

\* Harmonics for rank 0

\* Harmonics for rank 1

$$\vec{G}_1^{(1,0)}[q](A)$$

\*\* symmetry

$$z$$

\*\* expression

$$\frac{\sqrt{2}Q_{xy}}{2} - \frac{\sqrt{2}Q_{yx}}{2}$$

$$\vec{G}_{1,1}^{(1,0)}[q](E), \vec{G}_{1,2}^{(1,0)}[q](E)$$

\*\* symmetry

$$x$$

$$y$$

\*\* expression

$$\frac{\sqrt{2}Q_{yz}}{2} - \frac{\sqrt{2}Q_{zy}}{2}$$

$$-\frac{\sqrt{2}Q_{xz}}{2} + \frac{\sqrt{2}Q_{zx}}{2}$$

\* Harmonics for rank 2

$$\vec{G}_2^{(1,0)}[q](A)$$

\*\* symmetry

$$-\frac{x^2}{2} - \frac{y^2}{2} + z^2$$

\*\* expression

$$\frac{\sqrt{6}Q_{xyz}}{2} - \frac{\sqrt{6}Q_{yxz}}{2}$$

$$\vec{G}_{2,1}^{(1,0)}[q](E, 1), \vec{G}_{2,2}^{(1,0)}[q](E, 1)$$

\*\* symmetry

$$\sqrt{3}yz$$

$$-\sqrt{3}xz$$

\*\* expression

$$\frac{\sqrt{2}Q_x(y-z)(y+z)}{2} - \frac{\sqrt{2}Q_yxy}{2} + \frac{\sqrt{2}Q_zxz}{2}$$

$$-\frac{\sqrt{2}Q_xxy}{2} + \frac{\sqrt{2}Q_y(x-z)(x+z)}{2} + \frac{\sqrt{2}Q_zyz}{2}$$

$$\vec{G}_{2,1}^{(1,0)}[q](E, 2), \vec{G}_{2,2}^{(1,0)}[q](E, 2)$$

\*\* symmetry

$$\frac{\sqrt{3}(x-y)(x+y)}{2}$$

$$-\sqrt{3}xy$$

\*\* expression

$$\frac{\sqrt{2}Q_{xyz}}{2} + \frac{\sqrt{2}Q_{yxz}}{2} - \sqrt{2}Q_zxy$$

$$\frac{\sqrt{2}Q_{xxz}}{2} - \frac{\sqrt{2}Q_{yyz}}{2} - \frac{\sqrt{2}Q_z(x-y)(x+y)}{2}$$

\* Harmonics for rank 3

$$\vec{G}_3^{(1,0)}[q](A, 1)$$

\*\* symmetry

$$-\frac{z(3x^2 + 3y^2 - 2z^2)}{2}$$

\*\* expression

$$-\frac{\sqrt{3}Q_{xy}(x^2+y^2-4z^2)}{4} + \frac{\sqrt{3}Q_{yx}(x^2+y^2-4z^2)}{4}$$

$$\vec{\mathbb{G}}_3^{(1,0)}[q](A, 2)$$

\*\* symmetry

$$\frac{\sqrt{10}y(3x^2-y^2)}{4}$$

\*\* expression

$$-\frac{\sqrt{30}Q_{xz}(x-y)(x+y)}{8} + \frac{\sqrt{30}Q_{yxyz}}{4} + \frac{\sqrt{30}Q_{zx}(x^2-3y^2)}{8}$$

$$\vec{\mathbb{G}}_3^{(1,0)}[q](A, 3)$$

\*\* symmetry

$$\frac{\sqrt{10}x(x^2-3y^2)}{4}$$

\*\* expression

$$\frac{\sqrt{30}Q_{xyz}}{4} + \frac{\sqrt{30}Q_{yz}(x-y)(x+y)}{8} - \frac{\sqrt{30}Q_{zy}(3x^2-y^2)}{8}$$

$$\vec{\mathbb{G}}_{3,1}^{(1,0)}[q](E, 1), \vec{\mathbb{G}}_{3,2}^{(1,0)}[q](E, 1)$$

\*\* symmetry

$$-\frac{\sqrt{6}x(x^2+y^2-4z^2)}{4}$$

$$-\frac{\sqrt{6}y(x^2+y^2-4z^2)}{4}$$

\*\* expression

$$\frac{5\sqrt{2}Q_{xyz}}{4} - \frac{\sqrt{2}Q_{yz}(11x^2+y^2-4z^2)}{8} + \frac{\sqrt{2}Q_{zy}(x^2+y^2-4z^2)}{8}$$

$$\frac{\sqrt{2}Q_{xz}(x^2+11y^2-4z^2)}{8} - \frac{5\sqrt{2}Q_{yxyz}}{4} - \frac{\sqrt{2}Q_{zx}(x^2+y^2-4z^2)}{8}$$

$$\vec{\mathbb{G}}_{3,1}^{(1,0)}[q](E, 2), \vec{\mathbb{G}}_{3,2}^{(1,0)}[q](E, 2)$$

