12. Use the method in the previous problem to balance each of the reactions below.
a. $HI + HNO_2 \longrightarrow NO + I_2 + H_2O$
b. $FeCl_3 + H_2S \longrightarrow FeCl_2 + HCl + S$

13. Balance the equation for the reaction in which hot, concentrated sulfuric acid reacts with zinc to form zinc sulfate, hydrogen sulfide, and water.

Oxidizing and Reducing Agents

SECTION 3 REVIEW

14. a. Identify the most active reducing agent among all common elements.
b. Why are all of the elements in its group in the periodic table very active reducing agents?
c. Identify the most active oxidizing agent among the common elements.

15. Use **Table 3** to identify the strongest and weakest reducing agents among the substances listed within each of the following groupings:
a. Ca, Ag, Sn, Cl^-
b. Fe, Hg, Al, Br^-
c. F^-, Pb, Mn^{2+}, Na

16. Use **Table 3** to respond to each of the following:
a. Would Al be oxidized by Ni^{2+}?
b. Would Cu be oxidized by Ag^+?
c. Would Pb be oxidized by Na^+?
d. Would F_2 be reduced by Cl^-?
e. Would Br_2 be reduced by Cl^-?

MIXED REVIEW

17. Identify the following reactions as redox or nonredox:
a. $Mg(s) + ZnCl_2(aq) \longrightarrow Zn(s) + MgCl_2(aq)$
b. $2H_2(g) + OF_2(g) \longrightarrow H_2O(g) + 2HF(g)$
c. $2KI(aq) + Pb(NO_3)_2(aq) \longrightarrow PbI_2(s) + 2KNO_3(aq)$
d. $CaO(s) + H_2O(l) \longrightarrow Ca(OH)_2(aq)$
e. $3CuCl_2(aq) + 2(NH_4)_3PO_4(aq) \longrightarrow 6NH_4Cl(aq) + Cu_3(PO_4)_2(s)$
f. $CH_4(g) + 2O_2(g) \longrightarrow CO_2(g) + 2H_2O(g)$

18. Arrange the following in order of decreasing oxidation number of the nitrogen atom: N_2, NH_3, N_2O_4, N_2O, N_2H_4, and NO_3^-.

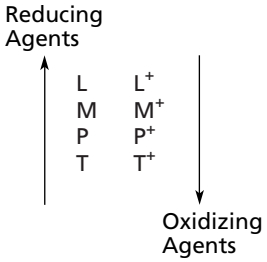
19. Balance the following redox equations:
a. $SbCl_5 + KI \longrightarrow KCl + I_2 + SbCl_3$
b. $Ca(OH)_2 + NaOH + ClO_2 + C \longrightarrow NaClO_2 + CaCO_3 + H_2O$

20. Balance the following equations in basic solution:
a. $PbO_2 + KCl \longrightarrow KClO + KPb(OH)_3$
b. $KMnO_4 + KIO_3 \longrightarrow MnO_2 + KIO_4$
c. $K_2MnO_4 \longrightarrow MnO_2 + KMnO_4$

21. Balance the following equations in acidic solution:
a. $MnO_4^- + Cl^- \longrightarrow Mn^{2+} + HClO$
b. $NO_3^- + I_2 \longrightarrow IO_3^- + NO_2$
c. $NO_2^- \longrightarrow NO + NO_3^-$

CRITICAL THINKING

22. Interpreting Graphics Given the activity table below, determine whether a reaction will occur or not. If the reaction will occur, give the products.



a. L and M^+
b. P and M^+
c. P and T^+

23. Drawing Conclusions A substance has an element in one of its highest possible oxidation states. Is this substance more likely to be an oxidizing agent or a reducing agent? Explain your reasoning.