MODERN PERIODIC TABLE

Lecture 5.

ANSWERS:

1 - Electronic configuration of the given elements:

i. $_{30}Zn$ – $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^{10}$

ii. $_{82}Pb$ – $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^{10}\ 4p^6\ 5s^2\ 4d^{10}\ 5p^6\ 6s^2\ 4f^{14}\ 5d^{10}\ 6p^2$

iii. $_{54}Xe$ – $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^{10}\ 4p^6\ 5s^2\ 4d^{10}\ 5p^6$

iv. $_{88}Ra$ – $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^{10}\ 4p^6\ 5s^2\ 4d^{10}\ 5p^6\ 6s^2\ 4f^{14}\ 5d^{10}\ 6p^6\ 7s^2$

Q.1 – Where does the element with the given valence shell electronic configuration lie in the periodic table?



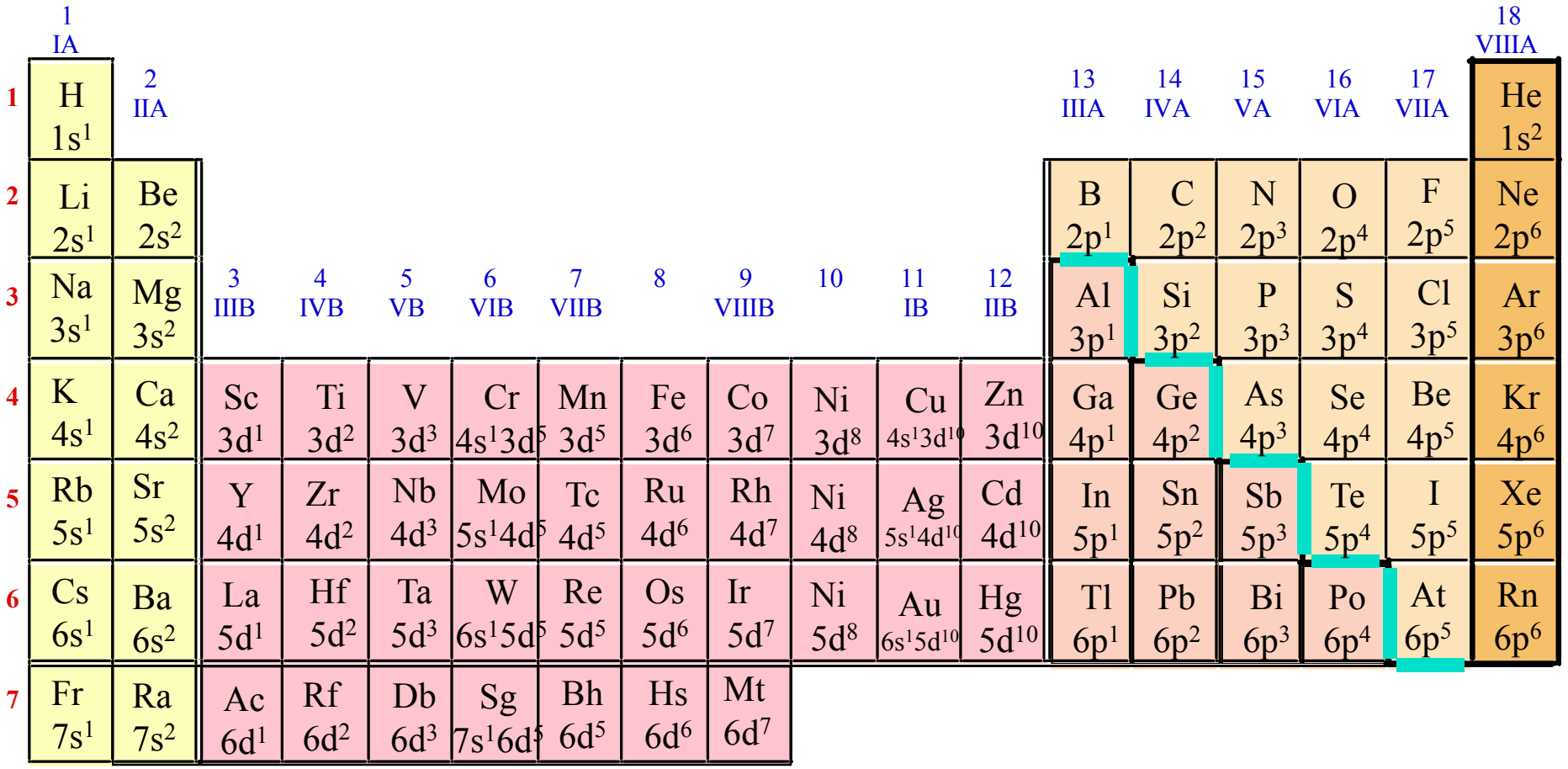
i. $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^{10}\ 4p^6\ 5s^2\ 4d^{10}\ 5p^6\ 6s^2\ 4f^{14}\ 5d^{10}\ 6p^4$

ii. $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^{10}\ 4p^6\ 5s^2\ 4d^{10}\ 5p^6\ 6s^2\ 4f^{14}\ 5d^7$

