

CT Chemistry Unit 3: Isotopes and Ions

Consider this atom ... $\begin{matrix} 23 \\ \text{Na} \\ 11 \end{matrix}$

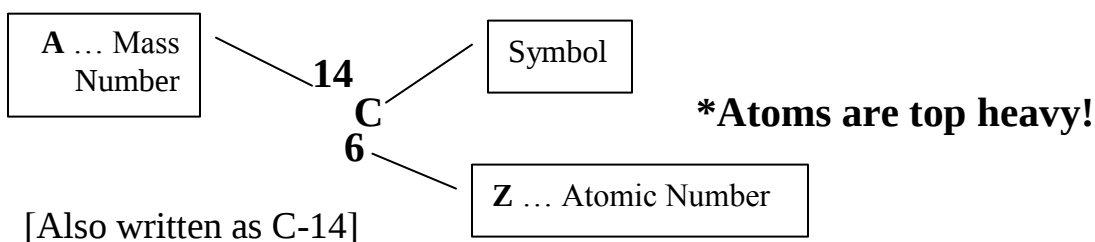
What element is represented?

How many protons are in this atom?

How many neutrons are present in the nucleus?

Atomic Number = the number of protons (**Z**)

Mass Number = the sum of protons and neutrons (**A**)



How many particles do each of these isotopes of Carbon contain?

<u>Isotope</u>	<u>Protons</u>	<u>Neutrons</u>	<u>Electrons</u>
C-12			
C-13			
C-14			

1. List the numbers of particles in the three isotopes of hydrogen.

<u>Isotope</u>	<u>Protons</u>	<u>Neutrons</u>	<u>Electrons</u>
H-1			
H-2 (Deuterium)			
H-3 (Tritium)			

2. True/False? Atoms that have the same number of neutrons but different numbers of protons are called isotopes.
3. True/False? The mass number of a nucleus represents the number of protons in the nucleus.
4. For each of the following elements, use a periodic table to write the elements atomic number.

a. Zinc

b. Tungsten

c. Strontium

d. Cobalt

e. Lithium

f. Antimony
5. Write the atomic symbol (${}^A_Z\text{X}$) for each of the isotopes described below.

a. Z = 8, number of neutrons = 9

- b. the isotope of chlorine in which $A = 37$
- c. $Z = 27$, $A = 60$
- d. number of protons = 26, number of neutrons = 31
- e. the isotope of I with a mass number of 131
- f. $Z = 3$, number of neutrons = 4
6. How many protons and neutrons are contained in the nucleus of each of the following atoms? Assuming each atom is uncharged, how many electrons are present?
- a. ${}_{95}^{241}\text{Am}$ $n^0 = \underline{\hspace{1cm}}$ $p^+ = \underline{\hspace{1cm}}$ $e^- = \underline{\hspace{1cm}}$
- b. ${}_{25}^{56}\text{Mn}$ $n^0 = \underline{\hspace{1cm}}$ $p^+ = \underline{\hspace{1cm}}$ $e^- = \underline{\hspace{1cm}}$

7. Complete the following table.

Name	Symbol	At. Number	Mass Number	Neutrons
Sodium		11	23	
Nitrogen	${}_{7}^{15}\text{N}$			
	${}_{56}^{136}\text{Ba}$			
Lithium				6
Boron		5	11	

8. How many protons and electrons are present in a vanadium atom?
9. How many protons and electrons are present in a nitrogen atom?
10. How many protons and electrons are present in a potassium atom?
11. How many protons and electrons are present in a platinum atom?
12. What is the name of the element that has atoms containing 5 protons?
13. What is the name of the element that has atoms containing 17 protons?
14. What is the name of the element that has atoms containing 25 protons?
15. What is the name of the element that has atoms containing 82 protons?
16. Write the symbol for the silver atom that has 61 neutrons.

Ions

Standards:

- 3.1.10 B Describe concepts of models as a way to predict and understand science and technology.
- 3.4.10 A Explain concepts about the structure and properties of matter.

1. For each of the positive ions listed in column 1, use the periodic table to find in column 2 the total number of electrons that ion contains. The same answer may be used more than once.

_____ 1. Al^{+3}	A. 2
_____ 2. Fe^{+3}	B. 10
_____ 3. Mg^{+2}	C. 21
_____ 4. Sn^{+2}	D. 23
_____ 5. Co^{+2}	E. 24
_____ 6. Co^{+3}	F. 25
_____ 7. Li^{+1}	G. 36
_____ 8. Cr^{+3}	H. 48
_____ 9. Rb^{+1}	I. 76
_____ 10. Pt^{+2}	J. 81

2. For each of the following ions, indicate the total number of protons and electrons in the ion.

Ion	Number of Protons	Number of Electrons
Co^{+2}		
Co^{+3}		
Cl^{-1}		
K^{+1}		
S^{-2}		
Sr^{+2}		
Al^{+3}		
P^{-3}		

3. For each of the following atomic numbers, use the periodic table to write the formula (including the charge) for the simple ion that the element is most likely to form.

- | | |
|-------|-------|
| a. 53 | d. 88 |
| b. 38 | e. 9 |
| c. 55 | f. 13 |

4. Write the chemical symbol for the ion with 12 protons and 10 electrons.

5. Write the chemical symbol for the ion with 74 protons and 68 electrons.

6. Write the chemical symbol for the ion with 95 protons and 89 electrons.
7. Write the chemical symbol for the ion with 33 protons and 36 electrons.
8. Write the chemical symbol for the ion with 29 protons and 27 electrons.
9. How many protons, neutrons, and electrons are present in the $^{59}_{28}\text{Ni}^{+2}$ ion?
10. How many protons, neutrons, and electrons are present in the $^{91}_{40}\text{Zr}^{+4}$ ion?
11. How many protons, neutrons, and electrons are present in the $^{140}_{58}\text{Ce}^{+3}$ ion?
12. How many protons, neutrons, and electrons are present in the $^{79}_{34}\text{Se}^{-2}$ ion?
13. How many protons, neutrons, and electrons are present in the $^{13}_6\text{C}^{-4}$ ion?
14. Write the complete chemical symbol for the ion with 84 protons, 125 neutrons, and 80 electrons.
15. Write the complete chemical symbol for the ion with 27 protons, 32 neutrons, and 25 electrons.
16. Write the complete chemical symbol for the ion with 73 protons, 108 neutrons, and 68 electrons.
17. Write the complete chemical symbol for the ion with 31 protons, 39 neutrons, and 28 electrons.