

Atoms, Ions, and Isotopes : Notes/W.S-40

Notes : The main isotope of fluorine is fluorine-19, also written as; ^{19}F , or $^{19}\text{F}_9$. The mass number is 19, the atomic number is 9, the number of neutrons is 10, and the number of electrons is 9 for a neutral atom. If the atom gains one electron, the symbol for the isotope becomes; $^{19}\text{F}_9^{-1}$.

Example : Find the atomic weight of lithium. The two main isotopes are; lithium-6, (7.5%) and lithium-7, (92.5%). The atomic weight is $6 \times 0.075 + 7 \times 0.925 = 6.93$. The true atomic weight is 6.94 because there are small amounts of heavier isotopes.

Example : Gallium has an atomic weight of 69.72. The two main isotopes are gallium-69 and gallium-71. Find the percentage abundances for each isotope. $69x + 71y = 69.72$. And $x + y = 1$, because the percentages x and y add to 100. Since $x + y = 1$, $69x + 69y = 69$, we have, from equations 1 and 3, $2y = 0.72$. $y = 0.36$ and $x = 0.64$. The percentage abundances are 64% and 36% respectively. Note : These numbers are approximate because there are small amounts of other isotopes.

1) Fill in the blanks in the table below. Give the numbers for each particle.

	Symbol	Protons	Neutrons	Electrons
1	^{29}Si			
2	$^{34}\text{S}^{-2}$			
3	$^{41}\text{K}^{+1}$			
4	^{109}Ag			
5	$^{47}\text{Tl}^{+3}$			
6	^2H			

2) Find the atomic weight.

a) Element X has two main isotopes, X-191 (38.5%) and X-193 (61.5%). Find the atomic weight. Which element is X?

b) The two main isotopes of antimony are antimony-121 and antimony-123. The percentage abundances are 57.3% and 42.7% respectively. Find the atomic weight of antimony.

c) Chlorine has an atomic weight of 35.45. The two main isotopes are chlorine-35 and chlorine-37. Find the percentage abundance for each isotope. (The two percentages add to 100)

d) Boron has an atomic weight of 10.81. The two main isotopes are boron-10 and boron-11. Find the percentage abundance for each isotope.

Answers : 1)

	Symbol	Protons	Neutrons	Electrons
1	^{29}Si	14	15	14
2	$^{34}\text{S}^{-2}$	16	18	18
3	$^{41}\text{K}^{+1}$	19	22	18
4	^{109}Ag	47	62	47
5	$^{47}\text{Ti}^{+3}$	22	25	19
6	^2H	1	1	1

2)a) 192, Iridium, b) 121.9, c) 77.%, 23.%, d) 19%, 81%.