International Tables for Crystallography (2006). Vol. C, Table 2.6.1.1, p. 92.

Table 2.6.1.1. *Formulae for the various parameters for h (left) and m (right) scales*

$R = K\sqrt{\tan\alpha}$ $\tan\alpha = \dfrac{\Delta \log I(h)}{\Delta h^2}$	$R = K\dfrac{\lambda a}{2\pi}\sqrt{\tan\alpha}$ $\tan\alpha = \dfrac{\Delta \log I(m)}{\Delta m^2}$
$K = \sqrt{\dfrac{3}{\log \mathrm{e}}} = 2.628$	
$R_c = K_c\sqrt{\tan\alpha}$ $\tan\alpha = \dfrac{\Delta \log[I(h)h]}{\Delta h^2}$	$R_c = K_c\dfrac{\lambda a}{2\pi}\sqrt{\tan\alpha}$ $\tan\alpha = \dfrac{\Delta \log[I(m)m]}{\Delta m^2}$
$K_c = \sqrt{\dfrac{2}{\log \mathrm{e}}} = 2.146$	
$R_t = K_t\sqrt{\tan\alpha}$ $\tan\alpha = \dfrac{\Delta \log[I(h)h^2]}{\Delta h^2}$	$R_t = K_t\dfrac{\lambda a}{2\pi}\sqrt{\tan\alpha}$ $\tan\alpha = \dfrac{\Delta \log[I(m)m^2]}{\Delta m^2}$
$K_t = \sqrt{\dfrac{1}{\log \mathrm{e}}} = 1.517$	
$V = 2\pi^2\dfrac{I(0)}{Q}$ $Q = \int I(h)h^2\,\mathrm{d}h$	$V = \dfrac{\lambda^3 a^3}{4\pi}\dfrac{I(0)}{Q_m}$ $Q_m = \int I(m)m^2\,\mathrm{d}m$
$A = 2\pi\dfrac{[I(h)h]_0}{Q}$	$A = \dfrac{\lambda^2 a^2}{2\pi}\dfrac{[I(m)m]_0}{Q_m}$
$T = \pi\dfrac{[I(h)h^2]_0}{Q}$	$T = \dfrac{\lambda a}{2}\dfrac{[I(m)m^2]_0}{Q_m}$
$M = \dfrac{I(0)}{P}K\dfrac{a^2}{cd(\Delta z)^2}$	$K = \dfrac{1}{I_e N_L} = 21.0$
$M_c = \dfrac{[I(h)h]_0}{P}\dfrac{K}{\pi}\dfrac{a^2}{cd(\Delta z)^2}$	$M_c = \dfrac{[I(m)m]_0}{P}\dfrac{2K}{\lambda}\dfrac{a}{cd(\Delta z)^2}$
$M_t = \dfrac{[I(h)h^2]_0}{P}\dfrac{K}{2\pi}\dfrac{a^2}{cd(\Delta z)^2}$	$M_t = \dfrac{[I(m)m^2]_0}{P}\dfrac{2\pi K}{\lambda^2}\dfrac{1}{cd(\Delta z)^2}$
$\overline{(\Delta\rho)^2} = \dfrac{Q}{P}\dfrac{a^2}{2\pi^2 d}K$	$\overline{(\Delta\rho)^2} = \dfrac{Q_m}{P}\dfrac{4\pi}{\lambda^3 ad}K$
$K = 10^{24}/I_e$ $(10^{24} = [\mathrm{cm}/\text{Å}]^3)$	
$O_s = \pi\dfrac{K}{Q}$ $K = \lim_{h\to\infty} I(h)h^4$	$O_s = \dfrac{2\pi^2}{\lambda a}\dfrac{K_m}{Q_m}$ $K = \lim_{m\to\infty} I(m)m^4$

$$R_g^2 = \frac{\int_0^\infty p(r)r^2\,\mathrm{d}r}{2\int_0^\infty p(r)\,\mathrm{d}r} \qquad (2.6.1.17)$$

or from the innermost part of the scattering curve [Guinier approximation (Guinier, 1939)]:

$$I(h) = I(0)\exp(-h^2R_g^2/3). \qquad (2.6.1.18)$$

A plot of $\log[I(h)]$ *vs* h^2 (Guinier plot) shows at its innermost part a linear descent with a slope $\tan\alpha$, where

$$R_g = K\sqrt{\tan\alpha}$$

(see Table 2.6.1.1).

The radius of gyration is related to the geometrical parameters of simple homogeneous triaxial bodies as follows (Mittelbach, 1964):

sphere (radius R)	$R_g^2 = (3/5)R^2$
hollow sphere (radii R_1 and R_2)	$R_g^2 = (3/5)\dfrac{R_2^5 - R_1^5}{R_2^3 - R_1^3}$
ellipsoid (semi-axes a, b, c)	$R_g^2 = (1/5)(a^2 + b^2 + c^2)$
parallelepiped (edge lengths A, B, C)	$R_g^2 = (1/12)(A^2 + B^2 + C^2)$
elliptic cylinder (semi-axes a, b; height h)	$R_g^2 = \dfrac{a^2 + b^2}{4} + \dfrac{h^2}{12} = R_c^2 + \dfrac{h^2}{12}$
hollow cylinder (height h and radii r_1, r_2)	$R_g^2 = \dfrac{r_1^2 + r_2^2}{2} + \dfrac{h^2}{12}.$

Radius of gyration of the cross section. In the special case of rod-like particles, the two-dimensional analogue of R_g is called radius of gyration of the cross section R_c. It can be obtained from

$$R_c^2 = \frac{\int_0^\infty p_c(r)r^2\,\mathrm{d}r}{2\int_0^\infty p_c(r)\,\mathrm{d}r}, \qquad (2.6.1.19)$$

where $p_c(r)$ is the PDDF of the cross section or it can be calculated from the innermost part of the scattering intensity of the cross section $I_c(h)$:

$$I_c(h) = I_c(0)\exp(-h^2R_c^2/2), \qquad (2.6.1.20)$$

with $I_c(h) = I(h)h$ (see Table 2.6.1.1).

Radius of gyration of the thickness. A similar definition exists for lamellar particles. The one-dimensional radius of gyration of the thickness R_t can be calculated from

$$R_t^2 = \frac{\int_0^\infty p_t(r)r^2\,\mathrm{d}r}{2\int_0^\infty p_t(r)\,\mathrm{d}r}, \qquad (2.6.1.21)$$

or from the innermost part of the scattered intensity of thickness $I_t(h)$:

$$I_t(h) = I_t(0)\exp(-h^2R_t^2), \qquad (2.6.1.22)$$

with $I_t(h) = I(h)h^2$ (see Table 2.6.1.1 and §2.6.1.3.2.1).

Volume. The volume of a homogeneous particle is given by

$$V = 2\pi^2\frac{I(0)}{Q}. \qquad (2.6.1.23)$$

This equation follows from equations (2.6.1.12)–(2.6.1.14). Such volume determinations are subject to errors as they rely on the validity of an extrapolation to zero angle [to obtain $I(0)$] and to larger angles (h^{-4} extrapolation for Q). Scattering functions cannot be measured from h equal to zero to h equal to infinity.