

9/10/18

ex: Ne :  $10p^+$   $\rightarrow$   $10n^0$  90.48%  $A = 10+10 = 20$   
 $\rightarrow$   $11n^0$  0.27%  $A = 10+11 = 21$   
 $\rightarrow$   $12n^0$  9.25%  $A = 10+12 = 22$

symbol:  $\overset{\text{mass \#}}{\overset{A}{\text{X}}} \overset{\text{atomic \#}}{\underset{Z}{\text{X}}} \text{ or } \text{X} - A$   
 (mass #)  $(\#p^+ + \#n^0)$   
 (atomic #)  $(\#p^+)$   
 element symbol

$^{20}_{10}\text{Ne}$ ,  $^{21}_{10}\text{Ne}$ ,  $^{22}_{10}\text{Ne}$

or

Neon-20    Neon-21    Neon-22  
 Ne-20    Ne-21    Ne-22

- in general, isotopes have same chemical behavior.

Q: How many  $p^+$ ,  $n^0$ , and  $e^-$  are in an atom of Magnesium-23?

A:

$\begin{array}{|c|} \hline 12 \\ \hline \text{Mg} \\ \hline \end{array}$

$Z = 12p^+$

$A = \#p^+ + \#n^0$   
 $\Rightarrow \#n^0 = A - \#p^+$   
 $= 23 - 12$   
 $= 11n^0$

dec. neutral!  
 $\#p^+ = \#e^-$   
 $\Rightarrow 12e^-$

Q: Sulfur-34 (one atom of...) neutral!

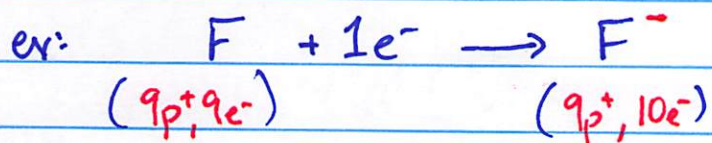
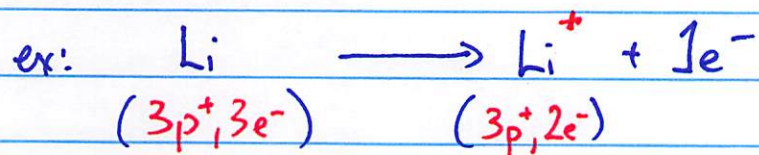
$\begin{array}{|c|} \hline 16 \\ \hline \text{S} \\ \hline \end{array}$

$Z = 16p^+$

$16e^-$

$A = 34 = \#p^+ + \#n^0$   
 $\Rightarrow A - \#p^+ = \#n^0$   
 $34 - 16 = 18n^0$

Atoms that gain/lose  $e^-$ s are called IONS.



positive ions are called cations (ex:  $\text{Li}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Al}^{3+}$ )  
(+ve)

& negative ions are called anions (ex:  $\text{F}^-$ ,  $\text{O}^{2-}$ ,  $\text{P}^{3-}$ )  
(-ve)

-ions behave v. differently than atoms!  $\text{Na}$  vs  $\text{Na}^+$   
 $\text{F}$  vs  $\text{F}^-$   
highly reactive vs pretty inert

## The Periodic Table (PT)

- Invented by the Russian chemist, Dmitri Mendeleev (1869)

- organized elements by mass in a table (later by  $Z$ )

- regular repeating patterns appeared!

- left gaps in the PT to avoid breaking patterns!

... which led to the discovery of 'missing' elements

ex: Ge (germanium)



All modern PT's are organized by  $Z$  non-metals  $\rightarrow$

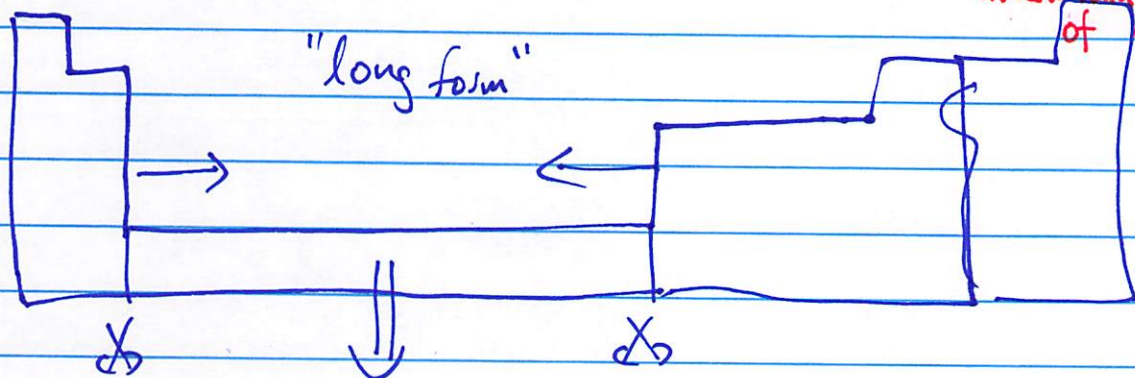
metalloids  
- some properties  
of metals / non-metals

