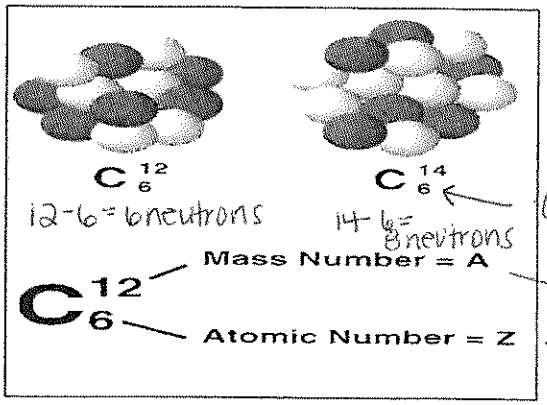
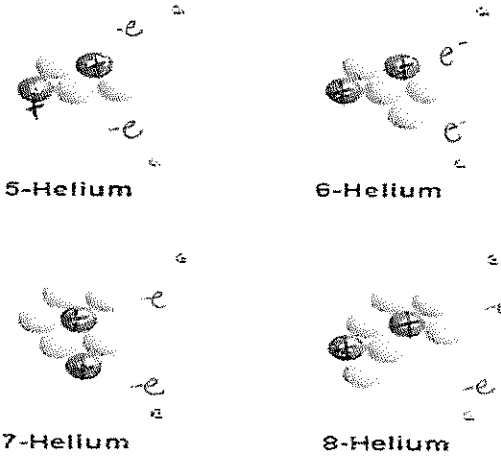
Isotopes

- Atoms of the Same element with a different number of neutrons
- The protons and electrons are the same in different isotopes of the same element
- Every isotope of an element has a different mass # because the # of neutrons varies.
- The average atomic mass of an element is the average of all the isotopes in their relative amounts.

- only difference is that C_6^{14} has 2 more neutrons
- does not change charge
- neutrons have no charge but do have a mass.





# of neutrons are increasing, therefore, atomic mass increases

1st look at P.T. and find atomic # (# of protons)

2. how many electrons (same as protons)

3. Find neutrons (atomic mass − # of protons) or atomic #

4. Find atomic mass (multiple # atoms by isotope) divide by total atoms

- 1.) What is the average atomic mass of a sample of Carbon with the following isotopes?

atomic mass ↓ — atomic # ↓

- 4 atoms of Carbon- 12
- 1 atom of Carbon - 11
- 2 atoms of Carbon -13

P	E	N	
6	6	6	(12 − 6)
6	6	5	
6	6	7	

- Avg. atomic mass =

isotope P E N

how many atoms total

$$\frac{(4\times12)+(1\times11)+(2\times13)}{(4+1+2)=7} \rightarrow \frac{85}{7} = 12.14$$

- 2.) What is the average atomic mass of a sample of Sodium with the following isotopes?

- 2 atoms of Na -22
- 4 atoms of Na -23
- 1 atom of Na -24

P	E	N
11	11	11
11	11	12
11	11	13

- Avg. atomic mass =

round to hundredths

$$\frac{(2\times22)+(4\times23)+(1\times24)}{7} \rightarrow \frac{160}{7} = 22.86$$

- 3.) What is the average atomic mass of this sample of Copper?

- 2 atoms of Cu- 63
- 2 atoms of Cu- 64

P	E	N
29	29	34
29	29	35

- Avg. atomic mass =

$$\frac{(2\times63)+(2\times64)}{2+2} \rightarrow \frac{254}{4} = 63.5$$

- 4.) The isotopes of Boron are B -10 and B-11. Why do you think the average atomic mass is 10.81 instead of 10.50?

B-10 · less isotopes
B-11 · more isotopes, higher average atomic mass

- 5.) What would you predict is the most common isotope (mass #) of an element with an average atomic mass of 19.8? ≈ 20
  ↖ round

Z = 20

the atomic mass of unknown isotope would be 20.