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20.3 BALANCING REDOX REACTIONS

Section Review

Objectives

- Balance a redox equation using the oxidation-number-change method
- Balance a redox equation by breaking a redox equation into oxidation and reduction half-reactions and then using the half-reaction method

Vocabulary

- oxidation-number-change method
- half-reaction
- half-reaction method

Part A Completion

Use this completion exercise to check your understanding of the concepts and terms that are introduced is this section. Each blank can be completed with a term, short phrase, or number.

One method for balancing redox equations involves determining the change in ___1___ of the substances that are oxidized and reduced. Coefficients are then used to make the increase in oxidation number equal to the decrease.

The ___2___ method is another way to write a ___3___ equation for a redox reaction. In this method, the net ___4___ equation is divided into ___5___ half-reactions. Each half-reaction is balanced independently. Finally, the half-reactions are ___6___. The half-reaction method is particularly useful in balancing equations for ___7___ reactions.

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

Part B True-False

Classify each of these statements as always true, AT; sometimes true, ST; or never true, NT.

_____ **8.** The reduction half-reaction in the reaction $MnO_4^- + Cl^- \rightarrow Mn^{2+} + Cl_2$ involves $MnO_4^- \rightarrow Mn^{2+}$

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_____ **9.** In an oxidation half-reaction, electrons occur on the right side of the equation.

_____ **10.** Electrons never appear in a balanced redox reaction.

_____ **11.** $2e^- + 2Cl^- \rightarrow Cl_2$ is a balanced half-reaction.

_____ **12.** To balance the oxygen in a half reaction involving $MnO_4^- \rightarrow Mn^{2+}$, $2H_2O$ will be added to the product side of the equation.

_____ **13.** In the equation $2FeBr_2 + Br_2 \rightarrow 2FeBr_3$, the oxidation number of the iron doesn't change.

Part C Matching

Match each description in Column B to the correct term in Column A.

Column A	Column B
_____ **14.** half-reaction method	**a.** ions that are present but do not participate in or change during the reaction
_____ **15.** spectator ions	**b.** $Fe^{2+} \rightarrow Fe^{3+} + e^-$
_____ **16.** anions	**c.** balancing a redox equation by first balancing the oxidation and reduction half-reactions
_____ **17.** oxidation half-reaction	**d.** balancing a redox equation by comparing the increase and decrease in oxidation numbers
_____ **18.** half-reaction	**e.** equation showing either the reduction or the oxidation of a species in an oxidation-reduction reaction
_____ **19.** oxidation-number-change method	**f.** ions that can serve as reducing agents
_____ **20.** reduction half-reaction	**g.** $2e^- + Br_2 \rightarrow 2Br^-$

Part D Questions and Problems

Answer the following in the space provided.

21. Balance these redox equations using the oxidation-number-change method.

a. $HNO_3(aq) + HI(g) \rightarrow NO(g) + I_2(s) + H_2O$

b. $HNO_3(aq) + I_2(s) \rightarrow HIO_3(aq) + NO_2(g) + H_2O(l)$

22. Balance these redox equations using the half-reaction method.

a. $H_2S(aq) + HNO_3(aq) \rightarrow S(s) + NO(g) + H_2O(l)$

b. $Fe^{2+} + Cr_2O_7^{2-} \rightarrow Fe^{3+} + Cr^{3+}$