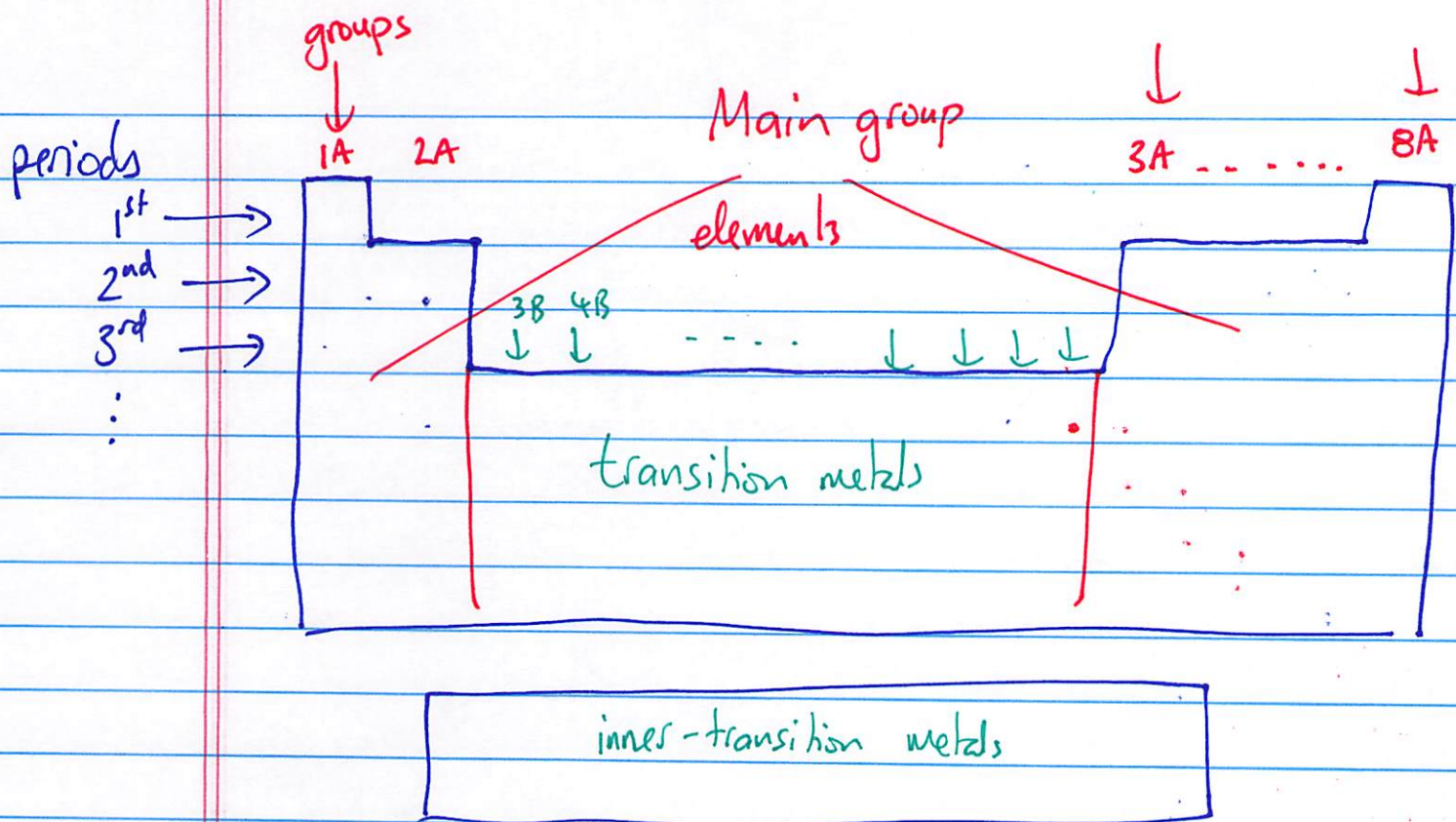
Metals: shiny, malleable, ductile, excellent conductors of heat/elec  
- often lose  $e^-$ s to form cations

Non-metals: dull, brittle, poor conductors of...  
- often gain  $e^-$ s to form anions

ex Si  
- shiny  
- brittle

intermediate conductor  
of elec.





Elements in same group/family have similar chem. props.

ex: 1A ~ Alkali Metals ~ react w/  $H_2O$  violently!!  
ex: Na, K

2A ~ Alkaline-Earth Metals ~ react moderately w/  $H_2O$   
ex: Mg, Ca