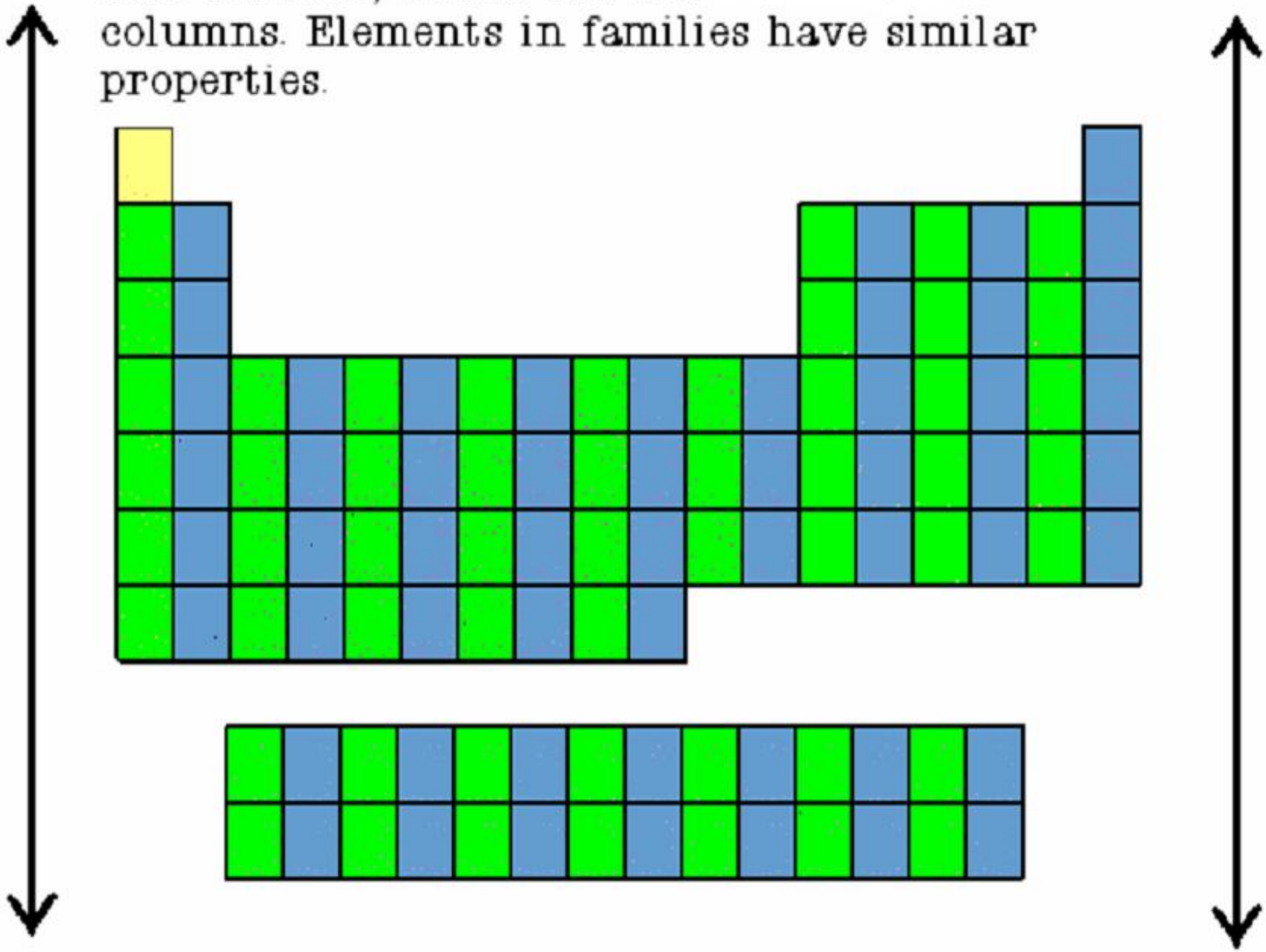
iii. $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^{10}\ 4p^6\ 5s^2\ 4d^{10}\ 5p^6\ 6s^2\ 4f^4$

iv. $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2\ 3d^{10}\ 4p^6\ 5s^2\ 4d^{10}\ 5p^6\ 6s^1\ 4f^{14}\ 5d^{10}$

