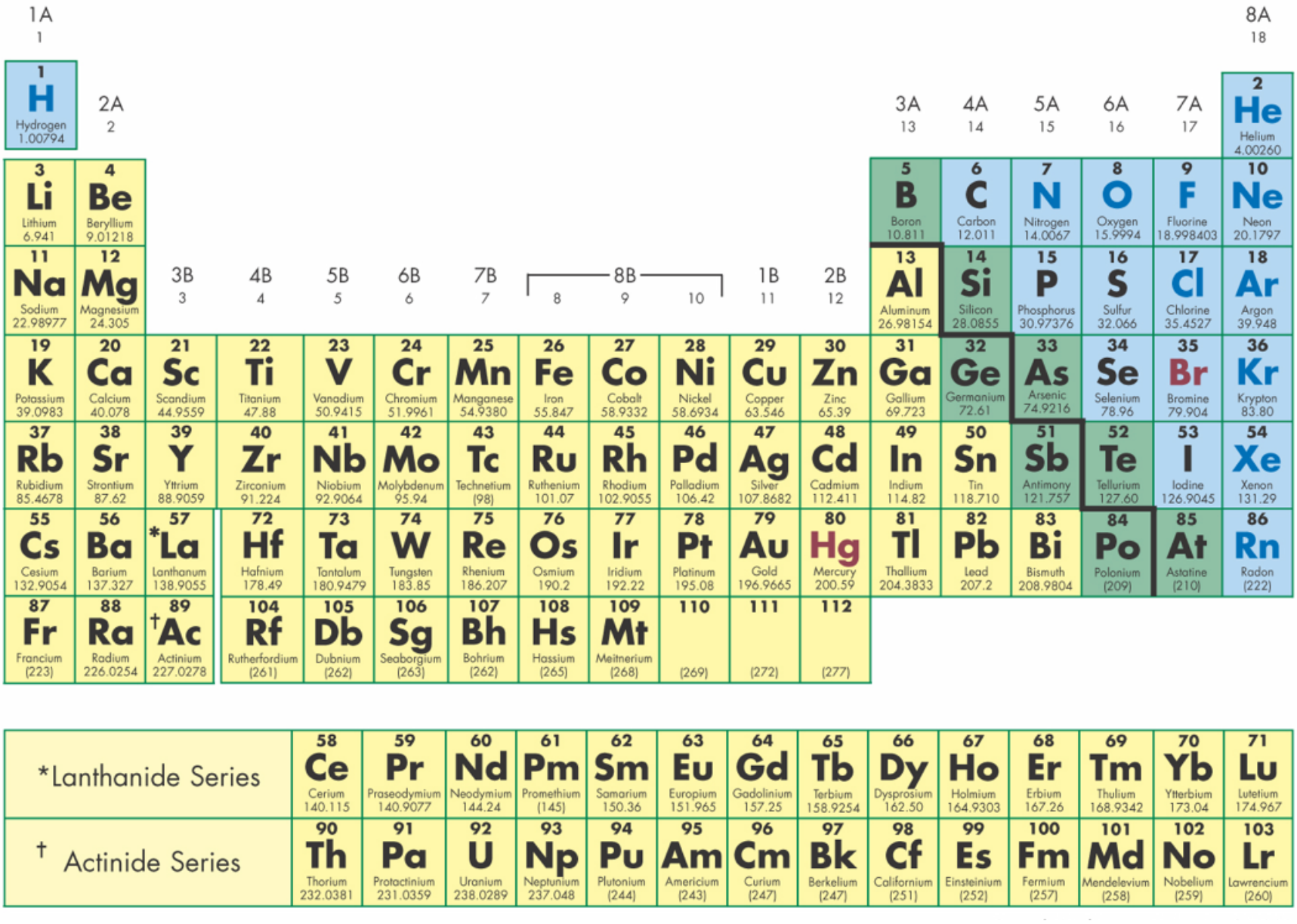
Ca

Si

I

Kr

The Periodic Table (Section 2.7)