\*\* symmetry

$$\sqrt{15}xyz$$

$$\frac{\sqrt{15}z(x-y)(x+y)}{2}$$

\*\* expression

$$\frac{\sqrt{5}Q_{xx}(y-z)(y+z)}{2} - \frac{\sqrt{5}Q_{yy}(x-z)(x+z)}{2} + \frac{\sqrt{5}Q_{zz}(x-y)(x+y)}{2}$$

$$\frac{\sqrt{5}Q_{xy}(x^2-y^2+2z^2)}{4} - \frac{\sqrt{5}Q_{yx}(x^2-y^2-2z^2)}{4} - \sqrt{5}Q_{zxyz}$$

\* Harmonics for rank 4

$$\vec{\mathbb{G}}_4^{(1,0)}[q](A, 1)$$

\*\* symmetry

$$\frac{3x^4}{8} + \frac{3x^2y^2}{4} - 3x^2z^2 + \frac{3y^4}{8} - 3y^2z^2 + z^4$$

\*\* expression

$$-\frac{\sqrt{5}Q_{xyz}(3x^2+3y^2-4z^2)}{4} + \frac{\sqrt{5}Q_{yxz}(3x^2+3y^2-4z^2)}{4}$$

$$\vec{\mathbb{G}}_4^{(1,0)}[q](A, 2)$$

\*\* symmetry

$$\frac{\sqrt{70}xz(x^2-3y^2)}{4}$$

\*\* expression

$$\frac{\sqrt{14}Q_xxy(x^2 - 3y^2 + 6z^2)}{8} - \frac{\sqrt{14}Q_y(x^4 - 3x^2y^2 - 3x^2z^2 + 3y^2z^2)}{8} - \frac{3\sqrt{14}Q_zyz(3x^2 - y^2)}{8}$$

$\vec{\mathbb{G}}_4^{(1,0)}[q](A, 3)$

\*\* symmetry

$$\frac{\sqrt{70}yz(3x^2 - y^2)}{4}$$

\*\* expression

$$\frac{\sqrt{14}Q_x(3x^2y^2 - 3x^2z^2 - y^4 + 3y^2z^2)}{8} - \frac{\sqrt{14}Q_yxy(3x^2 - y^2 - 6z^2)}{8} + \frac{3\sqrt{14}Q_zxz(x^2 - 3y^2)}{8}$$

$\vec{\mathbb{G}}_{4,1}^{(1,0)}[q](E, 1), \vec{\mathbb{G}}_{4,2}^{(1,0)}[q](E, 1)$

\*\* symmetry

$$-\frac{\sqrt{10}yz(3x^2 + 3y^2 - 4z^2)}{4}$$

$$\frac{\sqrt{10}xz(3x^2 + 3y^2 - 4z^2)}{4}$$

\*\* expression

$$-\frac{\sqrt{2}Q_x(3x^2y^2 - 3x^2z^2 + 3y^4 - 21y^2z^2 + 4z^4)}{8} + \frac{3\sqrt{2}Q_yxy(x^2 + y^2 - 6z^2)}{8} - \frac{\sqrt{2}Q_zxz(3x^2 + 3y^2 - 4z^2)}{8}$$

$$\frac{3\sqrt{2}Q_xxy(x^2 + y^2 - 6z^2)}{8} - \frac{\sqrt{2}Q_y(3x^4 + 3x^2y^2 - 21x^2z^2 - 3y^2z^2 + 4z^4)}{8} - \frac{\sqrt{2}Q_zyz(3x^2 + 3y^2 - 4z^2)}{8}$$

$\vec{\mathbb{G}}_{4,1}^{(1,0)}[q](E, 2), \vec{\mathbb{G}}_{4,2}^{(1,0)}[q](E, 2)$

\*\* symmetry

$$\frac{\sqrt{35}(x^2 - 2xy - y^2)(x^2 + 2xy - y^2)}{8}$$

$$\frac{\sqrt{35}xy(x - y)(x + y)}{2}$$

\*\* expression

$$\frac{\sqrt{7}Q_xyz(3x^2 - y^2)}{4} + \frac{\sqrt{7}Q_yxz(x^2 - 3y^2)}{4} - \sqrt{7}Q_zxy(x - y)(x + y)$$

$$-\frac{\sqrt{7}Q_xxz(x^2 - 3y^2)}{4} + \frac{\sqrt{7}Q_yyz(3x^2 - y^2)}{4} + \frac{\sqrt{7}Q_z(x^2 - 2xy - y^2)(x^2 + 2xy - y^2)}{4}$$

$\vec{\mathbb{G}}_{4,1}^{(1,0)}[q](E, 3), \vec{\mathbb{G}}_{4,2}^{(1,0)}[q](E, 3)$

\*\* symmetry

$$-\frac{\sqrt{5}(x - y)(x + y)(x^2 + y^2 - 6z^2)}{4}$$

$$\frac{\sqrt{5}xy(x^2 + y^2 - 6z^2)}{2}$$

\*\* expression

$$\frac{Q_xyz(3x^2 - 4y^2 + 3z^2)}{2} - \frac{Q_yxz(4x^2 - 3y^2 - 3z^2)}{2} + \frac{Q_zxy(x^2 + y^2 - 6z^2)}{2}$$

$$-\frac{Q_xxz(x^2 + 15y^2 - 6z^2)}{4} + \frac{Q_yyz(15x^2 + y^2 - 6z^2)}{4} + \frac{Q_z(x - y)(x + y)(x^2 + y^2 - 6z^2)}{4}$$