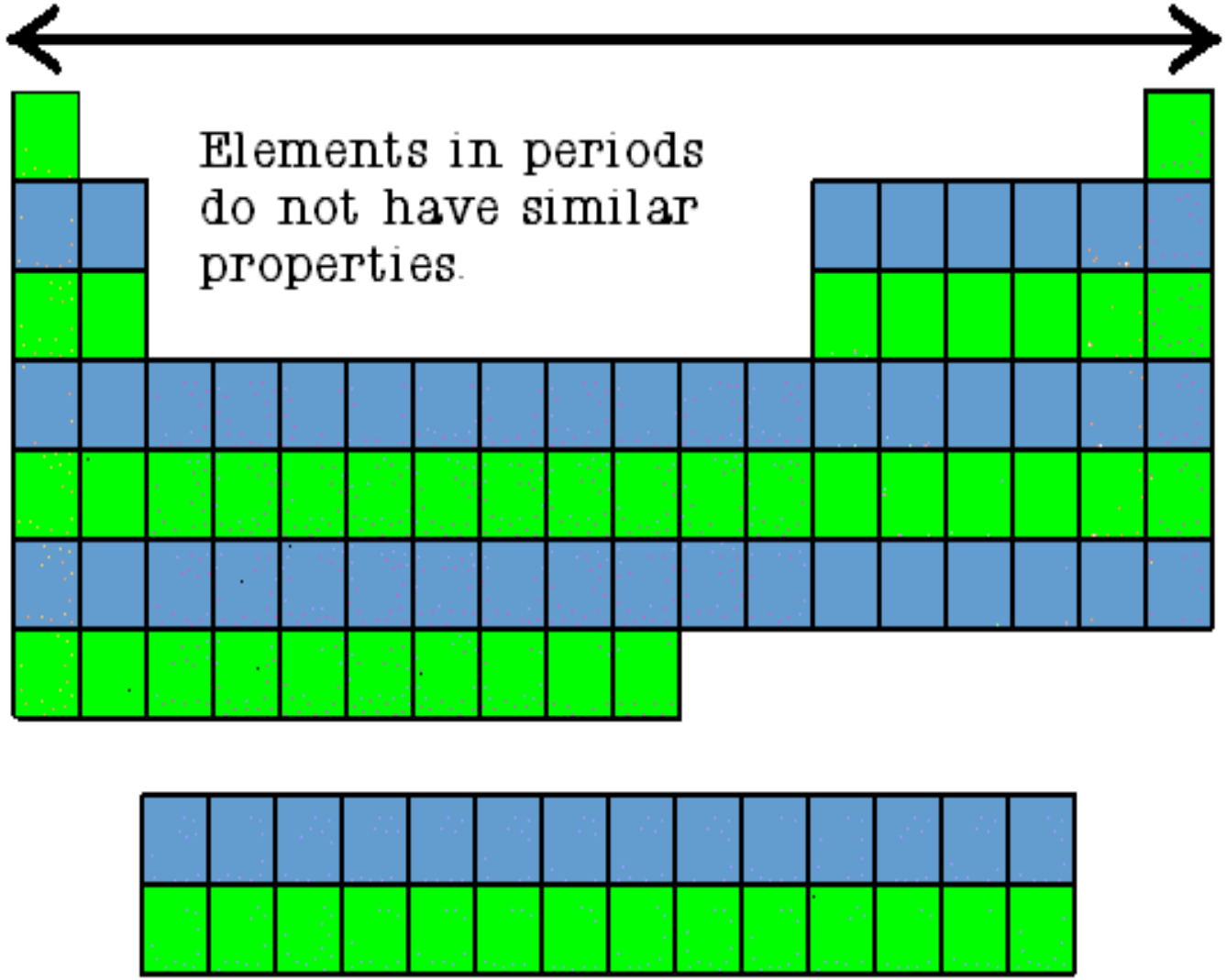
PER
ELECTRON



Elements in the periodic table are also grouped into families, which are the columns. Elements in families have similar properties.

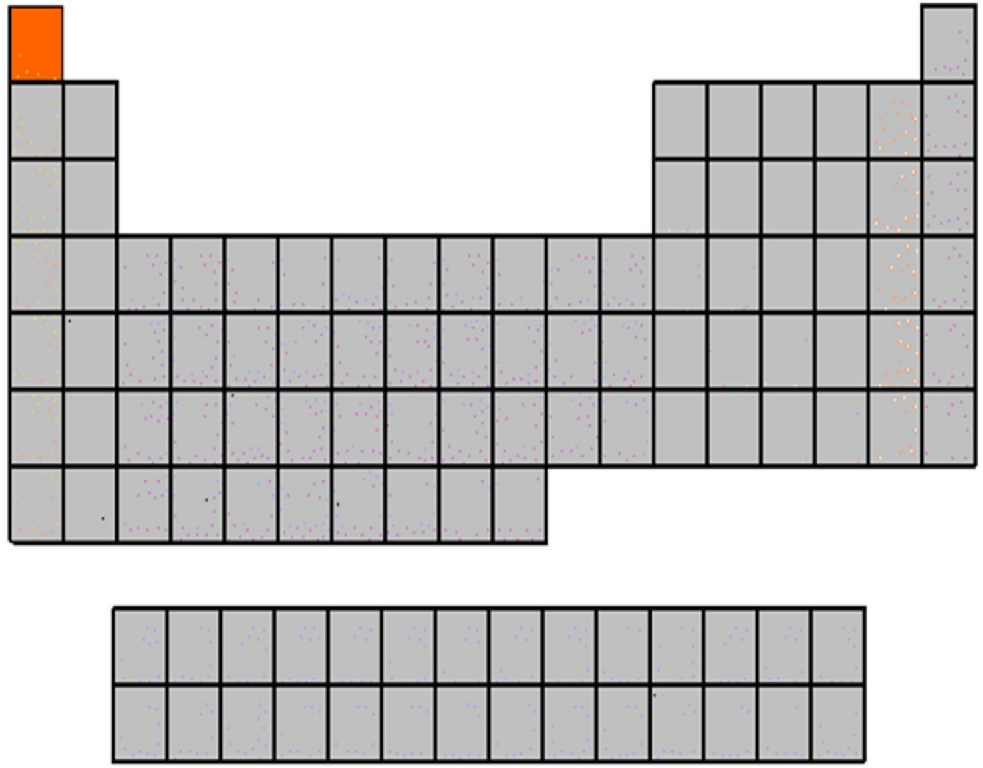


The elements are also categorized into periods, or horizontal rows.



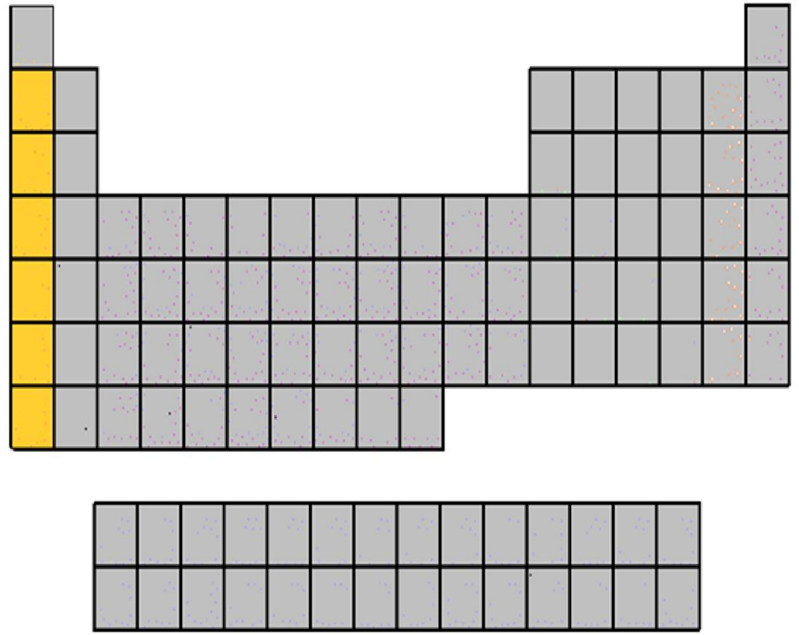
HYDROGEN

- The Hydrogen square sits atop Family A-1, but it is not a member of that family. Hydrogen is in a class of its own.
- It is a gas at room temperature.
- It has one proton and one electron in its one and only energy level.
- Hydrogen only needs 1 more electron to fill up its valence shell i.e. to achieve duplet.