Classes of Elements

Metals

Shiny solids

Good conductors of heat and electricity

Metalloids

Look for the angled line

Hybrid properties

Non-Metals

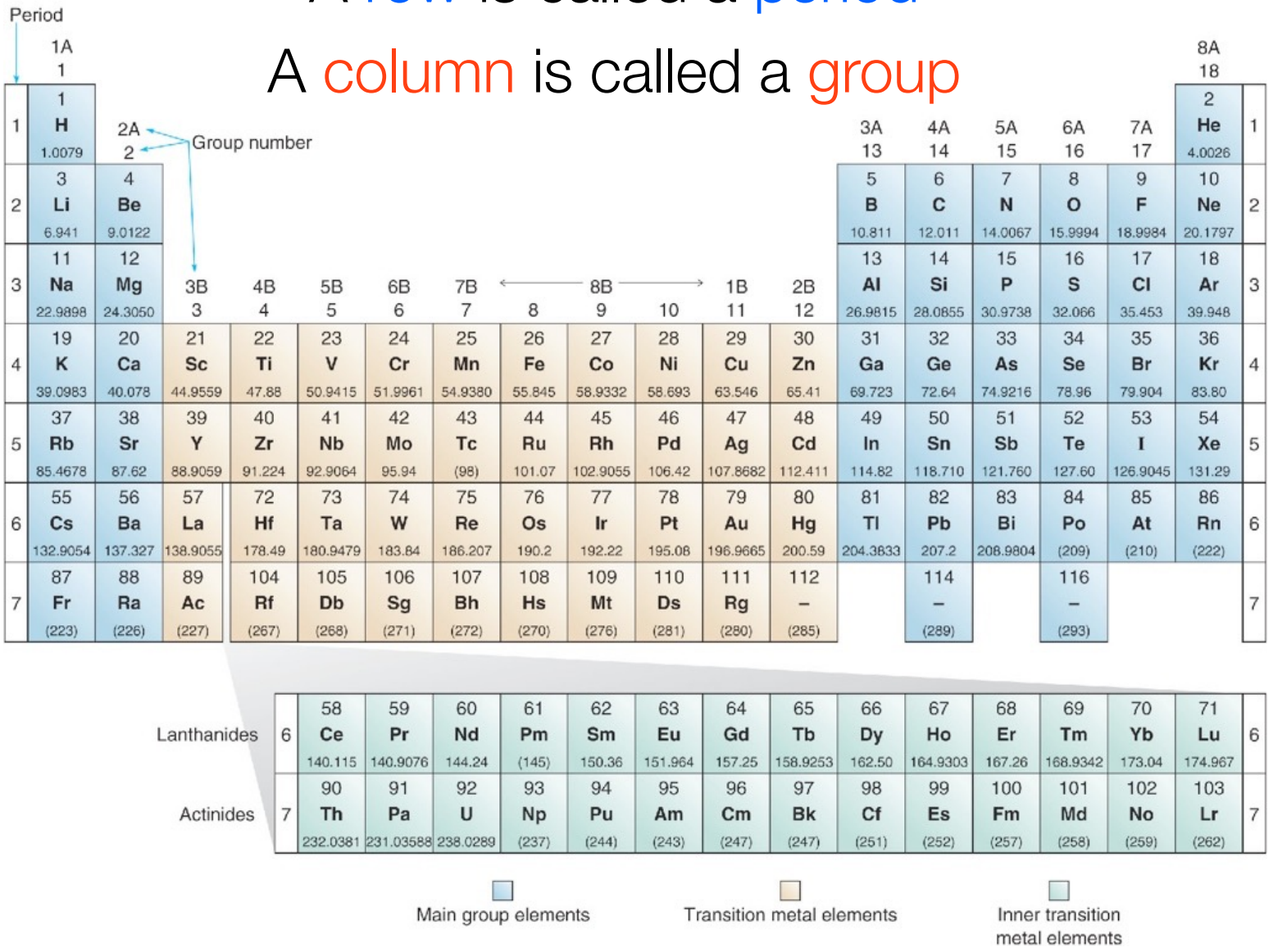
Variable appearance

