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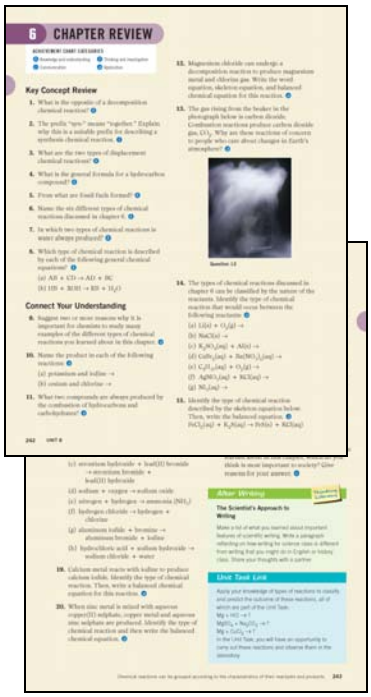

6 Chapter Review — ANSWERS TO QUESTIONS

Key Concept Review

1. The opposite of a decomposition chemical reaction is a synthesis chemical reaction.
2. "Syn-" means together. It is a suitable prefix for describing a synthesis chemical reaction because in this type of reaction, two single elements (either two metals or two non-metals) combine ("get together") to form a compound.
3. The two types of displacement chemical reactions are single displacement reactions and double displacement reactions.
4. The general formula for a hydrocarbon compound is C_xH_y.
5. Fossil fuels are hydrocarbons formed from the remains of once-living organisms.
6. The six different types of chemical reactions are: synthesis, decomposition, combustion, single displacement, double displacement, and neutralization.
7. Water is always produced in combustion reactions and in neutralization reactions.
8. **(a)** double displacement reaction
   (b) neutralization reaction

Connect Your Understanding

9. Scientists need to study many examples of chemical reactions because there are so many different elements on Earth and so many different compounds. Each set of reactions is unique and can have important and often surprising applications.
10. **(a)** potassium and iodine → potassium iodide
    (b) cesium and chlorine → cesium chloride
11. Carbon dioxide gas (CO_2) and water (H_2O) are always produced by the combustion of hydrocarbons and carbohydrates.
12. word equation: magnesium chloride → magnesium + chlorine
    skeleton equation: $MgCl_2(s) \rightarrow Mg(s) + Cl_2(g)$
    balanced chemical equation: $MgCl_2(s) \rightarrow Mg(s) + Cl_2(g)$
13. When combustion reactions release carbon dioxide gas into the atmosphere, they contribute to global warming. Atmospheric carbon dioxide gas prevents thermal energy from escaping into space. As the levels of carbon dioxide gas have increased over the past century, the average temperature on Earth has also increased. This global warming will have large environmental, social, and economic effects.

14. **(a)** synthesis
(b) decomposition
(c) single displacement
(d) double displacement
(e) combustion
(f) double displacement
(g) decomposition

15. This is a double displacement reaction. The balanced chemical equation is: $FeCl_2(aq) + K_2S(aq) \rightarrow FeS(s) + 2KCl(aq)$.

16. You would be able to see the iron(II) sulphide, FeS, in the bottom of the container. You know this because the equation indicates that FeS is a solid.

17. **(a)** decomposition: $CaCl_2(g) \rightarrow Ca(s) + Cl_2(g)$
(b) decomposition: $2NaN_3(s) \rightarrow 2Na(s) + 3N_2(g)$
(c) double displacement: $Pb(NO_3)_2(aq) + Cu_2SO_4(aq) \rightarrow PbSO_4(s) + 2CuNO_3(aq)$
(d) decomposition: $2Ni_2O_3(s) \rightarrow 4Ni(s) + 3O_2(g)$
(e) combustion: $CH_4(g) + 2O_2(g) \rightarrow CO_2(g) + 2H_2O(g)$
(f) double displacement: $3NaI(aq) + AlCl_3(aq) \rightarrow 3NaCl(aq) + AlI_3(s)$

18. **(a)** double displacement: $Na_2SO_4 + CaCl_2 \rightarrow 2NaCl + CaSO_4$
(b) synthesis: $3Mg + 2N_2 \rightarrow Mg_3N_2$
(c) double displacement: $Sr(OH)_2 + PbBr_2 \rightarrow SrBr_2 + Pb(OH)_2$
(d) synthesis: $4Na + O_2 \rightarrow 2Na_2O$
(e) synthesis: $N_2 + 3H_2 \rightarrow 2NH_3$
(f) decomposition: $2HCl \rightarrow H_2 + Cl_2$
(g) single displacement: $2AlI_3 + 3Br_2 \rightarrow 2AlBr_3 + 3I_2$
(h) neutralization: $HCl + NaOH \rightarrow NaCl + H_2O$

19. This is a synthesis reaction: $Ca + I_2 \rightarrow CaI_2$.

20. This is a single displacement reaction: $Zn(s) + CuSO_4(aq) \rightarrow Cu(s) + ZnSO_4(aq)$.

21. $Mg(s) + Br_2(g) \rightarrow MgBr_2(s)$

22. This is a double displacement reaction.
Word equation: zinc bromide + silver nitrate → silver bromide + zinc nitrate
Skeleton equation: $ZnBr_2(aq) + AgNO_3(aq) \rightarrow AgBr(s) + Zn(NO_3)_2(aq)$
Balanced equation: $ZnBr_2(aq) + 2AgNO_3(aq) \rightarrow 2AgBr(s) + Zn(NO_3)_2(aq)$

23. Yes, she is correct. The reactants for a neutralization reaction are always an acid and a base, both of which are compounds.

Reflection

24. Student answers may vary but might include combustion reactions because they produce energy, or neutralization reactions because they prevent acid indigestion and assist in neutralizing hydrochloric acid as it enters the small intestine during digestion and also because they reduce environmental damage due to acid precipitation. You might ask students to prepare a small poster to advertise the benefits of the chemical reaction they have chosen as an extension mini-project.

After Writing

Student answers will vary but may include the following. Scientific writing includes relevant section titles, tables of data, key terms (sometimes in bold), definitions of key terms, examples, figures that illustrate concepts, sample questions, and practice problems. Students may indicate that science writing differs from writing in other courses because it more factual and can include mathematical information, formulas, and subject-specific vocabulary. Science writing can sometimes include diagrams, which are less common in writings in other courses.

Unit Task Link

$Mg + 2HCl \rightarrow MgCl_2 + H_2$
$MgSO_4 + Na_2CO_3 \rightarrow MgCO_3 + Na_2SO_4$
$Mg + CuCl_2 \rightarrow MgCl_2 + Cu$