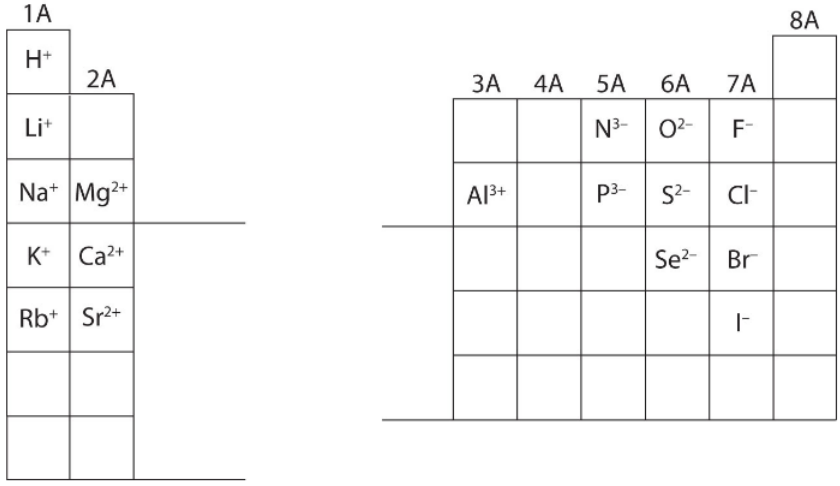
3.2.E: Atoms and the Periodic Table (Exercises)

Concept Review Exercises

1. Why is the atomic number so important to the identity of an atom?
2. What is the relationship between the number of protons and the number of electrons in an atom?
3. How do isotopes of an element differ from each other?
4. What is the mass number of an element?
5. Calculate the subatomic particles for
   a. Zn-67,
   b. radium,
   c. the aluminum cation,
   d. Mg-23, and
   e. the phosphorus anion.
6. Which element(s) has/have 32 neutrons: germanium, cobalt, or Mn-57?
7. Which natural isotope of platinum is most abundant?
8. Which element has 19 electrons?
9. Write A/Z format for the species in question #5.
10. Calculate the weighted average of nitrogen. N-14 has an exact mass of 14.003074u and is 99.63% abundant. N-15 has a mass of 15.000108u.

Solutions

1. The atomic number defines the identity of an element.
2. In an electrically neutral atom, the number of protons equals the number of electrons.
3. Isotopes have different numbers of neutrons in their nuclei.
4. The mass number is the sum of the numbers of protons and neutrons in the nucleus of an atom.
5. For ion charges, refer to the table for assistance:



Periodic table with common group charges labeled.

Species	Protons	Electrons	Neutrons
Zn-67	30	30	37 (is isotope)
Radium	88	88	138
Aluminum cation	13	10 (look up charge, 3+)	14
Mg-23	12	12	11 (is isotope)
Phosphorus anion	15	18 (look up charge, 3-)	16

6. Both cobalt and Mn-57 have 32 neutrons. Germanium has 41 neutrons.
7. Pt-195 is closest to the weighted average (found on periodic table) and would be the most abundant.
8. If an ion charge is not given, locate the electrons of the element by looking to the atomic number. Potassium is the only atom of these three that would have 19 electrons.
9. $^{67}_{30}\mathrm{Zn}$, $^{226}_{88}\mathrm{Ra}$, $^{27}_{13}\mathrm{Al}^{3+}$, $^{23}_{12}\mathrm{Mg}$ and $^{31}_{15}\mathrm{P}^{3-}$
10. For this problem, you need to assume that all percentages add up to 100%. Since the problem provided 99.63%, you will need to subtract this given percentage from 100.00%.

$$\text{Atomic mass } = (0..9963)\,(14.003074) + (0.0037)\,(15.000108) = 14.01 \text{ amu} \qquad (3.2.E.1)$$

Name:_____ Date:_____

Q# 1

Symbol	Atomic number	Mass number	Number of p	Number of e^-	Number of n	Charge
	6			6	6	
Ba^{2+}	56				81	
Sr^{2+}		88			50	2+
N^{3-}		14		10		

Q# 2

Symbol	Atomic number	Mass number	Number of p	Number of e^-	Number of n	Charge
S	16			16	16	
S^{2-}		32				2-
Pd^{2+}					60	2+
	15			15	16	

Q# 3.

Symbol	Atomic number	Mass number	Number of p	Number of e^-	Number of n	Charge
	8				8	2-
Na^{+}	11				12	
Mg^{2+}		24			12	2+
P^{3-}		31		18		