Can be solids, liquids or gases

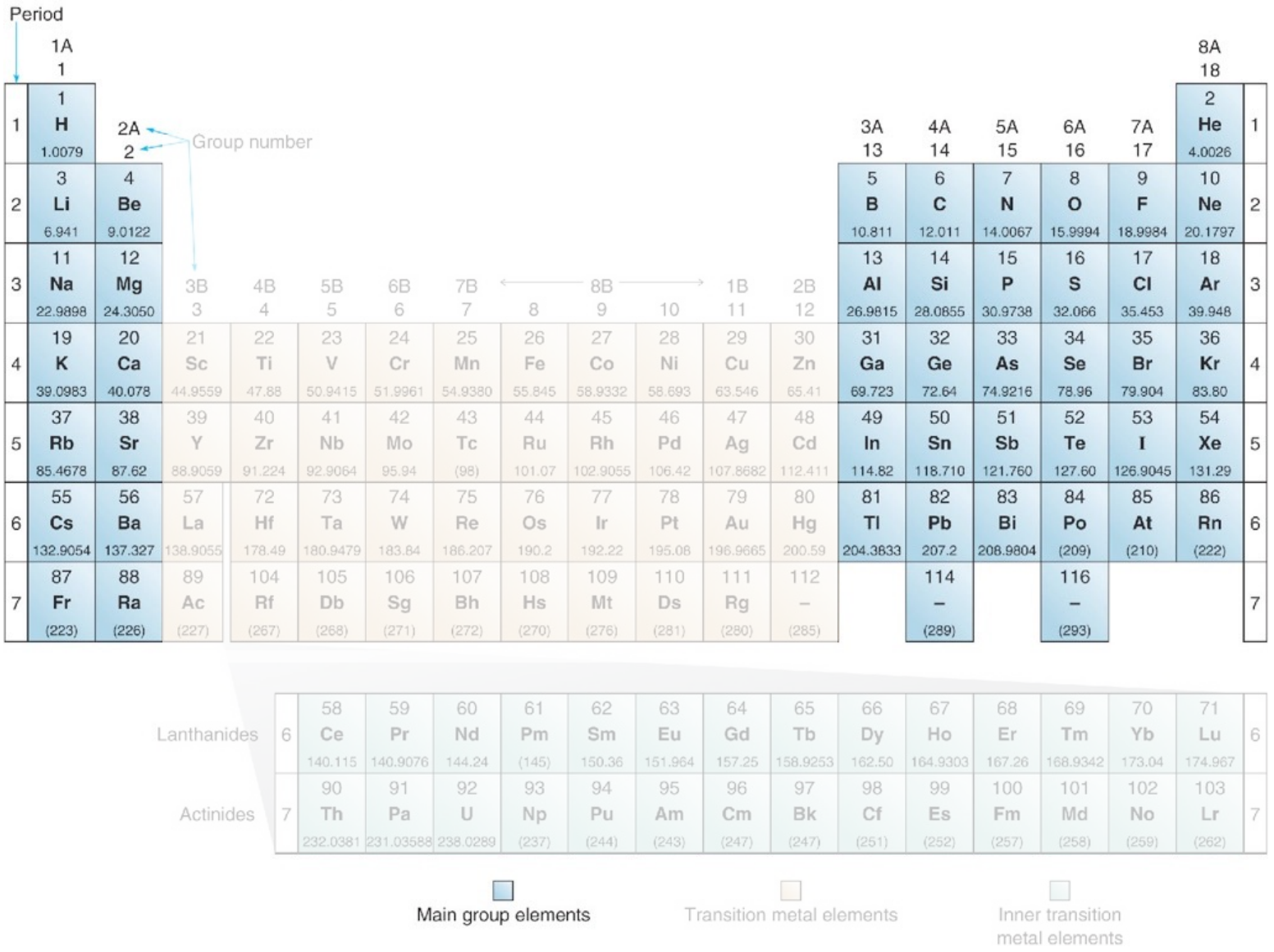
The Periodic Table

A row is called a period

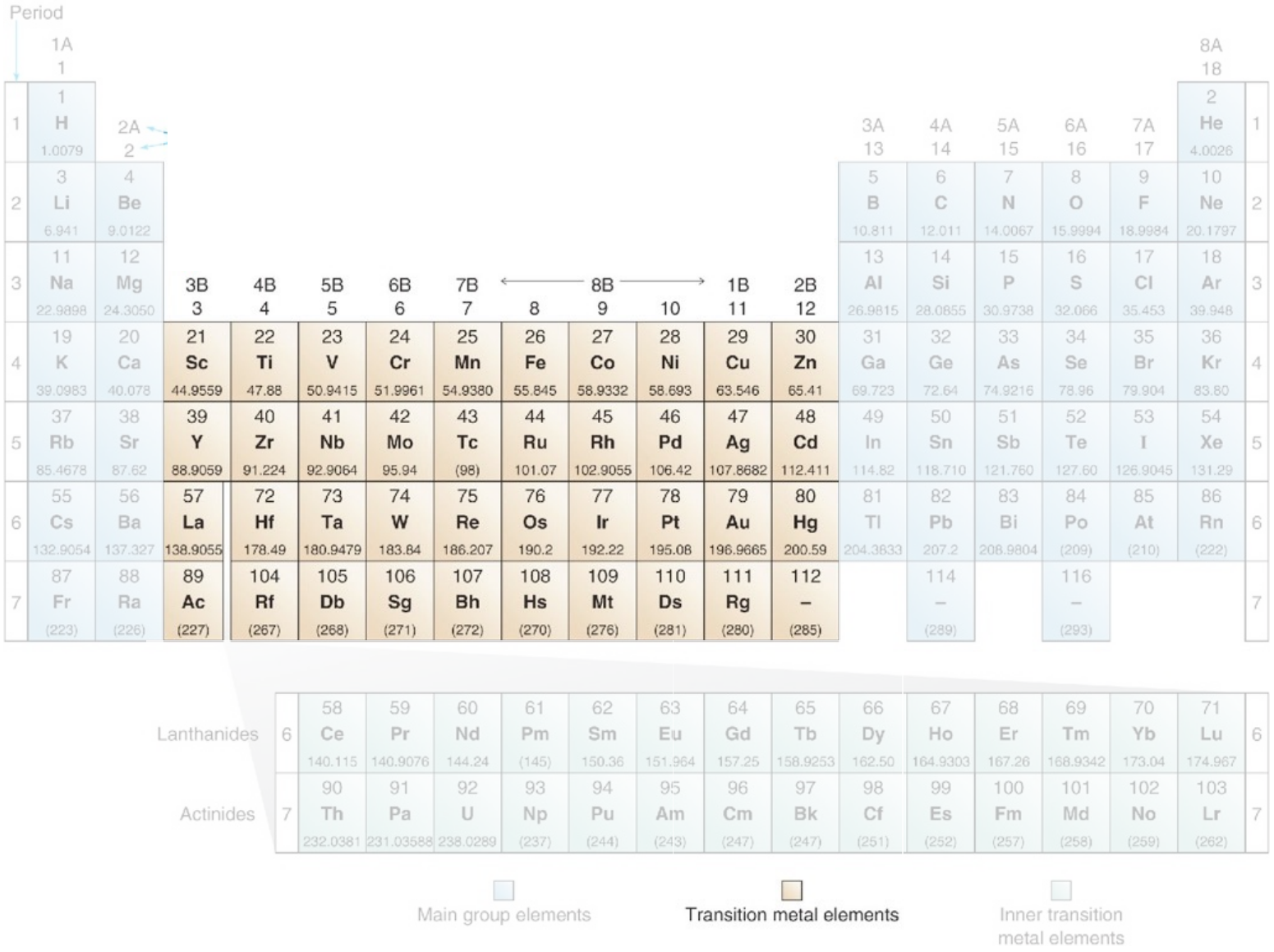
A column is called a group



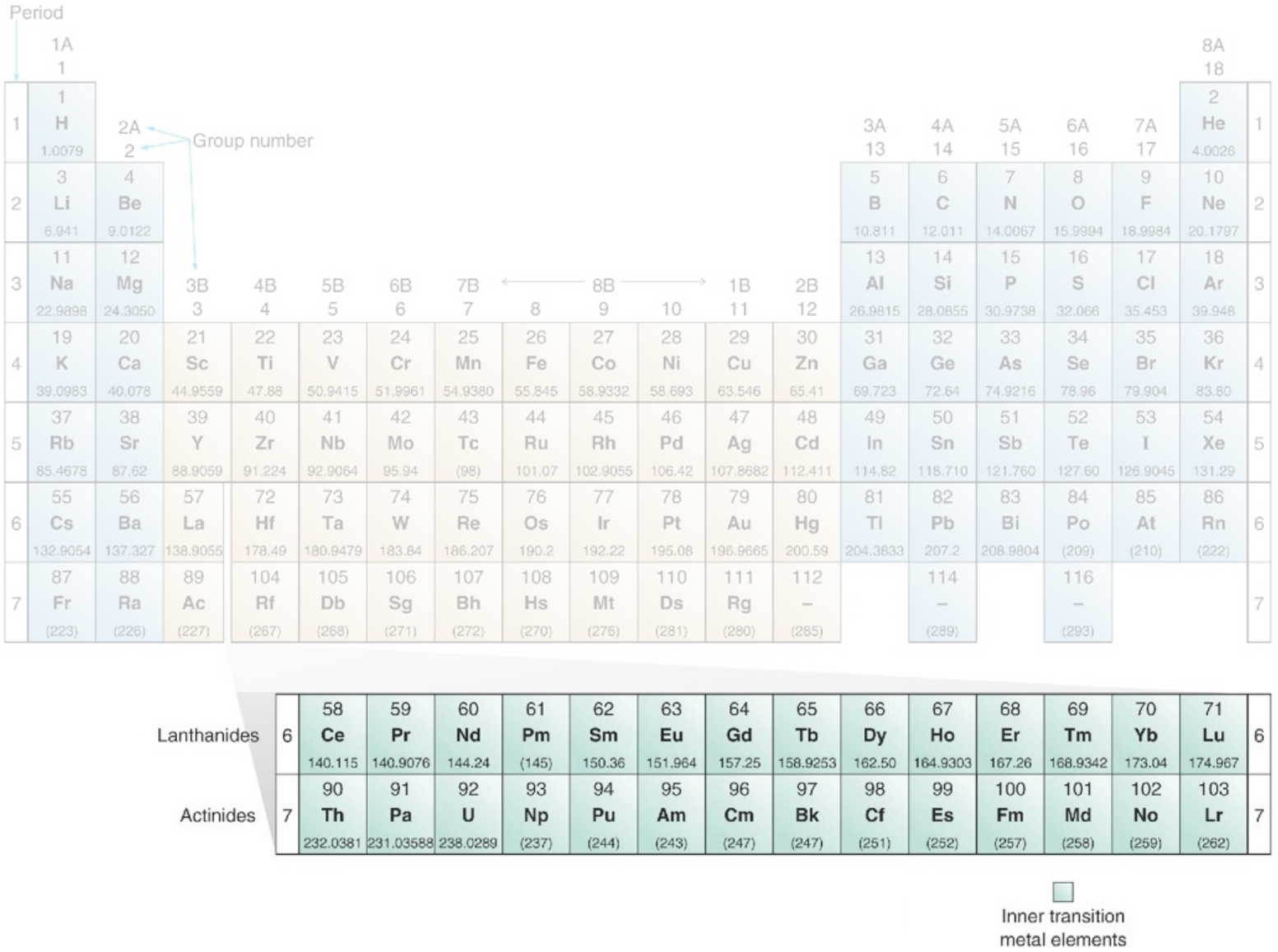
