

Basic Centrifugation Formulas

To calculate the most exact value of RCF at any speed for any given radius use the RCF equation:

$$\text{RCF} = 11.17 r (\text{rpm}/1000)^2 \quad \text{where } r = \text{radius in centimeters}$$
$$\text{RCF} = 28.38 R (\text{rpm}/1000)^2 \quad \text{where } R = \text{radius in inches}$$

To calculate the K factor for a rotor:

$$K = \frac{(2.53 \times 10^{11}) \ln (R_{\max}/R_{\min})}{(\text{rpm})^2}$$

where:

R_{\max} = the maximum radial distance a particle can be from the rotor's axis of rotation.
Usually measured out to the bottom of the tube cavity.

R_{\min} = the minimum radial distance a particle can be from the rotor's axis of rotation.
Usually measured out to the liquid meniscus in the tube.

The smaller the K factor, the more efficient the rotor, or the less time it takes to pellet particles.

To calculate pellet time:

$$T = K/S \quad \text{where: } T = \text{pellet time in hours}$$
$$K = \text{K factor}$$
$$S = \text{sedimentation coefficient}$$

To convert pellet times between rotors:

$$T_1/K_1 = T_2/K_2 \text{ or } T_1 = T_2 (K_1/K_2)$$

where:

T_1 = time to pellet in the "new" rotor

T_2 = time to pellet in the "old" rotor

K_1 = K factor of the "new" rotor

K_2 = K factor of the "old" rotor

To adjust the K factor for runs performed at less than maximum speed:

$$K_{\text{new}} = K_{\text{rotor}} (\text{maximum speed of rotor}/\text{actual run speed})^2$$

