

# Isotopes

- atoms of an element that have the same atomic # but they have different #n<sup>0</sup>. (same #p<sup>+</sup>) (different mass #)

Ex) Hydrogen has 3 isotopes



atomic # = 1

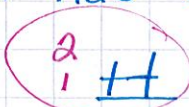
mass # = 1

#p<sup>+</sup> = 1

#n<sup>0</sup> = 1 - 1 = 0

#e<sup>-</sup> = 1

protium



atomic # = 1

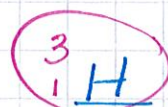
mass # = 2

#p<sup>+</sup> = 1

#n<sup>0</sup> = 2 - 1 = 1

#e<sup>-</sup> = 1

deuterium



atomic # = 1

mass # = 3

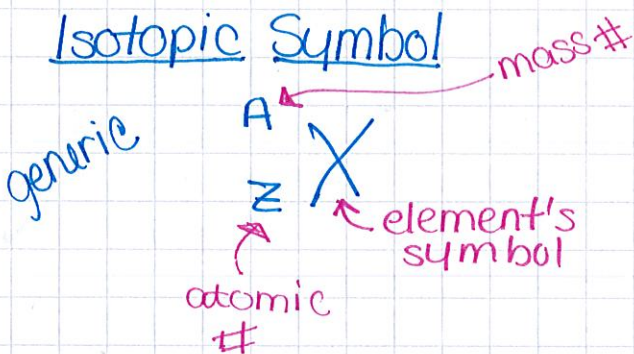
#p<sup>+</sup> = 1

#n<sup>0</sup> = 3 - 1 = 2

#e<sup>-</sup> = 1

tritium

## Isotopic Symbol



Ex) Practice

isotopic symbol	Z	A	#p <sup>+</sup>	#n <sup>0</sup>	#e <sup>-</sup>	name
<sup>59</sup> <sub>27</sub> Co	27	59	27	59 - 27 = 32	27	cobalt
<sup>139</sup> <sub>56</sub> Ba	56	56 + 83 = 139	56	83	56	barium
<sup>289</sup> <sub>114</sub> Fl	114	289	114	289 - 114 = 175	114	flerovium
<sup>207</sup> <sub>82</sub> Pb	82	207	82	207 - 82 = 125	82	lead
<sup>19</sup> <sub>9</sub> F	9	9 + 10 = 19	9	10	9	fluorine



## Atomic Mass (A.M.)

- where does the mass for an atom come from?

The  $p^+$ ,  $n^0$ , &  $e^-$

atomic mass is the weighted average mass of all the isotopes of that element

$$\text{A.M.} = (\text{mass isotope 1} \cdot \% \text{isotope 1}) + (\text{mass isotope 2} \cdot \% \text{isotope 2}) \\ + (\text{mass isotope 3} \cdot \% \text{isotope 3}) + \dots$$

Ex) Gallium has 2 isotopes, the first has a mass of 68.925881 amu (atomic mass units) and an abundance of 60.10%. The second has a mass of 70.924705 amu and an abundance of 39.892%. Calculate the atomic mass.

$$\text{A.M.} = (68.925881 \cdot 60.10) + (70.924705 \cdot 39.892)$$

amu    amu