40. A sample of rock contains 40 g of a radioisotope. How much of the radioisotope will remain after three half-lives?

41. Refer to the Table 7.6, on page 307, to find information on the radioactive decay of uranium-235.
   (a) What is the approximate maximum age of rock that can be dated by uranium-235 analysis?
   (b) What is the ratio of uranium-235 to lead-207 present in a sample after one half-life has gone by?
   (c) How many years does it take for 32 g of uranium-235 to decay into 8 g?

42. Provide the nuclear symbol for the parent nucleus for each.
   (a) ____ → $^{207}_{85}At$ (alpha decay)
   (b) ____ → $^{239}_{94}Pu$ (beta decay)
   (c) ____ → $^{24}_{12}Mg$ (gamma decay)
   (d) ____ → $^{228}_{88}Ra$ (alpha decay)
   (e) ____ → $^{82}_{36}Kr$ (beta decay)
   (f) ____ → $^{171}_{76}Os$ (alpha decay)
   (g) ____ → $^{99}_{44}Ru$ (beta decay)
   (h) ____ → $^{52}_{27}Co$ (gamma decay)

43. Complete each nuclear equation given the type of decay process involved.
   (a) $^{20}_{9}F$ → (beta decay)
   (b) $^{211}_{87}Fr$ → (alpha decay)
   (c) $^{149}_{64}Gd^*$ → (gamma decay)

44. Classify each nuclear equation as alpha, beta, or gamma decay.
   (a) $^{231}_{91}Pa^* \rightarrow {}^{231}_{91}Pa + {}^{0}_{0}\gamma$
   (b) $^{131}_{53}I \rightarrow {}^{131}_{54}Xe + {}^{0}_{-1}\beta$
   (c) $^{234}_{90}Th \rightarrow {}^{230}_{88}Ra + {}^{4}_{2}He$

45. Complete the following nuclear equations.
   (a) $^{99}_{43}Tc \rightarrow {}^{99}_{44}Ru +$ ____
   (b) $^{247}_{95}Am^* \rightarrow {}^{247}_{95}Am +$ ____
   (c) $^{166}_{67}Ho \rightarrow$ ____ $+ {}^{4}_{2}\alpha$
   (d) $^{82}_{35}Br \rightarrow {}^{82}_{36}Kr +$ ____

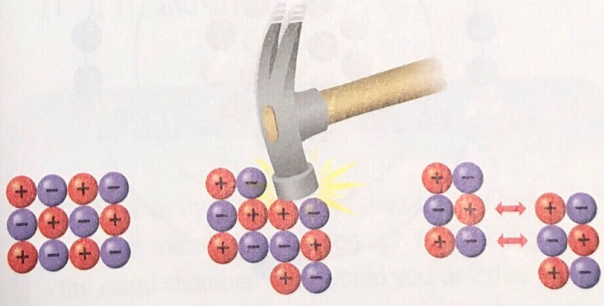
Thinking Critically

46. How is the number of electrons in the valence shell of a non-metal atom different from the number of electrons in the valence shell of a metal atom?

47. Why is each of the following chemical formulas impossible? Give reasons for your answers.
   (a) KF_2
   (b) $CaBr_3$
   (c) $LiSO_4$

48. When magnesium burns in air, the solid product formed has a greater mass than the original magnesium. When wood burns in air, the solid product formed has less mass than the original wood. Why is the mass of the solid product greater in one reaction but less in the other reaction?

49. The following diagrams is a model of what happens in a crystal of salt when hit with a hammer. Use the diagrams to explain why all crystals of salt have flat faces. Remember that the ions being represented are very, very tiny, and the hammer is very, very large in comparison.



before during after