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## CHAPTER 20 CHAPTER ASSESSMENT

## Redox Reactions

## Reviewing Vocabulary

Compare and contrast each pair of related terms.

- oxidation, reduction  
Oxidation occurs when an atom loses one or more electrons, and reduction occurs when an atom gains one or more electrons.
- oxidizing agent, reducing agent  
An oxidizing agent oxidizes another substance, and a reducing agent reduces another substance.
- oxidation–reduction reaction, redox reaction  
The terms are synonymous and are the same type of reaction.

Use the following terms to complete the statements. A term may be used more than once.

species	half-reaction	oxidation–reduction reaction
oxidizing agent	oxidation-number method	reducing agent

- A chemical reaction in which electrons are transferred from one atom to another is a(n) **oxidation–reduction reaction**.
- Any kind of chemical unit involved in a process is a(n) **species**.
- Redox equations can be balanced using the **oxidation-number method**.
- The chemical equation for a redox reaction can be written as two equations: an **oxidation half-reaction** and a **reduction half-reaction**.
- A substance that accepts electrons from another substance is a(n) **oxidizing agent**.
- A substance that loses electrons to another substance is a(n) **reducing agent**.

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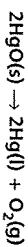
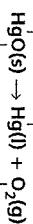
## CHAPTER ASSESSMENT

## Understanding Main Ideas (Part A)

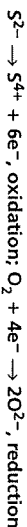
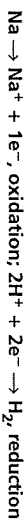
Determine the oxidation number of the boldface element in these ions.

- $\text{H}_3\text{AsO}_4$  +5      3.  $\text{Fe}(\text{NO}_3)_2$  +2      5.  $\text{CrO}_4^{2-}$  +6
- $\text{CaSO}_3$  +6      4.  $\text{AlN}$  -3      6.  $\text{I}_2\text{O}_5$  +5

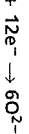
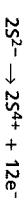
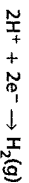
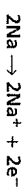
Balance the following equations, using the oxidation-number method for the redox part of the equation. Show your work.



Write half-reactions for the following reactions. Identify each as being either oxidation or reduction.



Use your answers from questions 9 and 10 to help you balance the following equations. Show your work.



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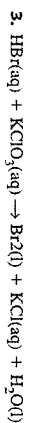
## Understanding Main Ideas (Part B)

Answer the following questions.

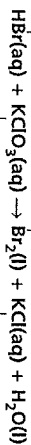
1. Explain how the oxidation-number method of balancing equations differs from balancing them by the conventional method, as you did in Chapter 10.  
The conventional method is based on looking at what atoms are involved in the reaction and balancing the number of each by trial and error. The oxidation number method is based on balancing the number of electrons transferred in a redox reaction.
2. How many species are present in the following reaction? Explain your answer.  
 $2K + 2Cl \rightarrow 2K + Cl_2$

Four; a species is any type of a chemical unit involved in a process. Each ion and element listed is a species.

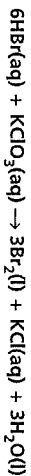
Balance the following equations, using the oxidation-number method for the redox part of the equation. Show your work.



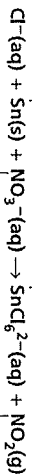
$$6(+1) = +6$$



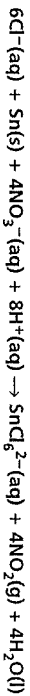
$$-6$$



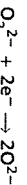
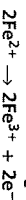
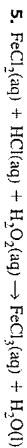
$$+4$$



$$4(-1) = -4$$



Balance the following equation, using half-reactions for the redox part of the equation. Show your work.



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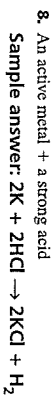
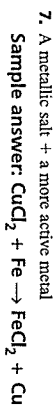
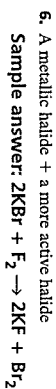
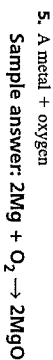
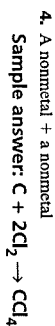
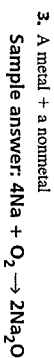
## CHAPTER ASSESSMENT

## Thinking Critically

Answer the following questions.

1. In a reaction, more than one element can be oxidized or reduced. In terms of oxidation and reduction, explain what happens in the following reaction.  
 $2H_2S(g) + SO_2(g) \rightarrow 3S(s) + 2H_2O(g) + O_2(g)$   
Sulfur in  $H_2S$  and oxygen in  $SO_2$  are oxidized. Sulfur in  $SO_2$  and hydrogen in  $H_2S$  are reduced.
2. How many species are in an aqueous sodium chloride solution? Explain your answer.  
Remember that sodium chloride is an ionic compound.  
In aqueous solution, sodium chloride exists as sodium ions and chloride ions.  
Three species exist in the solution: sodium ions, chloride ions, and water.

For each of the following, choose appropriate reactants, predict the formula(s) of the product(s), and write a balanced redox equation for the reaction. Do not use the same equation more than once. Use the oxidation-number method for three of the equations and the half-reaction method for the other three. Show your work. You do not have to show the states of the reactants and products.



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