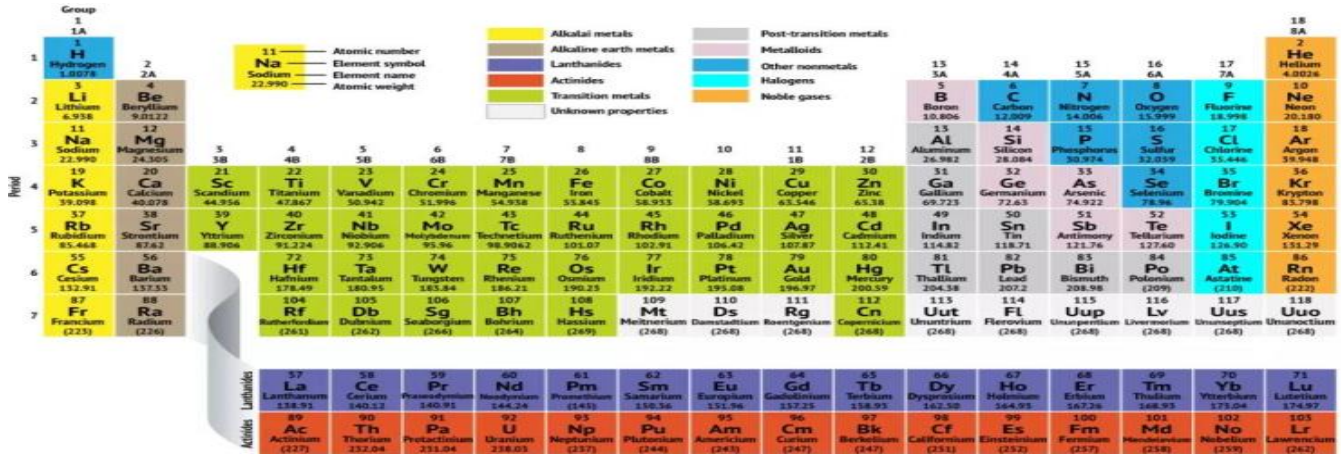
CHAPTER 5: Periodic Table & Periodic Trends



Part 1: Development of periodic table

•The 1800s brought large amounts of information and scientists needed a way to organize knowledge about elements.
•John Newlands proposed an arrangement where elements were ordered by increasing atomic mass.
•Newlands noticed when the elements were arranged by increasing atomic mass, their properties repeated every eighth element.
•Meyer and Mendeleev both demonstrated a connection between atomic mass and elemental properties.
•Moseley rearranged the table by increasing atomic number, and resulted in a clear periodic pattern.
•Periodic repetition of chemical and physical properties of the elements when they are arranged by increasing atomic number is called **periodic law.**
• Elements in groups 1,2, and 13–18 possess a wide variety of chemical and physical properties and are called the representative elements.
• Elements in groups 3–12 are known as the transition metals
• Metals are elements that are generally shiny when smooth and clean, solid at room temperature, and good conductors of heat and electricity.
• Alkali metals are all the elements in group 1 except hydrogen, and are very reactive. Ex: Li, Na, K.
• Alkaline earth metals are in group 2 or 2A, and are also highly reactive Ex: Mg, Ca.
• Nonmetals are elements that are generally gases or brittle, dull-looking solids, and poor conductors of heat and electricity.
• Group 17 is composed of highly reactive elements called halogens. Ex: F, Cl, Br, I
• Group 18 gases are extremely unreactive and commonly called noble gases.
• The transition elements are divided into transition metals and inner transition metals.
• The two sets of inner transition metals are called the lanthanide series and actinide series and are located at the bottom of the periodic table.
• Metalloids, such as silicon (Si) and germanium (Ge), have physical and chemical properties of both metals and nonmetals.

1 **The groups of elements from 3 to 12 in a periodic table is called**
CH 5
A Main Group Elements
B Halogens
C Noble gases
D Transition element
Elements in groups 3–12 are known as the transition metals →D

2 **Group 1A elements except for hydrogen are called**
CH 5
A Alkaline metals **B** Noble gases
C Halogens **D** Transition metals
Alkali metals are all the elements in group 1(1A) except Hydrogen, and are very reactive →A

3 **Group 17 (7A) in a periodic table**
CH 5
A Alkaline metals **B** Noble gases
C Halogens **D** Transition metals
is Group 17 (7A) is composed of highly reactive elements called halogens →C

4 **An example of metalloids is:**
CH5 **A** Cl **B** P **C** S **D** Si
Metalloids, such as silicon (Si) and germanium (Ge), have physical and chemical properties of both metals and nonmetals. →D

5 **Lanthanides and actinides are classified as**
CH5
A Main Group elements
B Inner transition elements
C Transition elements
D Noble gases
The two sets of inner transition metals are called the lanthanide series and actinide series and are located at the bottom of the periodic table. →B

6 **An example of Earth alkaline metals is:**
CH5 **A** Na **B** Mg **C** S **D** Si
Alkaline earth metals are in group 2 or 2 A, and are also highly reactive. Ex: Mg, Ca →B

7 **The actinide series is part of the**
CH5
A s-block elements.
B Inner transition elements
C Non-metals.
D Alkali metals.
The two sets of inner transition metals are called the lanthanide series and actinide series and are located at the bottom of the periodic table. →B

8 **An example of Nobel gas element:**
CH5 **A** Cl **B** Na **C** Ne **D** H
Nobel -gases are He, Ne, Ar, Kr, Xe. →C

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Part 2: Periodic Trend

- **Atomic radius** is half the distance between adjacent nuclei in a crystal of the element, ***atomic radius*** generally decreases from left to right, caused by increasing positive charge in the nucleus.
, atomic radius generally increases as you move down a group.
– increase shielding and screening effect – increase number of shells from one period to another through the group.