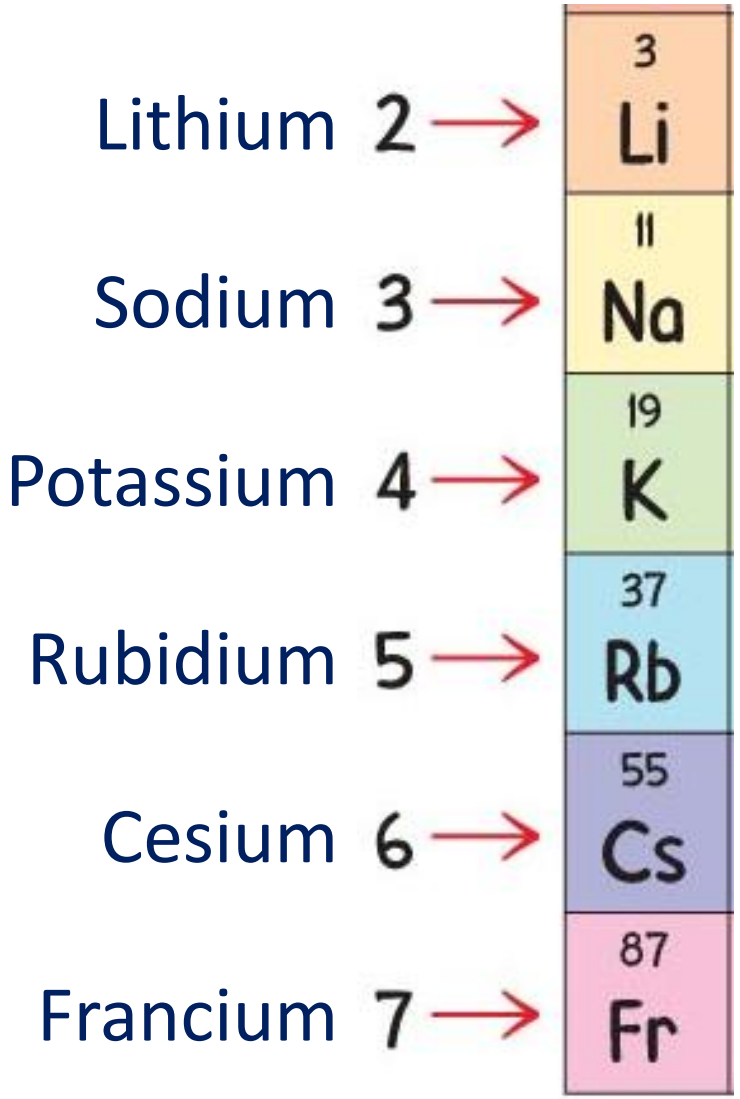
ALKALI METALS

- The alkali family is found in the first column of the periodic table.
- Atoms of the alkali metals have a single electron in their outermost level, in other words, 1 valence electron.
- They are shiny and are easily cut with a knife.
- They have general valence shell electronic configuration of $\mathbf{ns^1}$.



ALKALI METALS

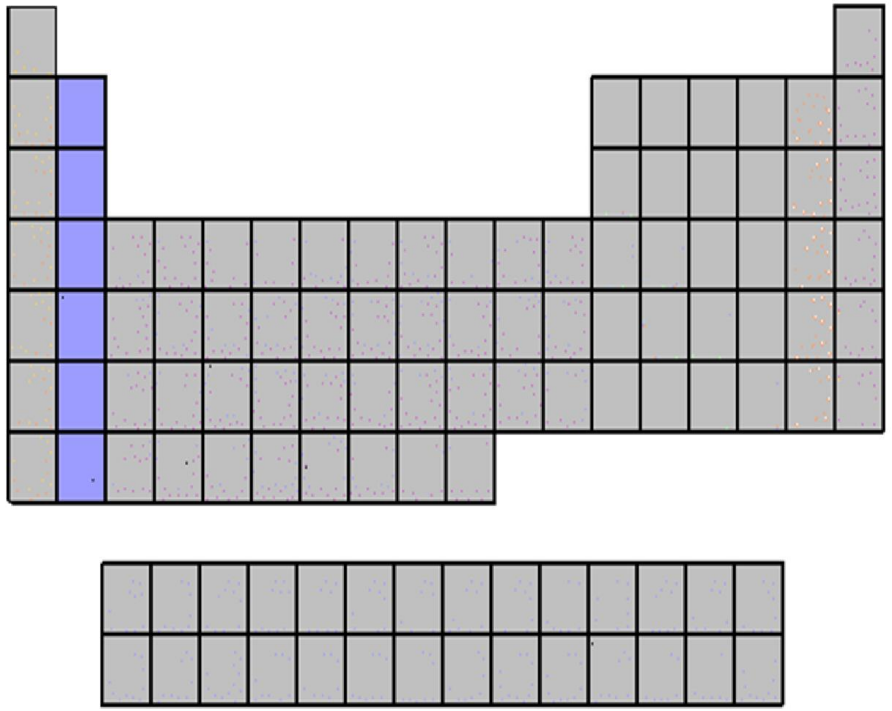
- They are the most reactive metals.
- They react violently with water.
- Alkali metals are never found as free elements in nature. They are always bonded with another element.

