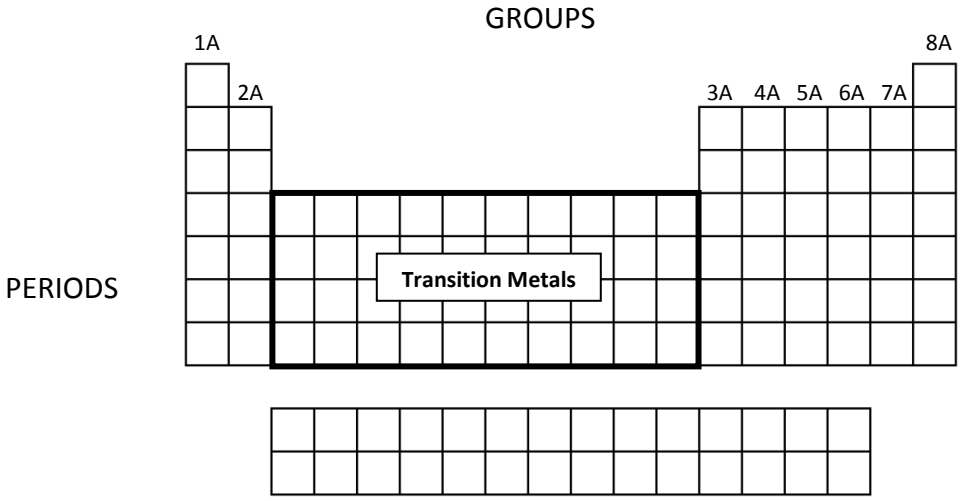
SCH 3U
THE PERIODIC TABLE

Dmitri Mendeleev – late 1800s

- Organized the elements by increasing **atomic mass**.
- Elements with similar properties were placed in vertical columns.

MODERN PERIODIC TABLE

- Arranged by increasing **atomic number**.
- **PERIODIC LAW** – chemical and physical properties of elements repeat in a regular pattern when arranged by atomic number.



PERIOD NUMBER

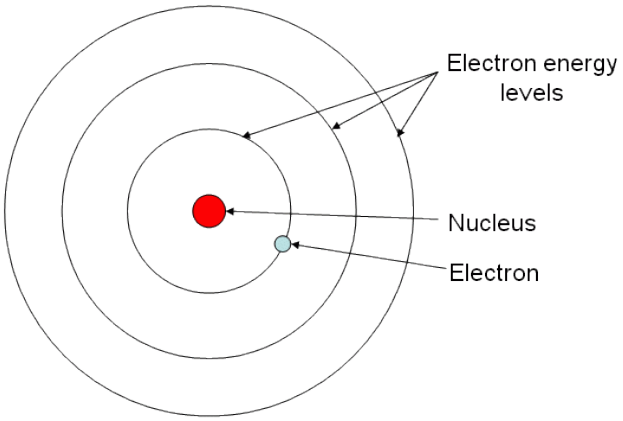
- Horizontal rows
- # of energy levels an element has in its atomic structure

GROUP (OR FAMILIES)

- Vertical columns
- Elements in groups have similar chemical properties
- Main group elements are classified as A type
- Relates to the number of valence electrons

1A	Alkali metals	1 valence electron
2A	Alkaline earth metals	2 valence e^-
4A	eg. Carbon	4 valence e^-
7A	Halogens	7 valence e^-
8A	Noble (inert) gases	8 valence e^-

ENERGY LEVELS (or shells)

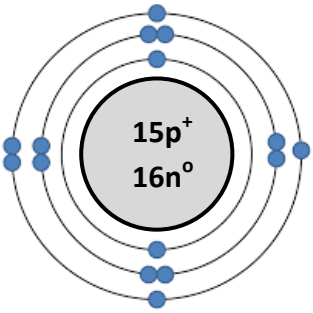


- Electrons move in fixed regions of space.
- The more energy (NRG) an electron has, the higher its NRG level and further from nucleus.

- Maximum of 2 e^- in 1st NRG level
- Maximum of 8 e^- in 2nd NRG level
- Up to 18 e^- in the 3rd NRG level
- Maximum #e^- = $2n^2$, where n =energy level number

BOHR-RUTHERFORD DIAGRAMS

EG. Phosphorus atom -- $^{31}_{15}P$



- 15 protons; 15 electrons; and 16 neutrons.

- Begin with nucleus at centre, draw 1 level at a time, inserting electrons on the level up to its maximum and up to the total number of electrons in the atom.
- For phosphorus, 2 + 8 + 5 electrons – max of 2 e^- in 1st row; max of 8 e^- in 2nd row (totally 10 of the 15 e^- so far); then 5 e^- in the 3rd level.
- The outer level (also known as the **VALENCE** shell) for phosphorus contains 5 electrons, one pair of e^- and 3 unpaired e^-.

LEWIS STRUCTURES

- Only show valence e^- without rings or levels.

Eg. 

Eg. 

NOBLE GASES (or inert gases): The last column of the periodic table – they are unreactive. The valence shell for these elements is full; that is, the outer shell has a **stable octet** – the valence shell has reached its maximum number of electrons.

- Exception – Helium has 2 electrons in its valence shell and since its valence shell is the 1st level, it has reached the maximum number of electrons. Therefore, it is unreactive.

EXERCISE:

① Name the element with the indicated properties:

A) period 4; 3 valence electrons

B) 3 shells; 2 valence electrons

C) halogen; 4 energy levels

D) alkali metal; period 5

E) 4 valence electrons; period 6

F) noble gas; 4 shells

G) alkaline earth metal; 50 neutrons

H) 3 energy levels; 18 neutrons

② Sketch the Bohr-Rutherford diagram for each atom.

- Indicate all subatomic particles.
- Identify period and group numbers.

A) calcium

B) oxygen

C) sodium

③ Draw the Lewis diagram of each atom. Identify period and group numbers.

A) sulfur

B) argon

C) lithium

D) helium

E) chlorine

F) oxygen