(e) $2LiI + Br_2 \rightarrow 2LiBr + I_2$
(f) $Cd + I_2 \rightarrow CdI_2$
(g) $C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$
(h) $3MgSO_4 + 2In \rightarrow In_2(SO_4)_3 + 3Mg$
(i) $AlCl_3 + Ru(NO_3)_3 \rightarrow Al(NO_3)_3 + RuCl_3$
(j) $H_2CO_3 + Mg(OH)_2 \rightarrow MgCO_3 + 2H_2O$

40. 5 g
41. (a) Greater than 10 million years
(b) 1:1
(c) 1420 million years (the time equivalent to two half-lives)
42. (a) $^{211}_{87}Fr$
(b) $^{239}_{93}Np$
(c) $^{24}_{12}Mg^*$
(d) $^{232}_{90}Th$
(e) $^{82}_{35}Br$
(f) $^{175}_{78}Pt$
43. (a) $^{20}_{9}F \rightarrow {}^{20}_{10}Ne + {}^{0}_{-1}\beta$
(b) $^{211}_{87}Fr \rightarrow {}^{207}_{85}At + {}^{4}_{2}\alpha$
(c) $^{149}_{64}Gd^* \rightarrow {}^{149}_{64}Gd + {}^{0}_{0}\gamma$
44. (a) Gamma
(b) Beta
(c) Alpha
45. (a) $^{0}_{-1}\beta$
(b) $^{0}_{0}\gamma$
(c) $^{162}_{65}Tb$
(d) $^{0}_{-1}\beta$

Thinking Critically

46. In a non-metal atom, there are typically more than four valence electrons. In a metal atom, there are typically fewer than four valence electrons. (Note that for metals, this is more often the case for the main block elements than for the transition metals.)
47. (a) Accept all logical responses. For example, potassium forms a 1+ ion while fluorine forms a 1– ion. The formula given would not be electrically neutral, which makes the formula incorrect.
(b) Calcium forms a 2+ ion while bromine forms a 1– ion. The formula given would not be electrically neutral, which makes the formula incorrect.
(c) Lithium forms a 1– ion while sulphate is a polyatomic ion with a charge of 2–. The formula given would not be electrically neutral, which makes the formula incorrect.
48. Magnesium reacts to form solid magnesium oxide, which contains all the original magnesium plus additional mass from the oxygen. Wood burns to form mostly gaseous products such as CO_2 and H_2O, which escape, decreasing the mass of the remaining ash.
49. When stuck with a hammer, the ions shift their position so that ions with like charges are adjacent all along the fracture plane. This causes the entire plane to break away, leaving a flat surface on both sides of the fracture.

Developing Skills

50. (a) Synthesis, $4Cr + 3O_2 \rightarrow 2Cr_2O_3$
(b) Single replacement, $Cu + 2AgNO_3 \rightarrow Cu(NO_3)_2 + 2Ag$
(c) Double replacement, $Pb(NO_3)_2 + 2KI \rightarrow 2KNO_3 + PbI_2$
(d) Combustion, $2C_2H_6 + 7O_2 \rightarrow 4CO_2 + 6H_2O$
(e) Decomposition, $2NaCl \rightarrow 2Na + Cl_2$
(f) Neutralization, $HCl + NaOH \rightarrow NaCl + H_2O$ (balanced)
51. (a) Oxide ion, O^{2-}
(b) Neon atom, Ne

Applying Your Understanding

52. B
53. C
54. C
55. A
56. B
57. A
58. D
59. D
60. A
61. D
62. B
63. C