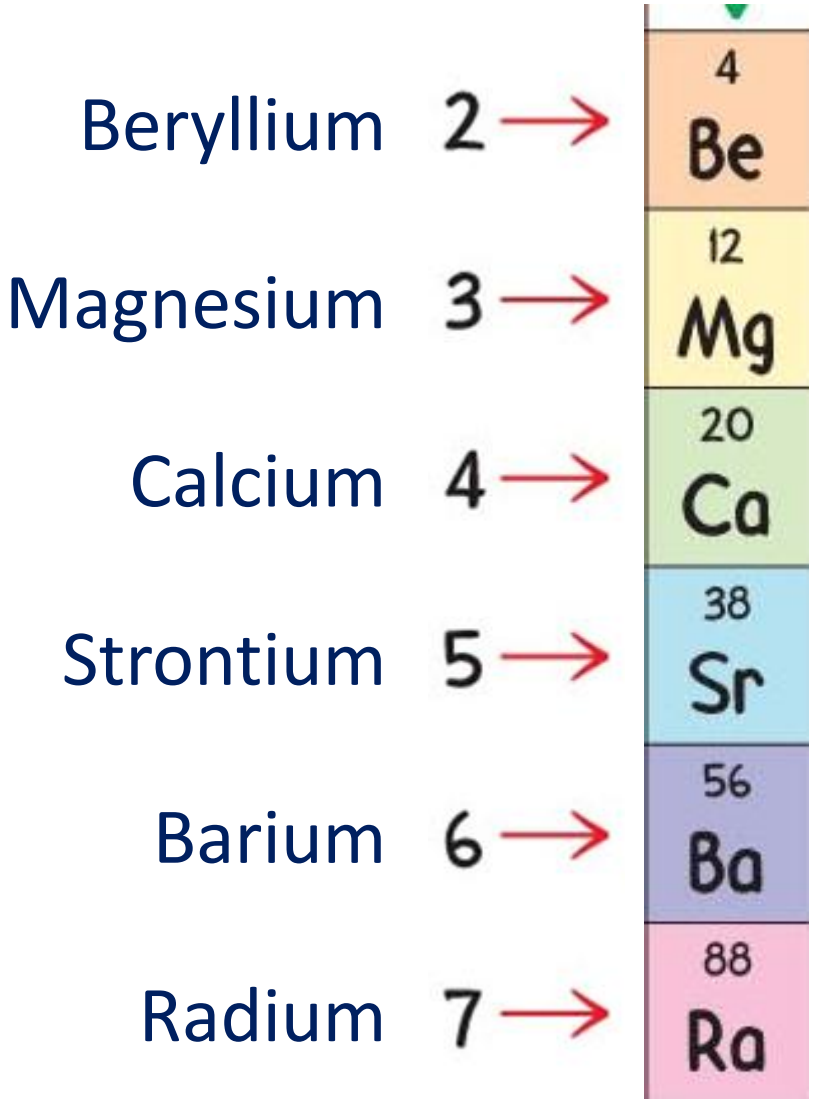


- Sodium and Potassium are stored in oil to keep them from reacting with oxygen and water in the air.
- Cesium is stored in glass tubes of argon gas (an inert gas).

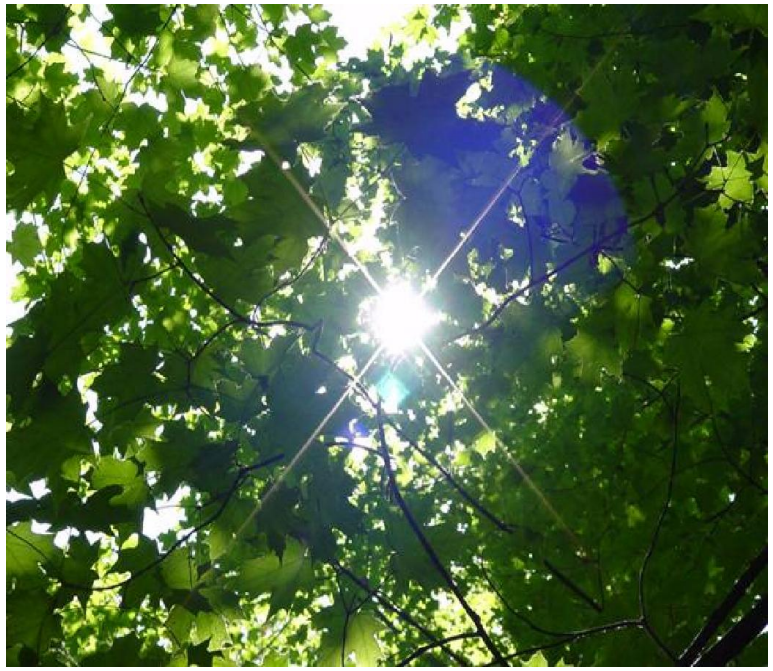
ALKALINE EARTH METALS

- Atoms of the alkaline earths have two electrons in their outermost level, in other words, 2 valence electrons.
- They are never found uncombined in nature.
- They have general valence shell electronic configuration of $\mathbf{ns^2}$.





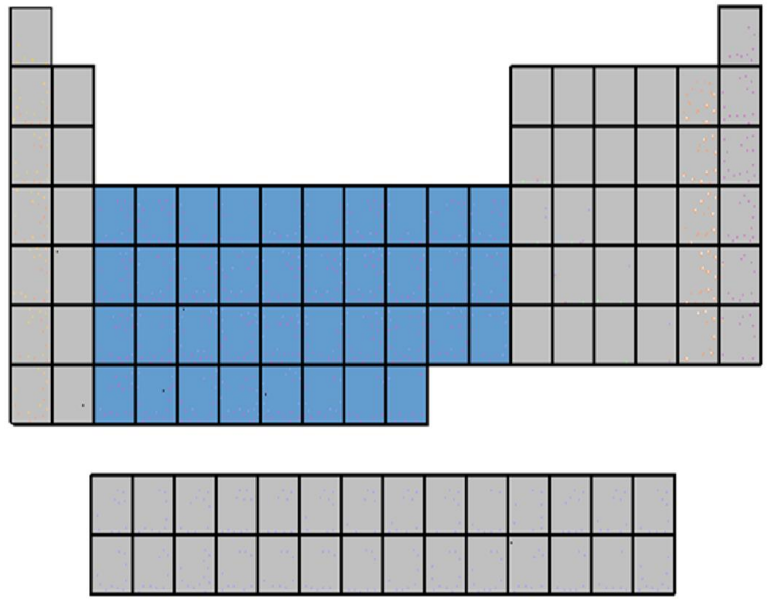
- There is Mg in chrolophyll – $C_{55}H_{72}O_5N_4Mg$
- Calcium is in your bones, chalk, limestone, toothpaste, pearl (all as calcium carbonate).





