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Comprehension
Section 6.1

Use with textbook pages 256–267.

Classifying chemical reactions

Classify each of the following reactions as synthesis (S), decomposition (D), single replacement (SR), double replacement (DR), neutralization (N), or combustion (C). Place the correct letter representing the reaction type in the space provided. Then **balance** the chemical equation by placing the correct coefficients in the equation.

S 1. ___ N_2 + 3 F_2 → 2 NF_3

D 2. 2 $KClO_3$ → 2 KCl + 3 O_2

C 3. ___ $C_{12}H_{22}O_{11}$ + 12 O_2 → 12 CO_2 + 11 H_2O

SR 4. 3 $CuSO_4$ + 2 Fe → ___ $Fe_2(SO_4)_3$ + 3 Cu

DR 5. ___ MgF_2 + ___ Li_2CO_3 → ___ $MgCO_3$ + 2 LiF

N 6. ___ H_3PO_4 + 3 NH_4OH → 3 H_2O + ___ $(NH_4)_3PO_4$

SR 7. 2 NaF + ___ Br_2 → 2 NaBr + ___ F_2

C 8. 2 CH_3OH + 3 O_2 → 2 CO_2 + 4 H_2O

D 9. ___ $ZnCl_2$ → ___ Zn + ___ Cl_2

DR 10. 2 $RbNO_3$ + ___ BeF_2 → ___ $Be(NO_3)_2$ + 2 RbF

S 11. ___ S_8 + 8 H_2 → 8 H_2S

SR 12. 2 LiCl + ___ Br_2 → 2 LiBr + ___ Cl_2

N 13. ___ H_2SO_4 + 2 KOH → 2 H_2O + ___ K_2SO_4

C 14. ___ $C_{10}H_8$ + 12 O_2 → 10 CO_2 + 4 H_2O

D 15. 2 HI → ___ H_2 + ___ I_2

SR 16. 6 HCl + 2 Al → 3 H_2 + 2 $AlCl_3$

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Applying Knowledge
Section 6.1

Use with textbook pages 256–267.

Types of chemical reactions—Word equations

Classify each of the following chemical reactions as synthesis (S), decomposition (D), single replacement (SR), double replacement (DR), or neutralization (N). Then **write a balanced equation** for each word equation.

S 1. magnesium + sulphur → magnesium sulphide

$Mg + S \rightarrow MgS$

N 2. potassium hydroxide + sulphuric acid → water + potassium sulphate

$2KOH + H_2SO_4 \rightarrow 2H_2O + K_2SO_4$

SR 3. chlorine + potassium iodide → potassium chloride + iodide

$Cl_2 + 2KI \rightarrow 2KCl + I_2$

DR 4. aluminum chloride + sodium hydroxide → aluminum hydroxide + sodium chloride

$AlCl_3 + 3NaOH \rightarrow Al(OH)_3 + 3NaCl$

D 5. lead(II) oxide → lead + oxygen

$2PbO \rightarrow 2Pb + O_2$

SR 6. magnesium + silver nitrate → silver + magnesium nitrate

$Mg + 2AgNO_3 \rightarrow 2Ag + Mg(NO_3)_2$

DR 7. cadmium(II) nitrate + ammonium sulphide → cadmium(II) sulphide + ammonium nitrate

$Cd(NO_3)_2 + (NH_4)_2S \rightarrow CdS + 2NH_4NO_3$

N 8. tin(IV) hydroxide + hydrogen bromide → water + tin(IV) bromide

$4Na + O_2 \rightarrow 2Na_2O$

D 9. sodium + oxygen → sodium oxide

$2Na_3N \rightarrow 6Na + N_2$

10. sodium nitride → sodium + nitrogen

N $Sn(OH)_4 + 4HBr \rightarrow 4H_2O + SnBr_4$

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Predicting the products

1. For each of the following:

I. predict the products

II. classify the reaction as synthesis (S), decomposition (D), single replacement (SR), double replacement (DR), neutralization (N), or combustion (C)

III. write a balanced equation

D (a) $H_2O \rightarrow 2H_2O$ $2H_2 + O_2$

S (b) $H_2 + Cl_2 \rightarrow 2HCl$

SR (c) $NaI + F_2 \rightarrow 2NaF + I_2$

DR (d) $3AgNO_3 + Na_3PO_4 \rightarrow Ag_3PO_4 + 3NaNO_3$

N (e) $Ba(OH)_2 + H_2SO_4 \rightarrow BaSO_4 + 2H_2O$

S (f) $P_4 + 6Cl_2 \rightarrow 4PCl_3$

C (g) $2CH_3OH + 3O_2 \rightarrow 2CO_2 + 4H_2O$

N (h) $3Sr(OH)_2 + 2H_3PO_4 \rightarrow Sr_3(PO_4)_2 + 6H_2O$

D (i) $FeI_2 \rightarrow Fe + I_2$

SR (j) $CuCl_2 + Fe \rightarrow FeCl_2 + Cu$

DR (k) $Cr_2(SO_4)_3 + 3K_2CO_3 \rightarrow Cr_2(CO_3)_3 + 3K_2SO_4$

C (l) $C_2H_5OH + 3O_2 \rightarrow 2CO_2 + 3H_2O$

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Section 6.2

Use with textbook pages 272–277.

