

4.1 Practice and Homework

1. Fill in the table below with the correct numbers.

neutrons or
protons
↑

Symbol	name	Atomic number	Mass number	charge	# of nucleons	# of protons	# of neutrons	# of electrons
${}_{11}^{23}\text{Na}$	sodium - 23	11	23	0	23	11	12	11
${}_{19}^{39}\text{K}$	potassium - 39	19	39	0	39	19	20	19
${}_{19}^{41}\text{K}$	potassium - 41	19	41	0	41	19	22	19
${}_{19}^{41}\text{K}^{1+}$	potassium - 41 cation	19	41	1+	41	19	22	18
${}_{12}^{25}\text{Mg}$	magnesium - 25	12	25	0	25	12	13	12
${}_{17}^{35}\text{Cl}^{1-}$	chlorine - 35 anion	17	18	1-	35	17	18	18
${}_{7}^{14}\text{N}^{3-}$	nitrogen - 14 anion	7	14	3-	14	7	7	10

2. Naturally occurring magnesium consists of three stable isotopes:

isotope	amu	Abundance
Mg-24	23.985	78.99%
Mg-25	24.986	10.00%
Mg-26	25.983	11.01%

What is the average atomic weight of magnesium?

Ans: 24.30 amu

$$23.985(0.7899) + 24.986(0.1000) + 25.983(0.1101) \\ = 24.30 \text{ amu}$$

3. Naturally occurring silicon consists of three stable isotopes:

isotope	amu	Abundance
Si-28	27.977	92.21%
Si-29	28.976	4.70%
Si-30	? 29.974	3.09%

$$27.977 (.9221) + 28.976 (.0470) + 29.974 (.0309)$$

↑ you can look this up

What is the average atomic mass of silicon?

Ans: 28.08 amu

4. Compare the following four symbols:



(A)



(B)



(C)



(D)

a) Which pairs of symbols (A, B, C, D) represent isotopes of each other?

A/C

B/D

Each member of a pair has the same atomic number

b) Explain how these isotopes (from #4a) are similar to each other. Explain how these isotopes are different from each other.

Same:

Different: - mass number

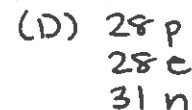
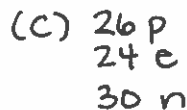
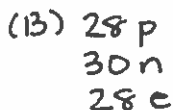
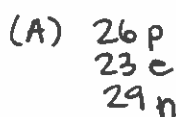
- properties

- atomic number
- # protons

- # neutrons

- charge (only because their # e's are different)

c) Compare the four isotopes above in terms of their number of electrons, protons, and neutrons.



5. Oxygen comes in two stable isotopes, O-16 and O-18. The atomic mass of oxygen-16 is 15.989 amu.

The atomic mass of oxygen-18 is 17.999 amu. If the average atomic mass of oxygen is 15.999 amu, determine the percent abundance of each isotope.

$$15.989x + 17.999(1-x) = 15.999$$

$$15.989x + 17.999 - 17.999x = 15.999$$

$$-2.01x = 15.999 - 17.999$$

$$x = .99502 \text{ or } 99.502\%$$

$$\text{thus } 1-x = .00498 \text{ or } 4.975\%$$

O-16 is 99.502% abundant

O-18 is 4.975% abundant