Main Group Elements



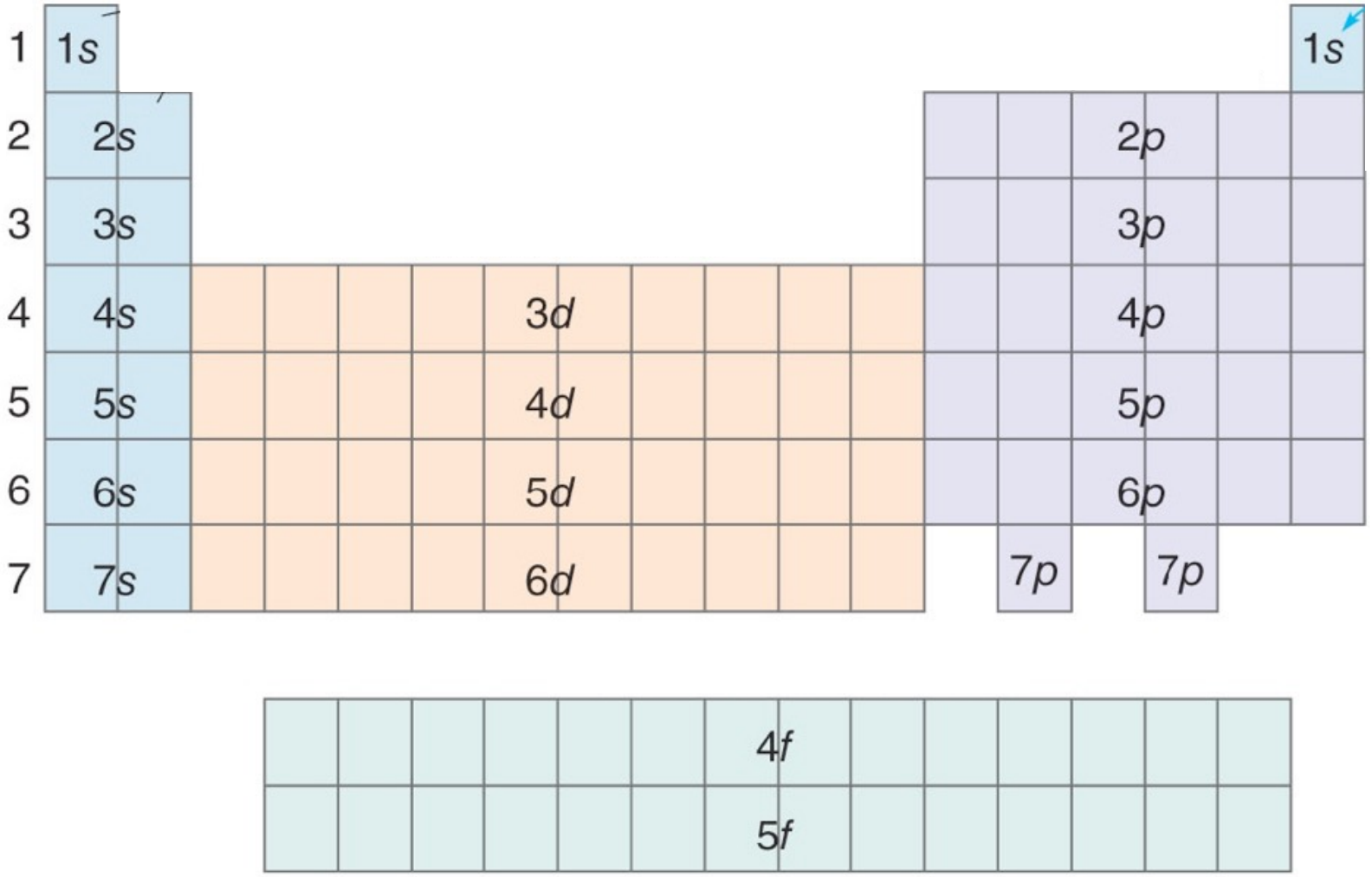
Transition Metal Elements



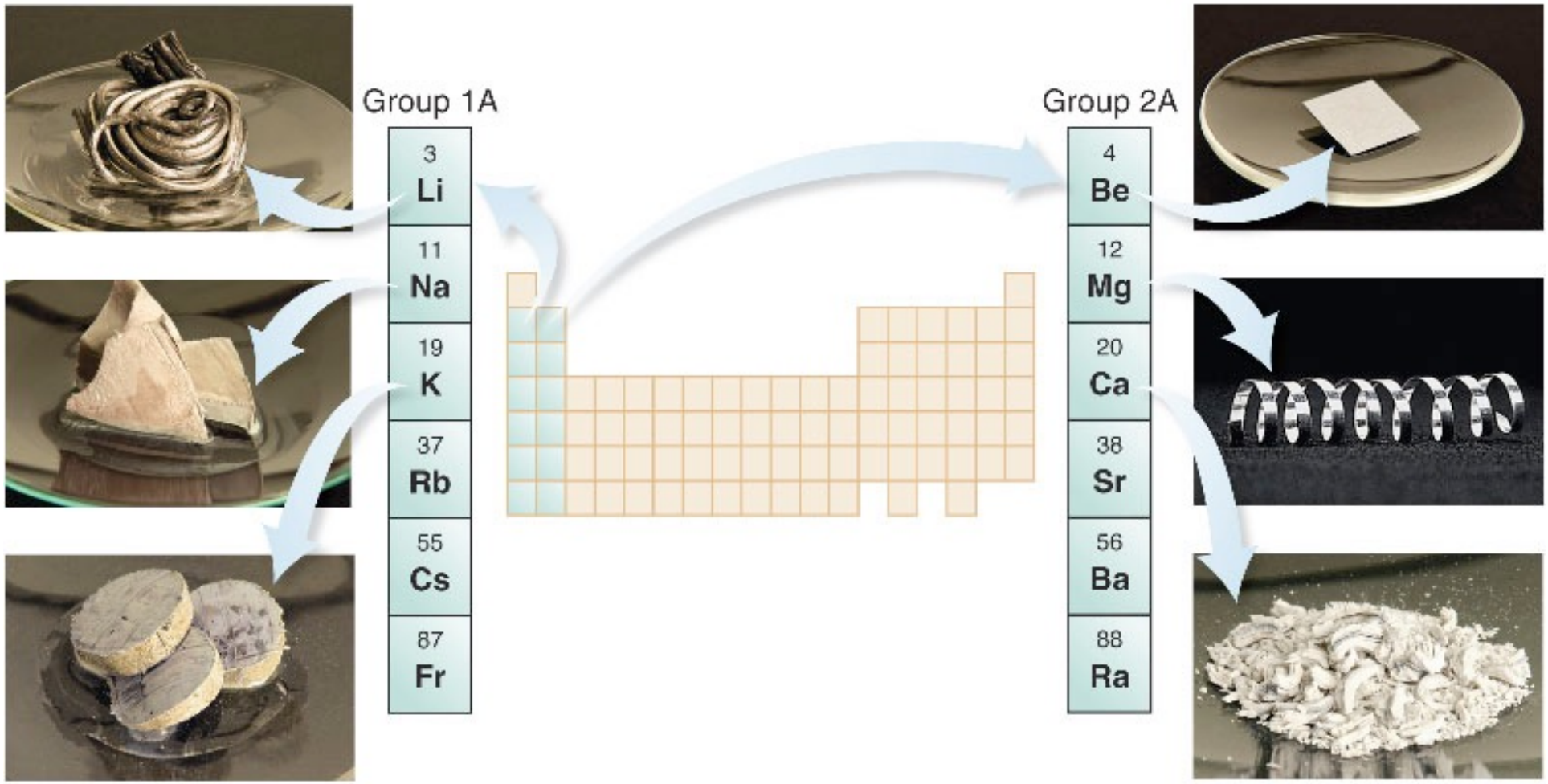
Inner Transition Metal Elements



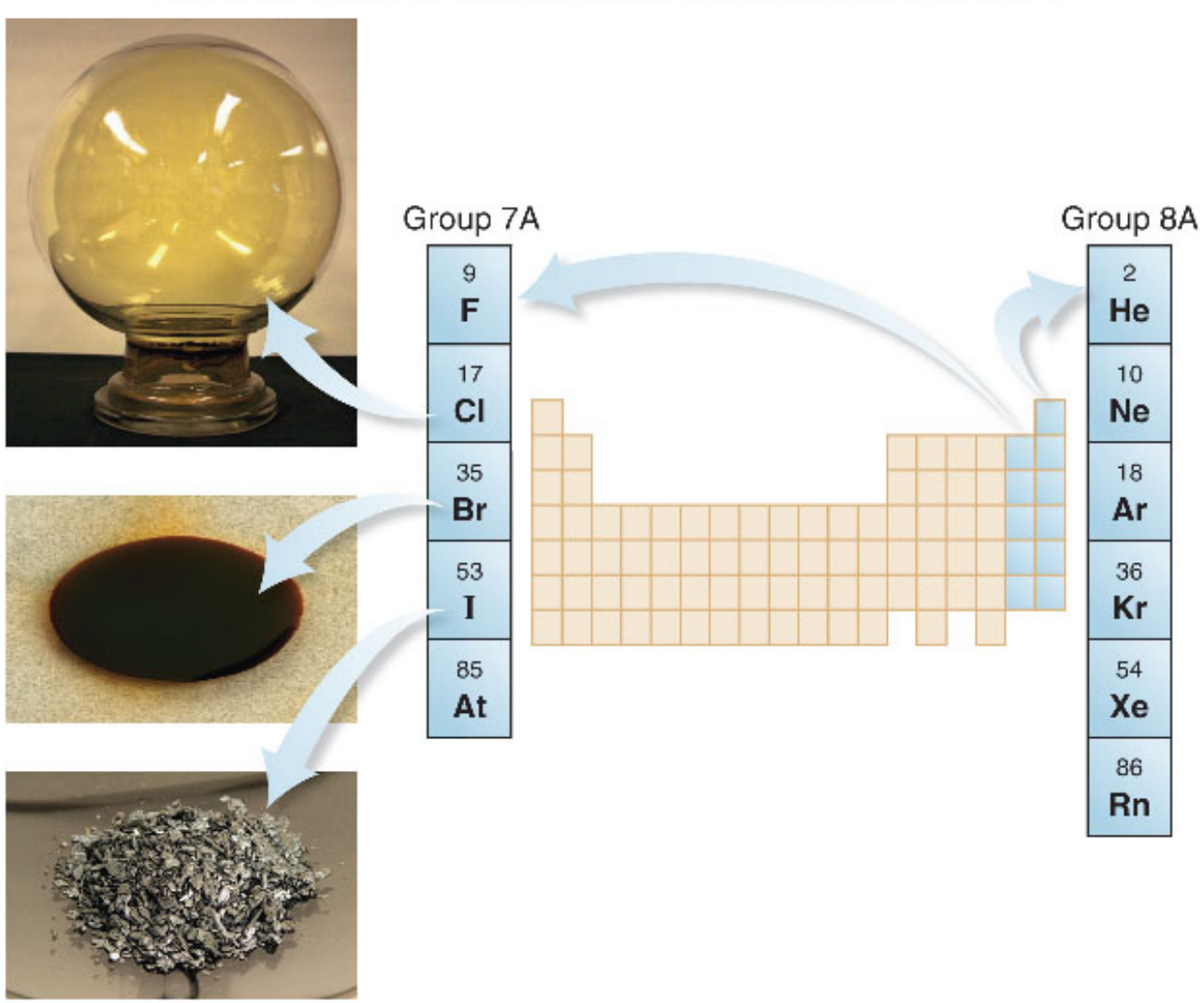
