ANSWER KEY

What is an Atom?

Name: _____

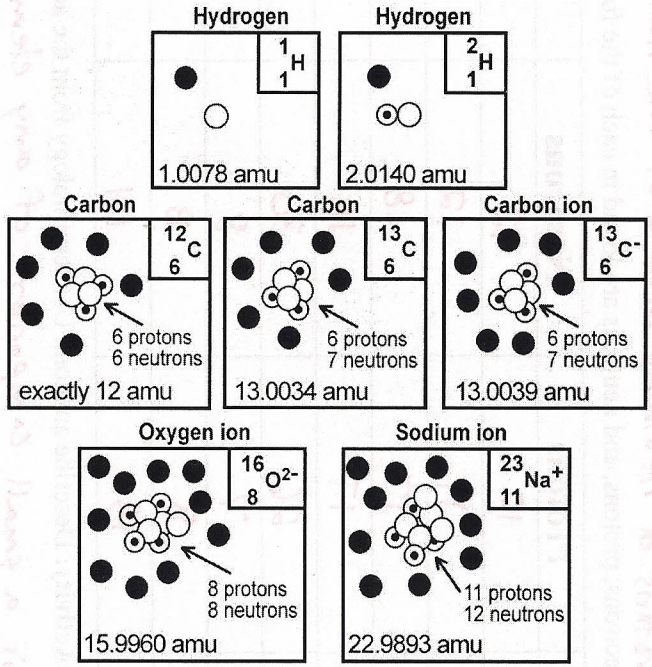
Data collected from selected atoms.

●	Electron (-)
○	Proton (+)
◉	Neutron (neutral)

$^{A}_{Z}X$ $\quad$ $^{12}_{6}C$

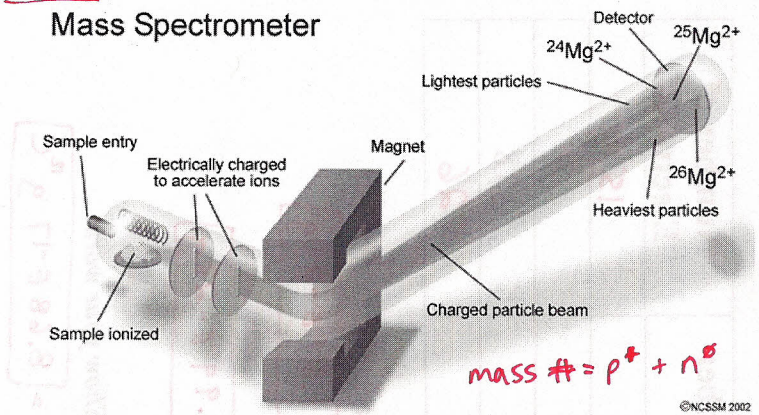
A is the mass number
Z is the atomic number

1 amu = 1.6606×10^{-24} g



The nucleus of an atom contains the protons and the neutrons.
^{1}H and ^{2}H are isotopes of hydrogen.
^{12}C and ^{13}C are isotopes of carbon.
An ion is a charged particle; O^{2-} and Na^{+} 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.



Critical Thinking Questions:

1. How many protons are found in ^{12}C? 6 ^{13}C? 6 $^{13}C^{-}$? 6
2. How many neutrons are founds in ^{12}C? 6 ^{13}C? 7 $^{13}C^{-}$? 7
3. How many electrons are found in ^{12}C? 6 ^{13}C? 6 $^{13}C^{-}$? 7
4. Based on the data presented above,
   a. What do all carbon atoms (and ions) have in common?
      Same # of protons / atomic # / atomic mass
   b. What do all hydrogen atoms (and ions) have in common?
      Same # of protons / atomic # / atomic mass
5. What is the significance of the atomic number, Z? Where will you find it on your periodic table?
   Atomic # indicates the # of protons. Atomic # is found above the element symbol
6. Look at your periodic table, what do all nickel (Ni) atoms have in common?
   Same # p+, atomic mass, and atomic #
7. How is the mass number, A, determined?
   mass # = p+ + n°
8. What structural feature is different in isotopes of a particular element?
   # of neutrons (n°) ∴ mass #
9. What feature distinguishes a neutral atom from an ion?
   charge
10. Where is most of the mass of an atom, within the nucleus or outside of the nucleus? Explain your reasoning.
    nucleus → protons + neutrons

11. Complete the chart below:

Isotope	Atomic Number Z	Mass Number A	Number of Electrons
$^{31}_{15}P$	15	31	15
$^{18}_{8}O$	8	18	8
$^{39}_{19}K$	19	39	18
$^{58}_{28}Ni^{2+}$	28	58	26

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

a. one ^{1}H atom? $\frac{1.0078\ amu}{1} \mid \frac{1.6606E-24\ g}{1\ amu} = 1.67E-24\ g$

b. one ^{12}C atom? $\frac{12.01\ amu}{1} \mid \frac{1.6606E-24\ g}{1\ amu} = 1.99E-23\ g$

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

$$\frac{4.35E6\ atoms\ ^{12}C}{1} \mid \frac{12.01\ amu}{1\ atom\ ^{12}C} \mid \frac{1.6606E-24\ g}{1\ amu} = 8.68E-17\ g\ ^{12}C$$

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

$^{12}C = \frac{12.01\ amu}{1} \mid \frac{1.6606E-24\ g}{1\ amu} = (1.99E-23\ g)$ / $\frac{32.00amu}{1} \mid \frac{1.6606E-24\ g}{1\ amu} = (5.31E-23\ g)$

$+ \rightarrow 7.30E-23\ g$

15. Define atomic number:
Identity & # p^+ of an atom

16. Define mass number:
Sum of protons & neutrons inside of the nucleus.

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

Atom/Ion	Protons	Neutrons	Electrons
$^{24}_{12}Mg$	12	12	12
$^{23}_{11}Na^{+}$	11	12	10
$^{35}_{17}Cl$	17	18	17
$^{35}_{17}Cl^{-}$	17	18	18
$^{56}_{26}Fe^{3+}$	26	30	23
$^{15}_{7}N$	7	8	7
$^{16}_{8}O^{2-}$	8	8	10
$^{27}_{13}Al^{3+}$	13	14	10

18. **Summary of Activity:** Describe an atom. Use terminology from the activity in your explanation.
An atom is a small component of any element with its own unique # of p^+, n^0, & e^-. Atoms are represented by its atomic # / # of protons present.