TRANSITION METALS

- Transition Elements include those elements in the B families.
- They are classified in 4 series as 3d, 4d, 5d & 6d.
- They are good conductors of heat and electricity.
- They usually exhibit variable valencies.
- They have general valence shell electronic configuration of $\mathbf{ns^{1-2}\ (n-1)d^{1-10}}$.



TRANSITION METALS

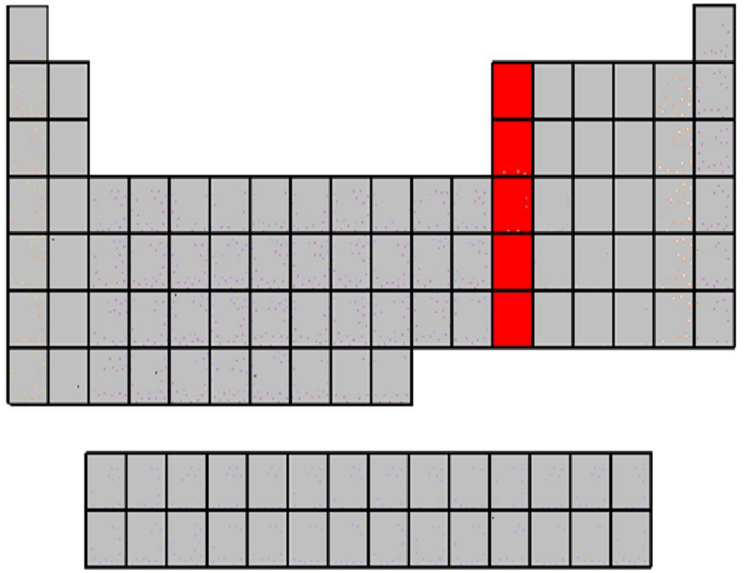
- The compounds of transition metals are usually brightly colored.
- Some transition elements can lose electrons in their next-to-outermost level.



BORON FAMILY

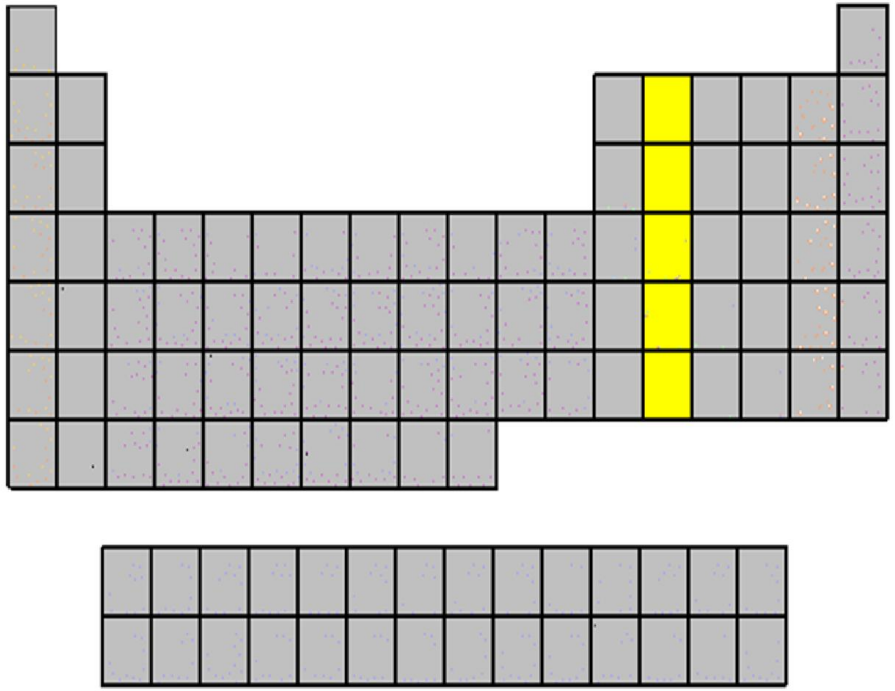
- The Boron Family is named after the first element in the family.
- Atoms in this family have 3 valence electrons.
- This family includes a metalloid (boron), and the rest are metals.
- This family includes the most abundant metal in the earth's crust (aluminum).
- They have general valence shell electronic configuration of $\mathbf{ns^2\ np^1}$.





CARBON FAMILY

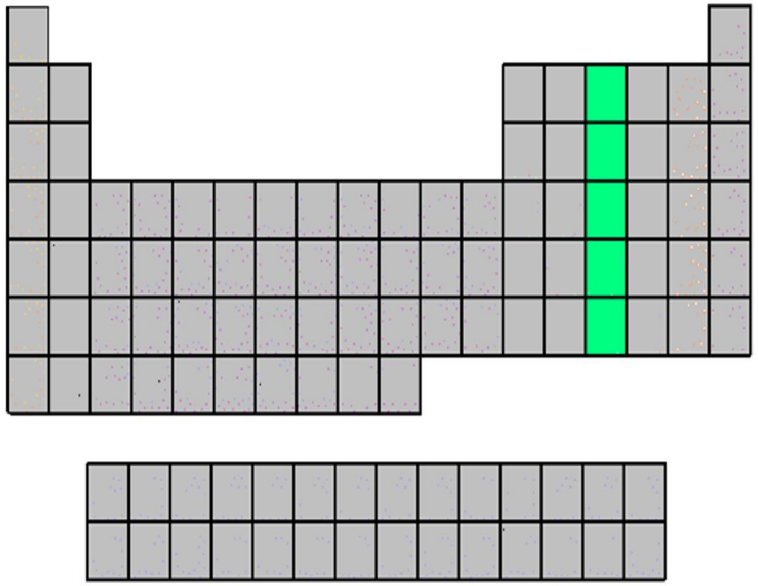
- Atoms of this family have 4 valence electrons.
- This family includes a non-metal (carbon), metalloids, and metals.
- The element carbon is called the “basis of life.” There is an entire branch of chemistry devoted to carbon compounds called organic chemistry.
- They have general valence shell electronic configuration of $\mathbf{ns^2\ np^2}$.