Periodic Table and Electron Arrangement



4 Special Groups



4 Special Groups



Identify the following elements

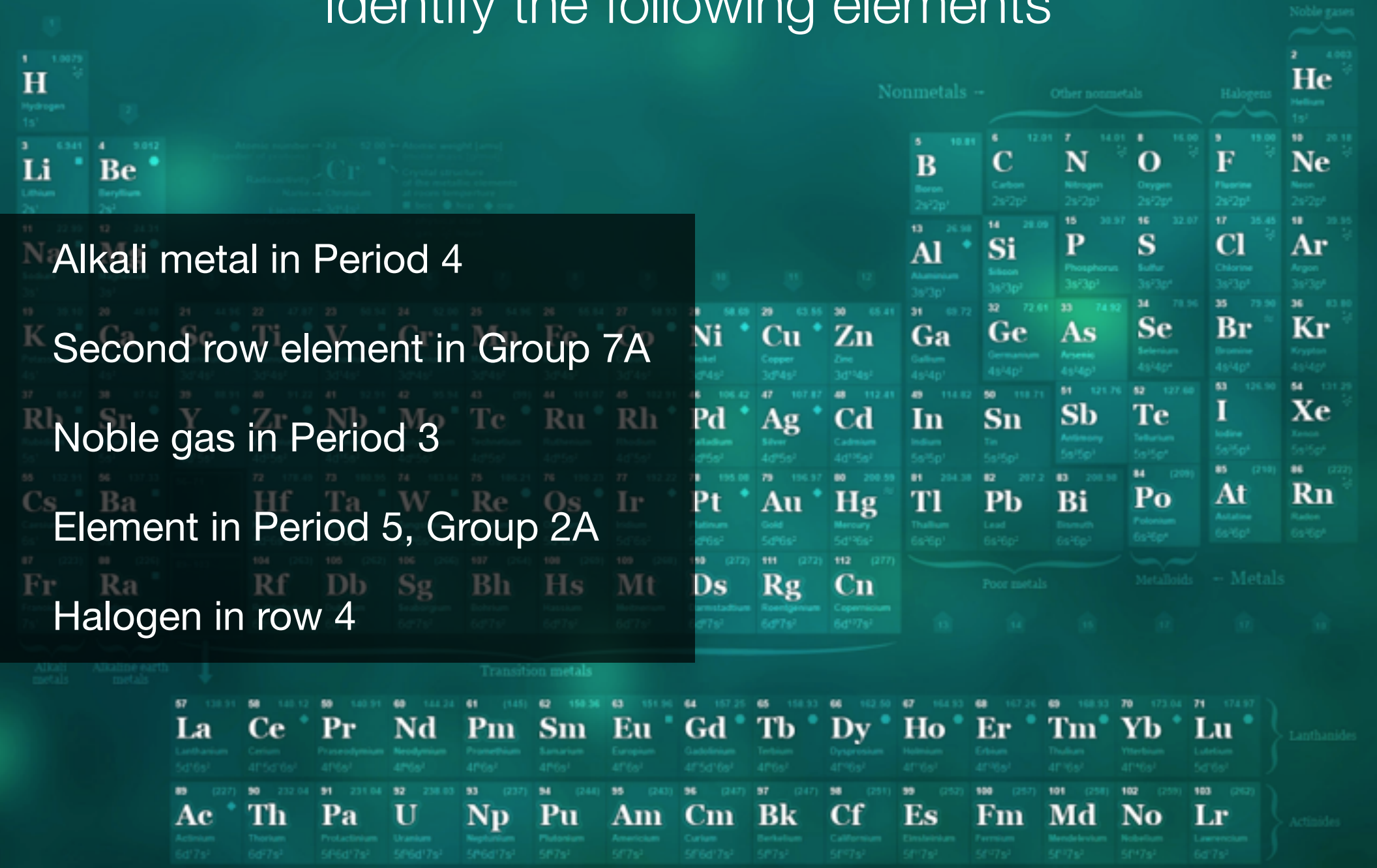
Alkali metal in Period 4

Second row element in Group 7A

Noble gas in Period 3

