$$\text{Log } C_p = \text{Log } C_p^0 - K_{el}(t)/2.303$$

(Equation 5.3)

Equation 5.3 is then thought of in terms of the Y-intercept form:

$$Y = b + mX$$

$$\text{Log } C_p = \text{Log } C_P^0 - K_{el}/2.303(t)$$

and interpreted as such in the semilogarithmic plot illustrated in Figure 5.14. Most drugs administered orally can be adequately described using a one-compartment model, whereas drugs administered by rapid intravenous infusion are usually best described by a two-compartment or three-compartment model system.

Assuming that a drug's volume of distribution is constant within this system, the total amount of drug in the body (Q_b) can be calculated from the following equation:

$$Q_b = \left[C_P^0\right][V_d] \qquad \text{(Equation 5.4)}$$

Usually, C_p^0 is determined by extrapolating the drug concentration–time plot to time zero.

In this simple one-compartment system, it is assumed that the administered drug is confined to the plasma (or blood) and then excreted. Drugs that exhibit this behavior have small volumes of distribution. For example, a drug such as warfarin sodium, which is extensively bound to plasma albumin, will have a volume of distribution equivalent to that of plasma water, about 2.8 L in an average 70-kg adult. Some drugs, however, are initially distributed at somewhat different rates in various fluids and tissues. Consequently, these drugs' kinetic behavior can best be illustrated by considering an expansion of the one-compartment system to the *two-compartment model* (Fig. 5.15).

In the two-compartment system, a drug enters into and is instantaneously distributed throughout the central compartment. Its subsequent distribution into the second or peripheral compartment is slower. For simplicity, on the basis of blood perfusion and tissue–plasma partition coefficients for a given drug, various tissues and organs are considered together and designated either

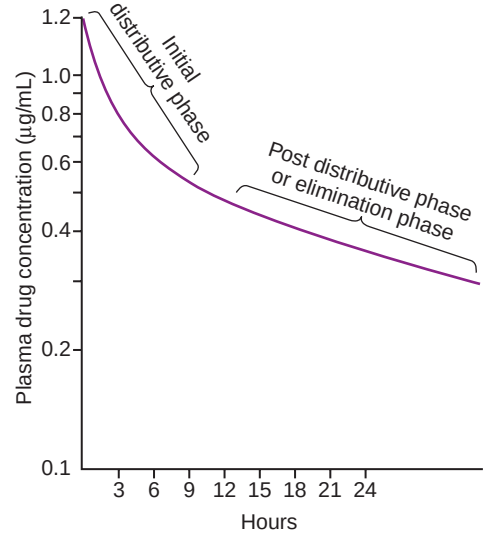
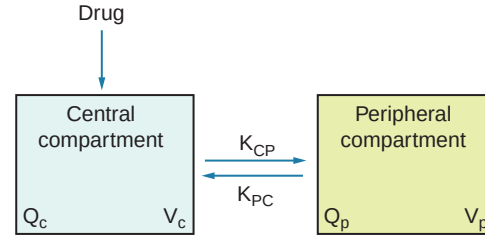


FIGURE 5.14 A semilogarithmic plot of plasma concentration versus time of an intravenous drug that follows first-order two-compartment pharmacokinetics.

central compartment or peripheral compartment. The central compartment is usually considered to include the blood, the extracellular space, and organs with good blood perfusion, such as the lungs, liver, kidneys, and heart. The peripheral compartment usually comprises tissues and organs that are poorly perfused by blood, such as the skin, bone, and fat.

Figure 5.16 depicts the plasma drug concentration–time plot for a rapidly administered intravenous dose of a hypothetical drug that exhibits kinetic behavior exemplifying a



Where:
Q_c = Quantity of drug in central compartment
V_c = Volume of the central compartment
Q_p = Quantity of drug in peripheral compartment
V_p = Volume of the peripheral compartment

FIGURE 5.15 A two-compartment system.