NITROGEN FAMILY

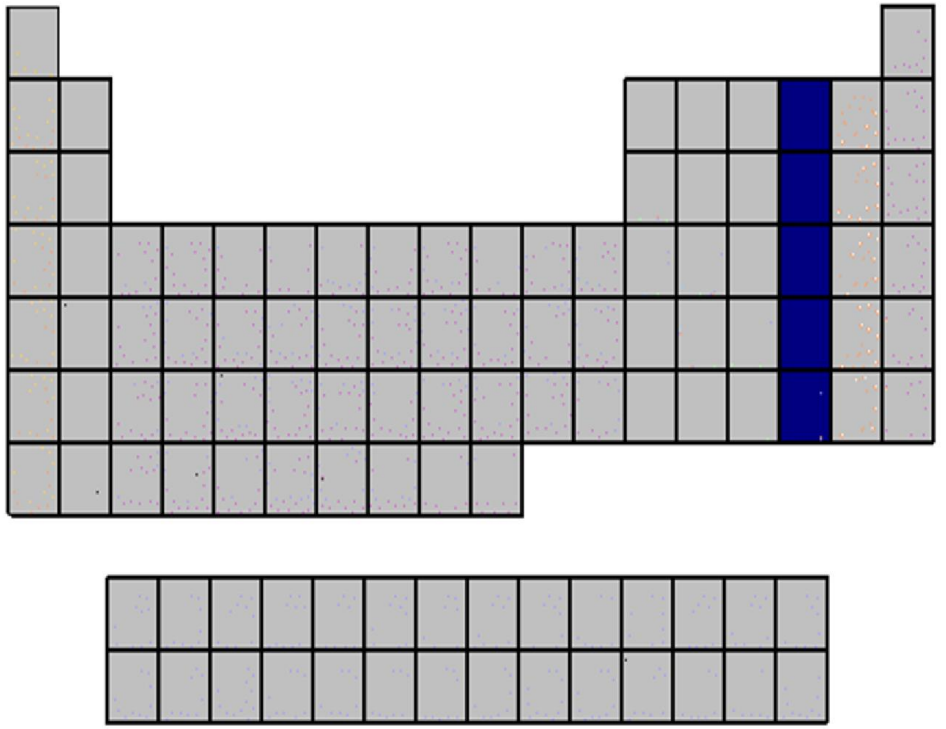
- The nitrogen family is named after the element that makes up 78% of our atmosphere.
- This family includes non-metals, metalloids, and metals.
- Atoms in the nitrogen family have 5 valence electrons. They tend to share electrons when they bond.
- They have general valence shell electronic configuration of $\mathbf{ns^2\ np^3}$.





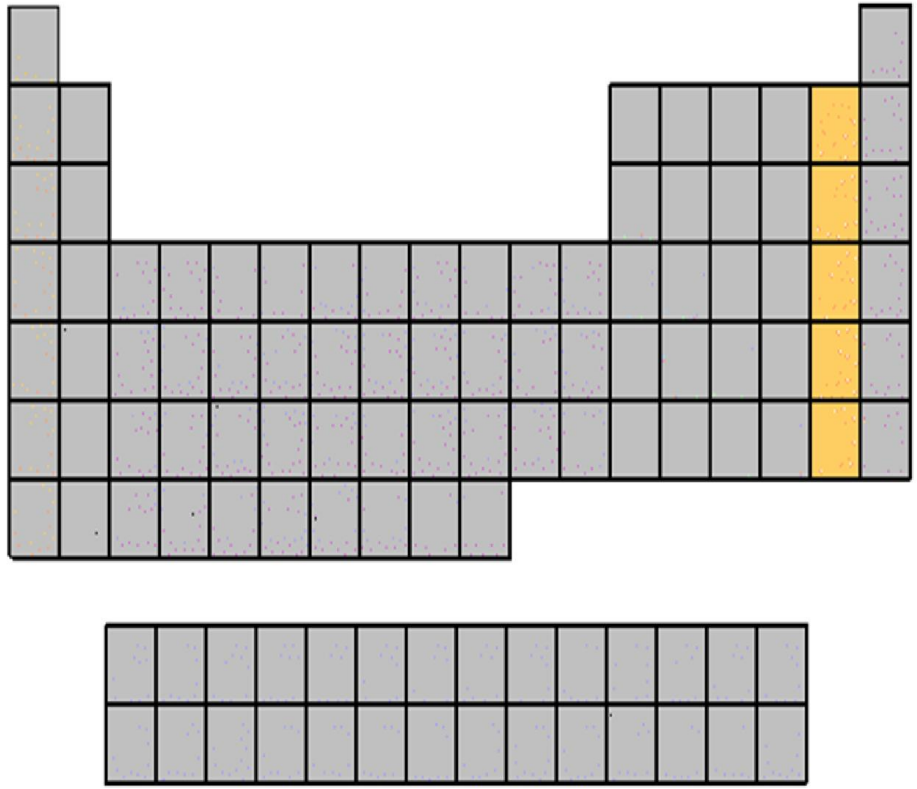
OXYGEN FAMILY

- Atoms of this family have 6 valence electrons.
- Most elements in this family share electrons when forming compounds.
- Oxygen is the most abundant element in the earth's crust. It is extremely active and combines with almost all elements.
- They have general valence shell electronic configuration of **$ns^2\ np^4$.**



