

5. Blue No. 1 is the most polar because it runs the fastest and appears at the top of the chromatogram. Red No. 40 is the least polar.

### You're the Chemist

- Wet a portion of a piece of candy and blot it with a paper towel to remove excess water. Press the wet side of the candy onto the chromatography paper so that it makes a colored spot. Repeat for other colors of candy. Develop in 0.1% NaCl.
- Make a small spot of each colored marker pen on a piece of chromatography paper and develop in solvent.
- Use a toothpick to spot a solution of powdered drink on chromatography paper.
- Rubbing alcohol runs much more slowly and gives slightly better separation than 0.1% NaCl.
- Some papers cause a reversal of the positions of Blue No. 1 and Yellow No. 5 because of the water content of the paper. Different water content changes variations in the polarity of the stationary phase (the water molecules hydrogen bonded to the paper).

## Section Review 9.1

### Part A Completion

- |              |                                |
|--------------|--------------------------------|
| 1. monatomic | 8. transition (Group B)        |
| 2. lose      | metals                         |
| 3. 1+        | 9. Stock                       |
| 4. 2+        | 10. classical                  |
| 5. 3+        | 11. polyatomic                 |
| 6. 8         | 12. <i>-ite</i> or <i>-ate</i> |
| 7. 1-        | 13. <i>-ite</i> or <i>-ate</i> |

### Part B True-False

- |        |        |        |
|--------|--------|--------|
| 14. ST | 16. ST | 18. AT |
| 15. AT | 17. NT |        |

### Part C Matching

- |       |       |       |
|-------|-------|-------|
| 19. b | 21. d | 23. c |
| 20. e | 22. a |       |

### Part D Questions and Problems

- |           |       |
|-----------|-------|
| 24. a. 1+ | c. 1- |
| b. 2-     | d. 2+ |
25. a. hydrogen carbonate

- b. ammonium  
c. permanganate  
d. hydroxide

26. a. loses 2                      c. gains 1  
b. gains 2                        d. loses 3

## Section Review 9.2

### Part A Completion

- |                  |                  |
|------------------|------------------|
| 1. cation        | 5. Roman numeral |
| 2. anion         | 6. anion         |
| 3. <i>-ide</i>   | 7. oxygen        |
| 4. sodium iodide | 8. zero          |

### Part B True-False

- |        |        |
|--------|--------|
| 9. ST  | 11. ST |
| 10. AT | 12. AT |

### Part C Matching

- |       |       |
|-------|-------|
| 13. b | 15. d |
| 14. a | 16. c |

### Part D Questions and Problems

17. a. iron(III) bromide, binary ionic  
b. potassium hydroxide, ionic with polyatomic ion  
c. sodium dichromate, ionic with polyatomic ion
18. a.  $\text{NaClO}_3$   
b.  $\text{Pb}_3(\text{PO}_4)_2$   
c.  $\text{Mg}(\text{HCO}_3)_2$

## Section Review 9.3

### Part A Completion

- nonmetallic
- ide*
- atoms
- diarsenic pentasulfide

### Part B True-False

- |       |       |
|-------|-------|
| 5. ST | 7. NT |
| 6. NT |       |

### Part C Matching

- |      |       |
|------|-------|
| 8. d | 10. b |
| 9. a | 11. c |

### Part D Questions and Problems

12. a. phosphorus pentachloride  
 b. sulfur dioxide  
 c. tetraphosphorus decasulfide
13. a.  $\text{CBr}_4$                       b.  $\text{N}_2\text{O}_4$

## Section Review 9.4

### Part A Completion

1. hydrogen                      6. hydroxide ions  
 2. hydrogen ions              7. ionic  
 3. hydrobromic                8. cation  
 4. nitric                         9. anion  
 5. ionic

### Part B True-False

10. ST                      11. NT                      12. NT

### Part C Matching

13. a                      14. c                      15. b

### Part D Questions and Problems

16. a.  $\text{Mg}(\text{OH})_2$               c.  $\text{H}_3\text{PO}_4$   
 b. HF                              d. LiOH
17. a. potassium hydroxide  
 b. hydroiodic acid  
 c. sulfuric acid

## Section Review 9.5

### Part A Completion

1. definite proportions      9. molecular  
 2. proportions                10. carbon tetrachloride  
 3. multiple proportions      11. acid  
 4. small whole                12. elements  
 5. acid                            13. anion  
 6. phosphoric acid          14. 4A  
 7. acid                            15. lead(II) acetate  
 8. binary

### Part B True-False

16. ST                      18. NT  
 17. ST                      19. AT

## Part C Questions and Problems

20. a. lead(IV) acetate  
 b. hydrofluoric acid  
 c. diphosphorus pentoxide  
 d. lithium bromide
21. a.  $\text{PCl}_5$   
 b. FeO  
 c.  $\text{HNO}_3$   
 d. KCl  
 e.  $\text{Ca}(\text{NO}_3)_2$

## Practice Problems 9

### Section 9.1

1. a. 2-                              d. 3+  
 b. 1-                              e. 2+  
 c. 1+                              f. 2+
2. a. 3 lost                         d. 2 lost  
 b. 3 gained                      e. 1 gained  
 c. 1 lost                         f. 2 gained
3. a. tin(II) or stannous cation  
 b. cobalt(III) or cobaltic cation  
 c. bromide anion  
 d. potassium cation  
 e. hydride anion  
 f. manganese(II) or manganous cation
4. a.  $\text{CO}_3^{2-}$                         d.  $\text{OH}^-$   
 b.  $\text{NO}_2^{2-}$                         e.  $\text{CrO}_4^{2-}$   
 c.  $\text{SO}_4^{2-}$                         f.  $\text{NH}_4^+$
5. a. cyanide anion  
 b. hydrogen carbonate anion  
 c. phosphate anion  
 d. chloride anion  
 e. calcium cation  
 f. sulfite anion

