

**3****Problem Solving in Chemistry****Skillsheet****Algebraic Equations**

An algebraic equation expresses a mathematical relationship between two or more quantities. In science, this mathematical relationship is actually a way of describing nature. It allows scientists to make predictions concerning the quantities with which they are working.

You have already used an algebraic equation in Chapter 2 to calculate changes in heat energy. In this chapter you will use an equation to calculate the density of a substance from its mass and volume. In such equations, you can solve for any term if the values of the other variables are known.

An algebraic equation usually has one unknown quantity. For example:

$$5 \times Y = 45$$

The numerical value of the letter Y in this equation is 9. There is a precise mathematical procedure for finding the value of an unknown. It is important, however, to be able to determine the value of the unknown without using the procedure.

Look at each of the following equations. Find the value of the unknown in each case. Then check your answers.

**Practice Problems**

Solve for the unknown in each equation.

1.  $18 + W = 22$  1. \_\_\_\_\_
2.  $18 - S = 15$  2. \_\_\_\_\_
3.  $7 \times R = 14$  3. \_\_\_\_\_
4.  $56 \div K = 7$  4. \_\_\_\_\_

There is often more than one way to solve an equation. The main rule is always the same. Whatever is done to one side of the equation must be done to the other side.

To solve equation 1, you can subtract 18 from both sides of the expression without changing its value.

$$18 - 18 + W = 22 - 18$$

$$W = 4$$

For equation 2, you can follow the same procedure:

$$18 - 18 - S = 15 - 18$$

$$0 - S = -3$$

To solve equation 3, divide both sides by 7.

$$\frac{7 \times R}{7} = \frac{14}{7}$$

The 7 in the denominator cancels the 7 in the numerator, and you are left with:

$$R = 2$$

In equation 4, multiply both sides by K.

$$\frac{56 \times K}{K} = 7 \times K$$

Then both sides are divided by 7.

$$\frac{56}{7} = 8$$

Now solve the equations in the next set of Practice Problems. Each solution requires more than one operation. When you finish check your answers.

**Practice Problems**

Solve for the unknown in each equation.

5.  $12 + (3 \times B) = 36$

6.  $14 + \left(\frac{8}{N}\right) = 16$

$$7. 59 - \left(\frac{G}{2}\right) = 54$$

$$12. \frac{(5 \times 7.3)}{4.2} = 189$$

$$8. 62 - (5 \times A) = 47$$

13. How many calories are required to raise the temperature of 10 g of iron from 100°C to 200°C? (Specific heat of iron = 0.11 cal/g °C)

When you have correctly solved the problems above, work the next ones. This set includes word problems similar to those you have been working in class. When you finish, check your answers.

### Practice Problems

Solve for the unknown in each equation.

$$9. 14 + (5 \times M) = 83$$

$$15. \frac{20 + (40 \times R)}{4} + 17 = 82$$

$$10. 1.5 + \left(\frac{L}{6}\right) = 37.2$$

$$11. (R \times 15) - 7 = -39.3$$

$$16. 56 + 4 \times M^2 = 120$$