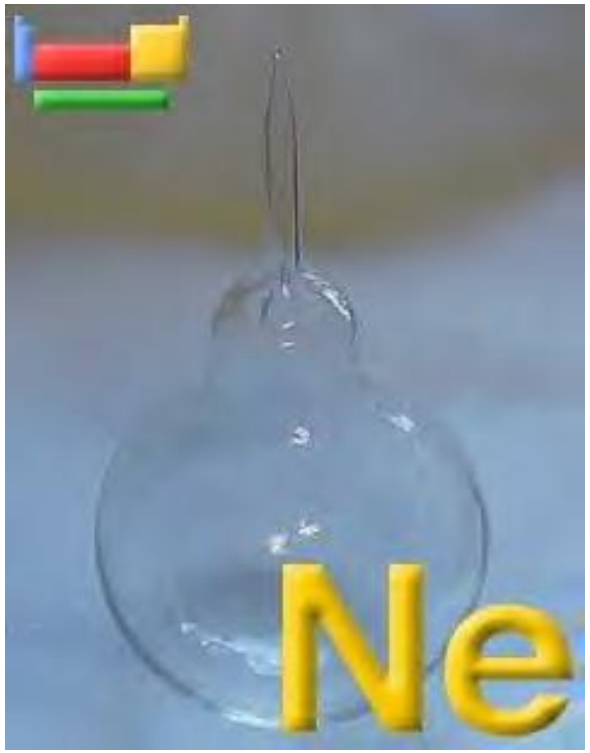
HALOGENS

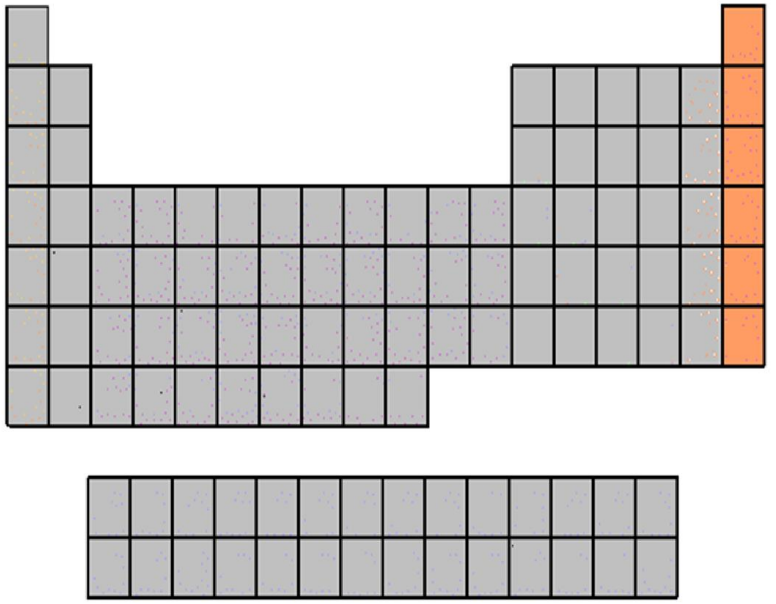
- Halogens have 7 valence electrons, which explains why they are the most active non-metals. They are never found free in nature.
- They have general valence shell electronic configuration of **ns^2 np^5.**



NOBLE GAS ELEMENTS

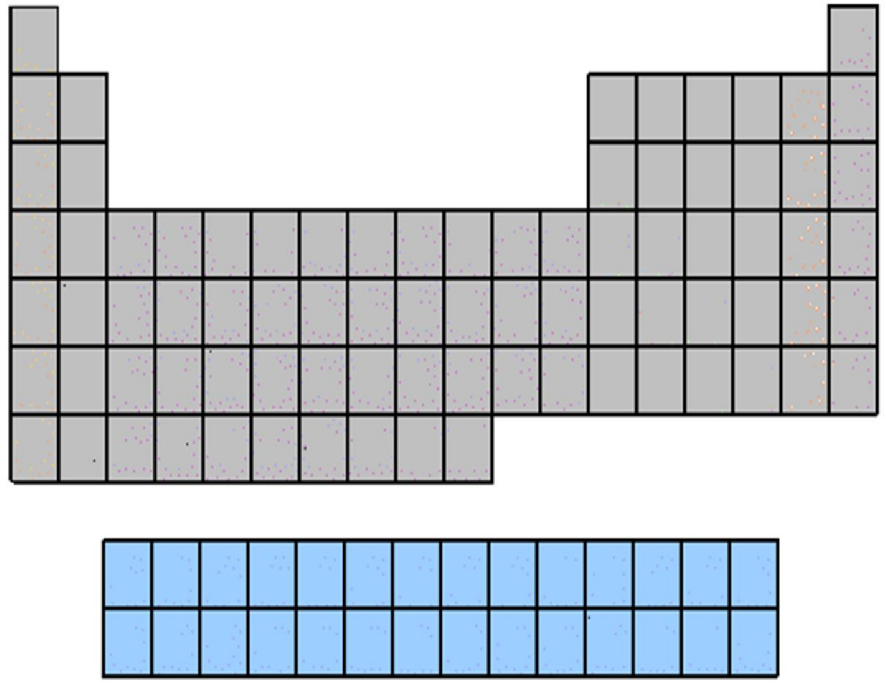
- Noble Gases are colorless gases that are extremely un-reactive.
- One important property of the noble gases is their inactivity. They are inactive because their outermost energy level is full.
- Because they do not readily combine with other elements to form compounds, the noble gases are called inert.
- All the noble gases are found in small amounts in the earth's atmosphere.
- They have general valence shell electronic configuration of **ns^2 np^6.**





INNER TRANSITION ELEMENTS

- The thirty rare earth elements are composed of the lanthanide and actinide series.
- One element of the lanthanide series and most of the elements in the actinide series are called trans-uranium, which means synthetic or man-made.
- They have general valence shell electronic configuration of $\mathbf{ns^2\ (n-1)d^{0-2}\ (n-2)f^{0-14}}$.



Next Lecture:

1. Trends in the MPT.

Any Question



“It is not the answer that enlightens, but the question.”

- Eugene Ionesco