




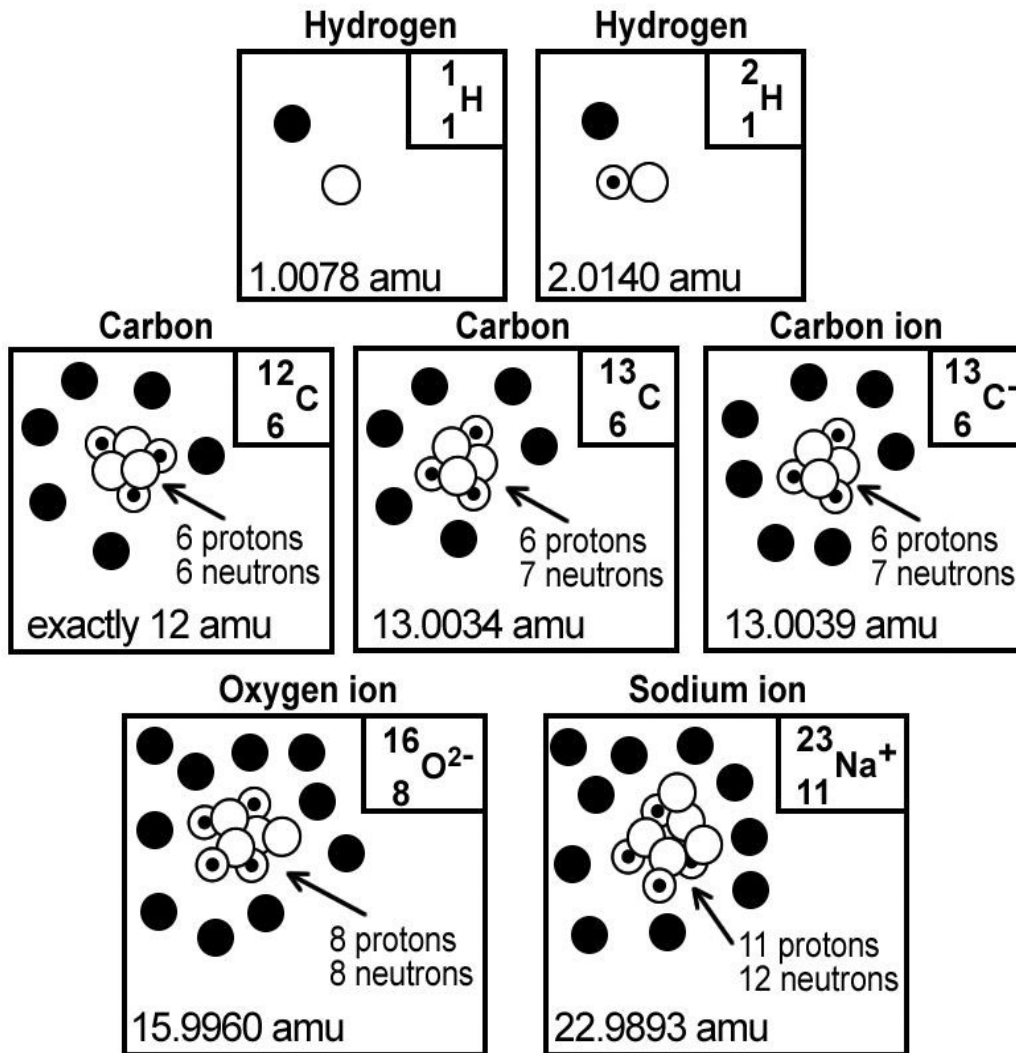
# What is an Atom?

Name: \_\_\_\_\_

Data collected from selected atoms.

	Electron (-)
	Proton (+)
	Neutron (neutral)

