

Solutions to Problems from Chapter 1

6. diamond – element (all carbon atoms)
brass – mixture (of copper and zinc atoms)
soil – mixture (of many things such as organic matter, sand, etc.)
glass – mixture (of SiO_2 , K_2O , Na_2O , and others)
cotton – mixture (of cellulose and other compounds)
milk of magnesia – mixture (of water and $\text{Mg}(\text{OH})_2$)
salt – compound (with a formula of NaCl)
iron – element (of course)
steel – mixture (of iron, carbon, and other additives)
8. This formula tells us that the compound consists of only phosphorous and sulfur with a ratio of 4 phosphorous atoms for every 3 sulfur atoms.
10. antimony \rightarrow Sb
gold \rightarrow Au
iron \rightarrow Fe
mercury \rightarrow Hg
potassium \rightarrow K
silver \rightarrow Ag
tin \rightarrow Sn
tungsten \rightarrow W
11. Na \rightarrow sodium
Mg \rightarrow magnesium
Al \rightarrow aluminum
Si \rightarrow silicon
P \rightarrow phosphorous
Cl \rightarrow chlorine
Ar \rightarrow argon

29. The atomic number is the same as the number of protons, of which ^{40}Ca has 20.

The mass number is the same as the sum of the number of protons and the number of neutrons, of which ^{40}Ca has 40.

The number of neutrons is the difference between the mass number and the atomic number; thus, ^{40}Ca has $40 - 20 = 20$ neutrons.

The difference between the number of protons and the number of electrons equals the element's net charge; because ^{40}Ca has no net charge, there must be 20 electrons.

32. For ^{127}I , the number of protons equals the atomic number for iodine, which is 53.

The number of neutrons is the difference between the mass number and the atomic number; thus, $127 - 53 = 74$ neutrons.

The number of protons minus the number of electrons gives the net charge. Because the net charge is 0, the number of protons and electrons must be the same; therefore, there are 53 electrons.

34. With 34 protons we know that the atomic number is 34 and the element, therefore, is Se (selenium). The mass number is the sum of the number of protons and neutrons, or $34 + 45 = 79$. With the same number of protons and electrons, the selenium has no net charge. The symbol for this species, therefore, is ^{79}Se .

49. H is the symbol for the hydrogen atom and H^+ is the symbol for the hydrogen ion (or proton) resulting from the loss of a single electron.

H is the symbol for the hydrogen atom and H^- is the symbol for the hydride ion resulting from the gain of a single electron.

2H is a notation meaning two separate hydrogen atoms, while H_2 is the symbolic representation for a molecule of hydrogen.

H^+ is the ion formed when a hydrogen atom loses an electron and H^- is the ion formed when the hydrogen atom gains an electron.

54. With 34 protons we know that the atomic number is 34 and the element, therefore, is Se (selenium). The mass number is the sum of the number of protons and neutrons, or $34 + 45 = 79$. With 36 electrons and 34 protons, the net charge is -2. The symbol for the species, therefore, is $^{79}\text{Se}^{2-}$.

56. Polyatomic ions are collections of two or more atoms that together have a net positive or negative charge.

59. The compound has no net charge; thus

$$5 \times \text{charge of } \text{Ca}^{2+} + 3 \times \text{charge of } \text{PO}_4^{3-} + \text{charge on fluoride} = 0$$

$$5 \times (+2) + 3 \times (3-) + \text{charge on fluoride} = 0$$

$$10 - 9 + \text{charge on fluoride} = 0$$

$$\text{charge on fluoride} = -1$$

60. The compound has no net charge; thus

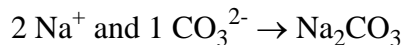
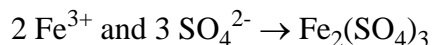
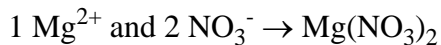
$$3 \times \text{charge on copper} + 2 \times \text{charge on OH}^- + 4 \times \text{charge on CH}_3\text{CO}_2^- = 0$$

$$3 \times \text{charge on copper} + 2 \times (-1) + 4 \times (-1) = 0$$

$$3 \times \text{charge on copper} - 2 - 4 = 0$$

$$\text{charge on copper} = +2$$

61. Since the total charge on the compound must be zero, we combine the cation and anion such that the total positive charge equals the total negative charge; thus



64. Potassium must be K^+ in potassium oxide because 2 K^+ balances the charge on a single O^{2-} . The O_2^{2-} ion, therefore, will need two potassium ions as well, giving a formula of K_2O_2 .

71. A period is a row of the periodic table and a group is a column of the periodic table; thus

Be, B, C is a period

Be, Mg, Ca is group

P, S, Al is a period

As, N, P is a group

Sb, Xe, Te is a period

K, Rb, Sr is neither a period or a group