Different rates of reactions

1. Indicate whether each of the following would increase or decrease the rate of reaction.

   (a) adding heat ↑ increase

   (b) removing heat ↓ decrease

   (c) adding a catalyst ↑ increase

   (d) diluting a solution ↓ decrease

   (e) removing an enzyme ↓ decrease

   (f) lowering the temperature ↓ decrease

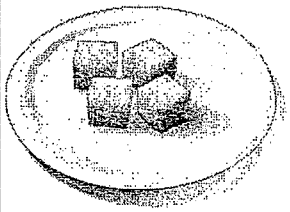
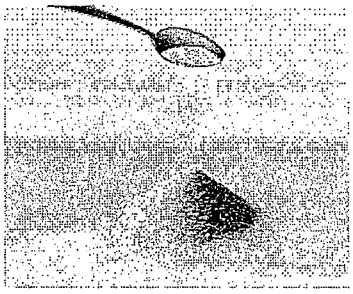
   (g) increasing the temperature ↑ increase

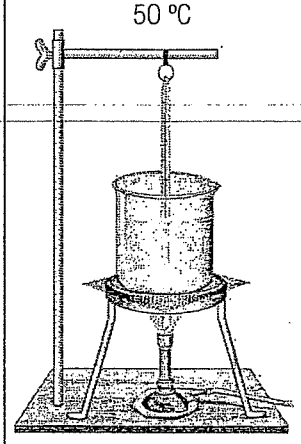
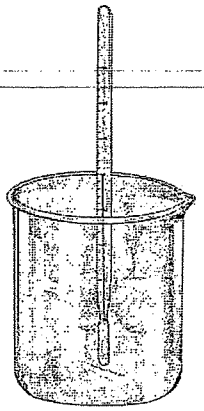
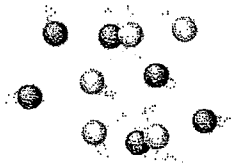
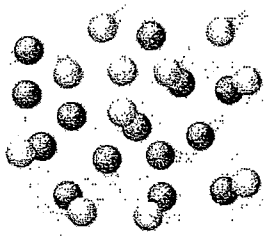
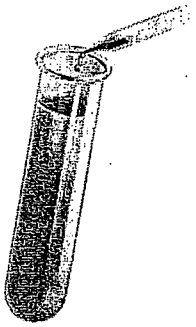
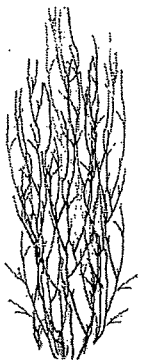
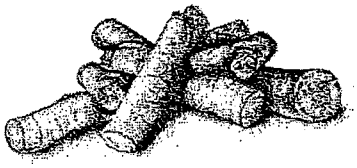
   (h) decreasing the surface area ↓ decrease

   (i) increasing the concentration of a solution ↑ increase

   (j) breaking a reactant down into smaller pieces ↑ increase

2. Identify which situation would have a higher reaction rate. Then state the factor that affected the rate of reaction in each situation.

	Situation X	Situation Y	Situation with a higher reaction rate (X or Y)	Factor affecting the rate of reaction
(a)	1 g of sugar (cubes) 	1 g of sugar (grains) 	Y	SA

(b)	50 °C 	0 °C 	X	temp
(c)	low number of particles = few collisions 	high number of particles = more collisions 	Y	Conc
(d)	enzyme added 	no enzyme added 	X	catalyst
(e)	twigs 	logs 	X	SA

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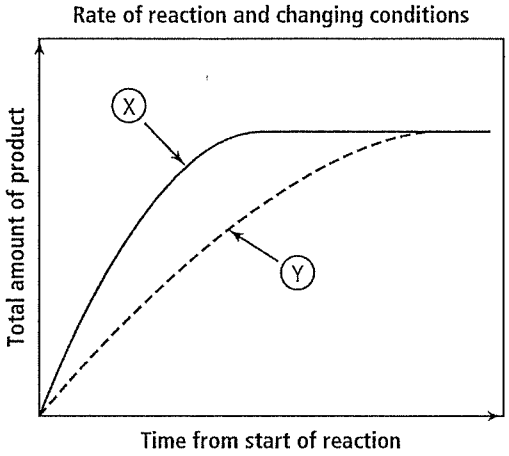
Use with textbook pages 272–277.

Four factors affecting the rate of reactions

Use the following graph to answer question 1.



1. The graph above shows the differences in the rate of reaction at different temperatures, concentrations, surface area, and the presence or absence of a catalyst. A steeper line represents a greater rate of reaction. Indicate which line (X or Y) each of the following are associated with.

(a) lower temperature Y (b) higher temperature X

(c) lower concentration Y (d) higher concentration X

(e) absence of a catalyst Y (f) presence of a catalyst X

(g) larger pieces (small surface area) Y

(h) smaller pieces (large surface area) X

2. Which of the four factors affecting reaction rate is most important in each of the following examples? Choose from concentration, temperature, surface area, and catalyst.

(a) Raw carrots are cut into thin slices for cooking. SA

(b) Protein is broken down in the stomach by the enzyme pepsin. catalyst

(c) A woolly mammoth is found, perfectly preserved, near the Arctic. temp

(d) More bubbles appear when a concentrated solution of hydrochloric acid is added to a magnesium strip than when a dilute solution of the acid is added. concentration

