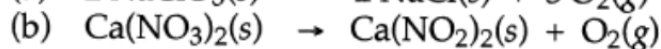
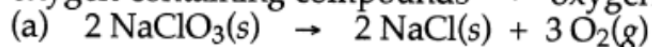


Chapter 8 - Equation Balancing and Reaction Types

Text Problems: 3, 11, 15, 19, 23, 25, 27, 35, 41, 43, 45, 49, 53, 61, 67, 71, 73, 75, 77, 79, 89

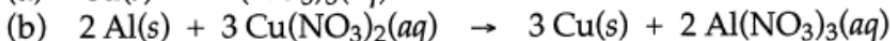
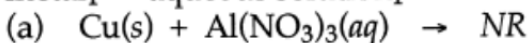
3. (a) The insoluble precipitate is evidence for a *chemical reaction*.
(b) The increased volume is evidence for a *physical change*.
11. $\text{Cd}(s) + \text{Co}(\text{NO}_3)_2(aq) \rightarrow \text{Cd}(\text{NO}_3)_2(aq) + \text{Co}(s)$
15. $\text{HNO}_3(aq) + \text{NaOH}(aq) \rightarrow \text{NaNO}_3(aq) + \text{HOH}(l)$
19. (a) $\text{H}_2\text{CO}_3(aq) + 2 \text{NH}_4\text{OH}(aq) \rightarrow (\text{NH}_4)_2\text{CO}_3(aq) + 2 \text{HOH}(l)$
(b) $\text{Hg}_2(\text{NO}_3)_2(aq) + 2 \text{NaBr}(aq) \rightarrow \text{Hg}_2\text{Br}_2(s) + 2 \text{NaNO}_3(aq)$
(c) $\text{Mg}(s) + 2 \text{HC}_2\text{H}_3\text{O}_2(aq) \rightarrow \text{Mg}(\text{C}_2\text{H}_3\text{O}_2)_2(aq) + \text{H}_2(g)$
(d) $2 \text{LiNO}_3(s) \rightarrow 2 \text{LiNO}_2(s) + \text{O}_2(g)$
(e) $2 \text{Pb}(s) + \text{O}_2(g) \rightarrow 2 \text{PbO}(s)$
23. Refer to the chemical reactions in Exercise 19.
(a) neutralization reaction
(b) double-replacement reaction
(c) single-replacement reaction
(d) decomposition reaction
(e) combination reaction
25. metal + oxygen gas \rightarrow metal oxide
(a) $2 \text{Ni}(s) + \text{O}_2(g) \rightarrow 2 \text{NiO}(s)$
(b) $4 \text{Fe}(s) + 3 \text{O}_2(g) \rightarrow 2 \text{Fe}_2\text{O}_3(s)$
27. nonmetal + oxygen gas \rightarrow nonmetal oxide
(a) $2 \text{C}(s) + \text{O}_2(g) \rightarrow 2 \text{CO}(g)$
(b) $4 \text{P}(s) + 5 \text{O}_2(g) \rightarrow 2 \text{P}_2\text{O}_5(s)$
35. (a) $2 \text{Na} + \text{I}_2 \rightarrow 2 \text{NaI}$
(b) $3 \text{Ba} + \text{N}_2 \rightarrow \text{Ba}_3\text{N}_2$
41. oxygen-containing compounds \rightarrow oxygen gas
(a) $\text{Ca}(\text{NO}_3)_2(s) \rightarrow \text{Ca}(\text{NO}_2)_2(s) + \text{O}_2(g)$
(b) $2 \text{Ag}_2\text{SO}_4(s) \rightarrow 2 \text{Ag}_2\text{SO}_3(s) + \text{O}_2(g)$
43. metal hydrogen carbonate \rightarrow metal carbonate + water + carbon dioxide
(a) $2 \text{AgHCO}_3(s) \rightarrow \text{Ag}_2\text{CO}_3(s) + \text{H}_2\text{O}(g) + \text{CO}_2(g)$
(b) $\text{Zn}(\text{HCO}_3)_2(s) \rightarrow \text{ZnCO}_3(s) + \text{H}_2\text{O}(g) + \text{CO}_2(g)$

45. oxygen-containing compounds \rightarrow oxygen gas

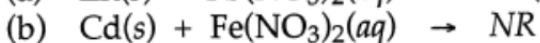
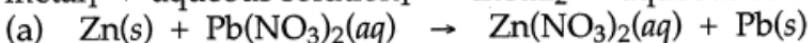


	<u>Element</u>	<u>Solution</u>	<u>Observation</u>
49.	(a) Ni	HCl(aq)	reaction; Ni > (H)
	(b) Zn	HCl(aq)	reaction; Zn > (H)
	(c) Cu	HCl(aq)	no reaction; Cu < (H)
	(d) Al	HCl(aq)	reaction; Al > (H)

53. metal₁ + aqueous solution₁ \rightarrow metal₂ + aqueous solution₂

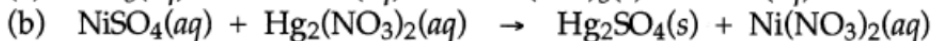
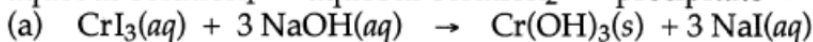


61. metal₁ + aqueous solution₁ \rightarrow metal₂ + aqueous solution₂

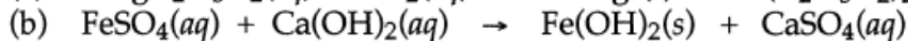
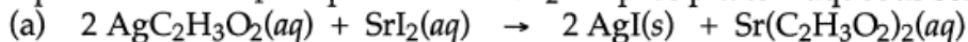


67.	(a) Al(NO ₃) ₃	soluble	(b) Na ₂ SO ₄	soluble
	(c) Co(OH) ₂	insoluble	(d) FePO ₄	insoluble

71. aqueous solution₁ + aqueous solution₂ \rightarrow precipitate + aqueous solution₃



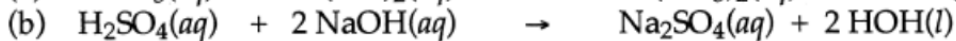
73. aqueous solution₁ + aqueous solution₂ \rightarrow precipitate + aqueous solution₃



75. aqueous acid + aqueous base \rightarrow aqueous salt + water



77. aqueous acid + aqueous base \rightarrow aqueous salt + water



79. If a chemical equation is impossible to balance, it is most likely that the equation has a chemical formula with an incorrect subscript.

89. **Ostwald Process for Manufacturing Nitric Acid:**