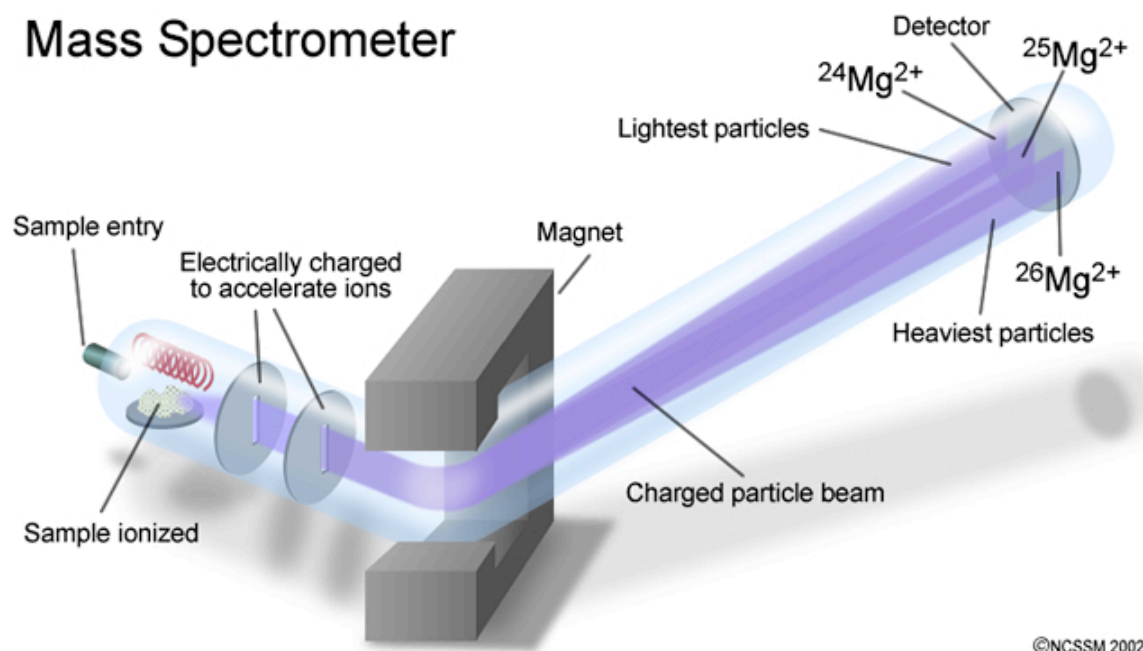
$\begin{matrix} A \\ Z \end{matrix} X \quad {}^{12}_6\text{C}$
<p>A is the mass number Z is the atomic number</p> <p>1 amu = 1.6606 x 10<sup>-24</sup> g</p>



The nucleus of an atom contains the protons and the neutrons.  
<sup>1</sup>H and <sup>2</sup>H are isotopes of hydrogen.  
<sup>12</sup>C and <sup>13</sup>C are isotopes of carbon.  
 An ion is a charged particle; O<sup>2-</sup> and Na<sup>+</sup> are ions.  
*You can't see all the neutron and protons in the nucleus in the diagrams*

Chemists identify isotopes by using a mass spectrometer. The separation is possible because each isotope has a different mass. Lighter masses will bend more as they pass through the magnet field.

## Mass Spectrometer



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### Critical Thinking Questions:

- How many protons are found in  $^{12}\text{C}$ ? \_\_\_\_\_  $^{13}\text{C}$ ? \_\_\_\_\_  $^{13}\text{C}^-$ ? \_\_\_\_\_
- How many neutrons are found in  $^{12}\text{C}$ ? \_\_\_\_\_  $^{13}\text{C}$ ? \_\_\_\_\_  $^{13}\text{C}^-$ ? \_\_\_\_\_
- How many electrons are found in  $^{12}\text{C}$ ? \_\_\_\_\_  $^{13}\text{C}$ ? \_\_\_\_\_  $^{13}\text{C}^-$ ? \_\_\_\_\_
- Based on the data presented above,
  - What do all carbon atoms (and ions) have in common?
  - What do all hydrogen atoms (and ions) have in common?
- What is the significance of the atomic number,  $Z$ ? Where will you find it on your periodic table?
- Look at your periodic table, what do all nickel (Ni) atoms have in common?
- How is the mass number,  $A$ , determined?
- What structural feature is different in isotopes of a particular element?
- What feature distinguishes a neutral atom from an ion?
- Where is most of the mass of an atom, within the nucleus or outside of the nucleus? Explain your reasoning.

11. Complete the chart below:

Isotope	Atomic Number <i>Z</i>	Mass Number <i>A</i>	Number of Electrons
$^{31}\text{P}$	15		
$^{18}\text{O}$			8
	19	39	18
$^{58}\text{Ni}^{2+}$		58	

12. Remember that  $1 \text{ amu} = 1.6606 \times 10^{-24} \text{ g}$ . What is the mass, in grams, of

a. one  $^1\text{H}$  atom? \_\_\_\_\_

b. one  $^{12}\text{C}$  atom? \_\_\_\_\_

13. What is the mass, in grams, of  $4.35 \times 10^6$  atoms of  $^{12}\text{C}$ ? *Show your work!*

14. What is the mass, in grams, of one molecule of carbon dioxide which has one  $^{12}\text{C}$  atom and two  $^{16}\text{O}$  atoms? *Show your work!*

15. Define atomic number:

16. Define mass number:

17. How many electrons, protons, and neutrons are found in each of the following?

Atom/Ion	Protons	Neutrons	Electrons
$^{24}\text{Mg}$			
$^{23}\text{Na}^+$			
$^{35}\text{Cl}$			
$^{35}\text{Cl}^-$			
$^{56}\text{Fe}^{3+}$			
$^{15}\text{N}$			
$^{16}\text{O}^{2-}$			
$^{27}\text{Al}^{3+}$			

18. **Summary of Activity:** Describe an atom. Use terminology from the activity in your explanation.