- **Ionic Radius**

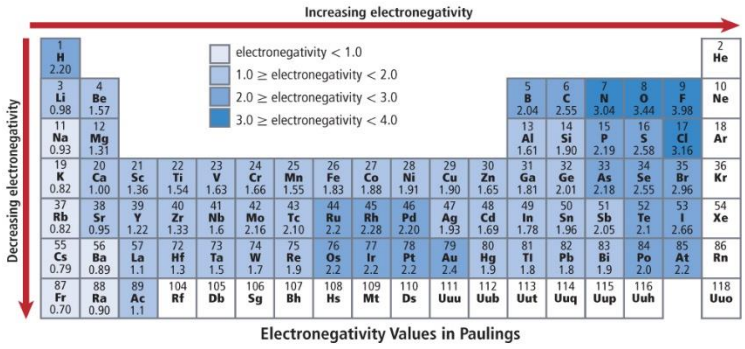
The ionic radii of **positive ions** generally decrease from left to right.
The ionic radii of **negative ions** generally decrease from left to right, beginning with group 15 or 16.

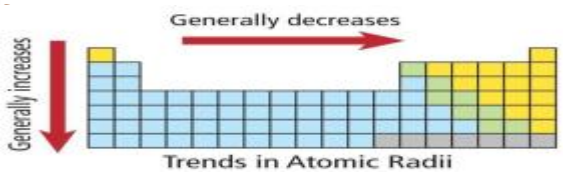
- **Ionization energy** is defined as the energy required to remove an electron from a gaseous atom.

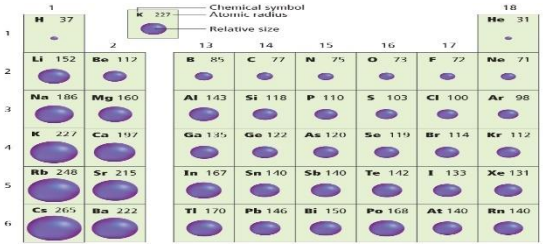
The energy required to remove the first electron is called the first **ionization energy.**

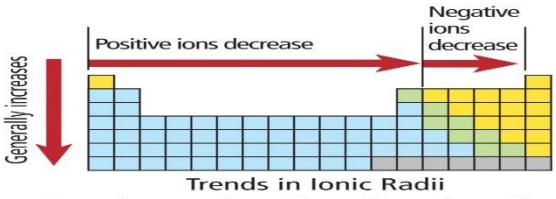
- **The electronegativity** of an element indicates its relative ability to attract electrons in a chemical bond
- Electronegativity decreases down a group and increases left to right across a period.

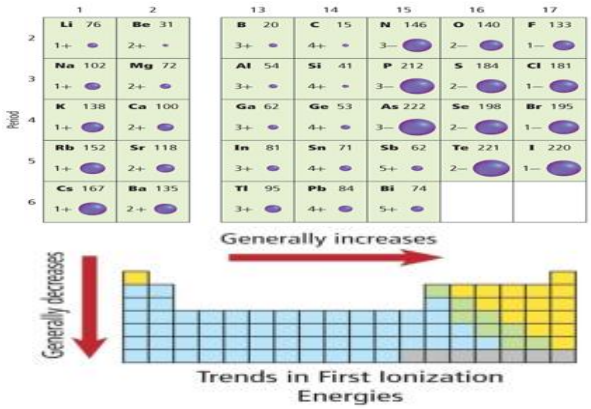
• Fluorine (F) is the smallest atom and the highest electronegativity in periodic table
• Cesium (Cs) is the largest atom and the lowest electronegativity in periodic table











9 **In periodic table as we move down in a group the:**

CH 5

A The radius of the atom decreases
B Ionization energy increases
C The radius of the atom increases
D Electronegativity increases

Atomic radius generally increases as you move down a group. →C

10 **The ability of an atom to attract the electrons in a bond is called**

CH 5

A Ionization energy **B** Activation energy
C Electronegativity **D** Crystalline energy

The electronegativity of an element indicates its relative ability to attract electrons in a chemical bond. →C

11 **If the elements of a group are arranged in the periodic table as shown in the figure, then the iodine atom has**

CH5

F
Cl
Br
I

A The highest electronegativity
B The highest ionization energy
C The lowest electronegativity
D The lowest atomic diameter

Electronegativity decreases down a group and increases left to right across a period. →C

12 **The most electronegative elements in the periodic table are...**

CH 5

A Alkali metals
B Alkaline Earth metals
C Halogens
D Group 18 elements (the noble gases)

Halogens are the most electronegative elements in the periodic table →C

13 **The ionic radius of a negative ion becomes larger when:**

CH 5

A Moving up a group
B Moving left to right across period
C Moving down a group
D The ion loses electrons

Both positive and negative ions increase in size moving down a group →C

14 **Base on the following table, Which element has the larger atomic radius**

	Group 1	Group 2
Period 2	Li	Be
Period 3	Na	Mg

CH 5

A Li **B** Na
C Be **D** Mg

Atomic radius generally decreases from left to right, atomic radius generally increases as you move down a group. →B