### Section 9.2

1. a. MgO                            d.  $\text{AlCl}_3$   
 b.  $\text{SnF}_2$                          e.  $\text{Na}_2\text{S}$   
 c. KI                                f.  $\text{FeBr}_3$
2. a.  $\text{BaCl}_2$                         d. KBr  
 b. AgI                              e.  $\text{Al}_2\text{O}_3$   
 c. CaS                              f. FeO
3. a. manganese(IV) oxide or manganous oxide  
 b. lithium nitride  
 c. calcium chloride

- d. strontium bromide  
 e. nickel(II) chloride  
 f. potassium sulfide  
 g. copper(II) chloride or cupric chloride  
 h. tin(IV) chloride or stannic chloride
4. a.  $\text{Na}_3\text{PO}_4$                       d. KCN  
 b.  $\text{MgSO}_4$                         e.  $\text{NH}_4\text{Cl}$   
 c.  $\text{NaOH}$                          f.  $\text{K}_2\text{Cr}_2\text{O}_7$
5. a.  $(\text{NH}_4)_2\text{SO}_4$                 c.  $\text{Ba}(\text{OH})_2$   
 b.  $\text{KNO}_3$                          d.  $\text{Li}_2\text{CO}_3$
6. a. sodium cyanide  
 b. iron(III) chloride or ferric chloride  
 c. sodium sulfate  
 d. potassium carbonate  
 e. copper(II) hydroxide or cupric hydroxide  
 f. lithium nitrate
7. a. sodium cation,  $\text{Na}^+$   
 b. nickel cation,  $\text{Ni}^{2+}$   
 c. calcium cation,  $\text{Ca}^{2+}$   
 d. potassium cation,  $\text{K}^+$   
 e. iron(III) cation,  $\text{Fe}^{3+}$   
 f. copper(I) cation,  $\text{Cu}^+$

### Section 9.3

1. a. phosphorous pentachloride  
 b. carbon tetrachloride  
 c. nitrogen dioxide  
 d. dinitrogen difluoride  
 e. tetraphosphorous hexoxide  
 f. xenon difluoride  
 g. silicon dioxide  
 h. dichlorine heptoxide
2. a.  $\text{NBr}_3$                          c.  $\text{SO}_2$   
 b.  $\text{Cl}_2\text{O}$                          d.  $\text{N}_2\text{F}_4$

### Section 9.4

1. a. nitrous acid                    c. hydrofluoric acid  
 b. sulfuric acid                    d. carbonic acid
2. a.  $\text{Ca}(\text{OH})_2$                     c.  $\text{Al}(\text{OH})_3$   
 b.  $\text{NH}_4\text{OH}$                         d.  $\text{LiOH}$

### Section 9.5

1. a.  $\text{K}_2\text{S}$                             g.  $\text{N}_2\text{O}_5$   
 b.  $\text{SnCl}_4$                          h.  $\text{Fe}_2(\text{CO}_3)_3$   
 c.  $\text{H}_2\text{S}$                             i.  $\text{SF}_6$   
 d.  $\text{CaO}$                             j.  $\text{MgCl}_2$   
 e.  $\text{HBr}$                             k.  $\text{H}_3\text{PO}_4$   
 f.  $\text{AlF}_3$                             l.  $\text{HNO}_3$

2.

|                  | $\text{SO}_4^{2-}$           | $\text{NO}_3^-$            | $\text{OH}^-$            | $\text{PO}_4^{3-}$           |
|------------------|------------------------------|----------------------------|--------------------------|------------------------------|
| $\text{Ca}^{2+}$ | $\text{CaSO}_4$              | $\text{Ca}(\text{NO}_3)_2$ | $\text{Ca}(\text{OH})_2$ | $\text{Ca}_3(\text{PO}_4)_2$ |
| $\text{Al}^{3+}$ | $\text{Al}_2(\text{SO}_4)_3$ | $\text{Al}(\text{NO}_3)_3$ | $\text{Al}(\text{OH})_3$ | $\text{AlPO}_4$              |
| $\text{Na}^+$    | $\text{Na}_2\text{SO}_4$     | $\text{NaNO}_3$            | $\text{NaOH}$            | $\text{Na}_3\text{PO}_4$     |
| $\text{Pb}^{4+}$ | $\text{Pb}(\text{SO}_4)_2$   | $\text{Pb}(\text{NO}_3)_4$ | $\text{Pb}(\text{OH})_4$ | $\text{Pb}_3(\text{PO}_4)_4$ |

3. a. potassium phosphate  
 b. aluminum hydroxide  
 c. sodium hydrogen sulfate  
 d. mercury(II) oxide or mercuric oxide  
 e. dinitrogen pentoxide  
 f. nitrogen tribromide  
 g. phosphorous triiodide  
 h. ammonium sulfate
4. The law of definite proportions states that samples of any compound will always contain the constituent elements in the same proportions. The law of multiple proportions states that in two compounds containing the same two elements, the masses of one element that combines with a given mass of the other element will be in the ratio of small whole numbers.

### Interpreting Graphics 9

1. 2A                                    8. 10  
 2. two                                9. 10  
 3. 12                                 10. 10  
 4. 10                                 11. a. 18  
 5. 7A                                 b. 18  
 6. one                                c. 18  
 7. nine                                d. 18