Element in Period 5, Group 2A

Halogen in row 4

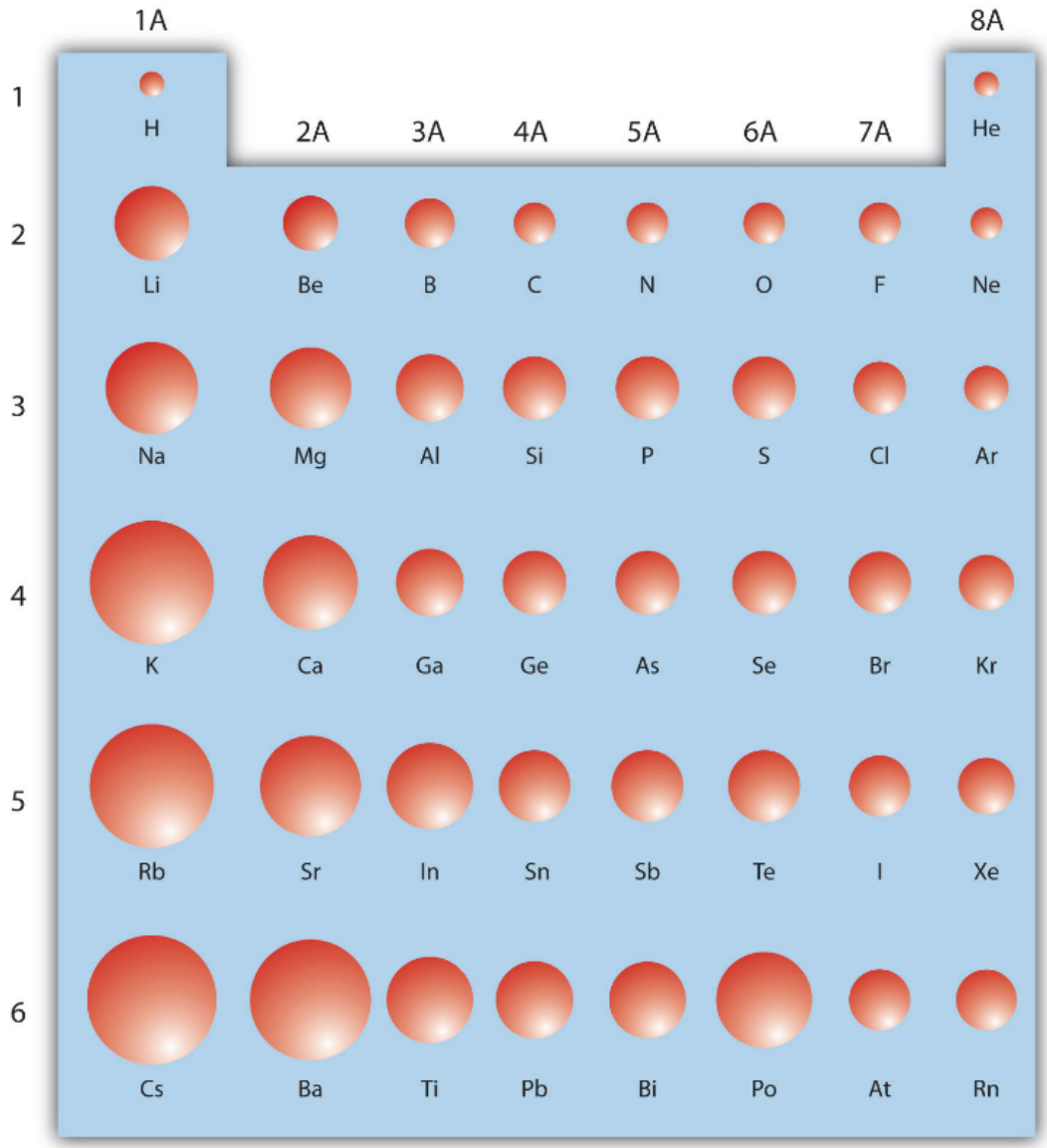


Atomic Size/Radius

The size of atoms increases down a column.

The size of atoms increases right to left across a row.

Atomic Size/Radius



Concept Review (Section 2.7)

CONCEPT REVIEW EXERCISES

1. How are the elements organized into the periodic table?

2. Looking at the periodic table, where do the following elements appear?

    a. the metals

    b. the nonmetals

    c. the halogens

    d. the transition metals

3. Describe the trends in atomic radii as related to an element's position on the periodic table.

Practice Problems: 1-14 in Section 2.7