

**Character Table 6**
**The Groups  $D_{nh}$  ( $n = 2, 3, 4, 5, 6$ )**

| $D_{2h}$<br>( $mmm$ ) | $E$ | $C_2(z)$ | $C_2(y)$ | $C_2(x)$ | $i$ | $\sigma(xy)$ | $\sigma(xz)$ | $\sigma(yz)$ |                 |
|-----------------------|-----|----------|----------|----------|-----|--------------|--------------|--------------|-----------------|
| $A_g$                 | 1   | 1        | 1        | 1        | 1   | 1            | 1            | 1            | $x^2, y^2, z^2$ |
| $B_{1g}$              | 1   | 1        | -1       | -1       | 1   | 1            | -1           | -1           | $R_z$ $xy$      |
| $B_{2g}$              | 1   | -1       | 1        | -1       | 1   | -1           | 1            | -1           | $R_y$ $xz$      |
| $B_{3g}$              | 1   | -1       | -1       | 1        | 1   | -1           | -1           | 1            | $R_x$ $yz$      |
| $A_u$                 | 1   | 1        | 1        | 1        | -1  | -1           | -1           | -1           |                 |
| $B_{1u}$              | 1   | 1        | -1       | -1       | -1  | -1           | 1            | 1            | $z$             |
| $B_{2u}$              | 1   | -1       | 1        | -1       | -1  | 1            | -1           | 1            | $y$             |
| $B_{3u}$              | 1   | -1       | -1       | 1        | -1  | 1            | 1            | -1           | $x$             |

| $D_{3h}$<br>( $\bar{6}$ ) $m2$ | $E$ | $2C_3$ | $3C_2$ | $\sigma_h$ | $2S_3$ | $3\sigma_v$ |                            |
|--------------------------------|-----|--------|--------|------------|--------|-------------|----------------------------|
| $A'_1$                         | 1   | 1      | 1      | 1          | 1      | 1           | $x^2 + y^2, z^2$           |
| $A'_2$                         | 1   | 1      | -1     | 1          | 1      | -1          | $R_z$                      |
| $E'$                           | 2   | -1     | 0      | 2          | -1     | 0           | $(x, y)$ $(x^2 - y^2, xy)$ |
| $A''_1$                        | 1   | 1      | 1      | -1         | -1     | -1          |                            |
| $A''_2$                        | 1   | 1      | -1     | -1         | -1     | 1           | $z$                        |
| $E''$                          | 2   | -1     | 0      | -2         | 1      | 0           | $(R_x, R_y)$ $(xz, yz)$    |

| $D_{4h}$<br>( $4/mmm$ ) | $E$ | $2C_4$ | $C_2$ | $2C'_2$ | $2C''_2$ | $i$ | $2S_4$ | $\sigma_h$ | $2\sigma_v$ | $2\sigma_d$ |                         |
|-------------------------|-----|--------|-------|---------|----------|-----|--------|------------|-------------|-------------|-------------------------|
| $A_{1g}$                | 1   | 1      | 1     | 1       | 1        | 1   | 1      | 1          | 1           | 1           | $x^2 + y^2, z^2$        |
| $A_{2g}$                | 1   | 1      | 1     | -1      | -1       | 1   | 1      | 1          | -1          | -1          | $R_z$                   |
| $B_{1g}$                | 1   | -1     | 1     | 1       | -1       | 1   | -1     | 1          | 1           | -1          | $x^2 - y^2$             |
| $B_{2g}$                | 1   | -1     | 1     | -1      | 1        | 1   | -1     | 1          | -1          | 1           | $xy$                    |
| $E_g$                   | 2   | 0      | -2    | 0       | 0        | 2   | 0      | -2         | 0           | 0           | $(R_x, R_y)$ $(xz, yz)$ |
| $A_{1u}$                | 1   | 1      | 1     | 1       | 1        | -1  | -1     | -1         | -1          | -1          |                         |
| $A_{2u}$                | 1   | 1      | 1     | -1      | -1       | -1  | -1     | -1         | 1           | 1           | $z$                     |
| $B_{1u}$                | 1   | -1     | 1     | 1       | -1       | -1  | 1      | -1         | -1          | 1           |                         |
| $B_{2u}$                | 1   | -1     | 1     | -1      | 1        | -1  | 1      | -1         | 1           | -1          |                         |
| $E_u$                   | 2   | 0      | -2    | 0       | 0        | -2  | 0      | 2          | 0           | 0           | $(x, y)$                |

**Character Table 6 (cont...)**
**The Groups  $D_{nh}$  ( $n = 2, 3, 4, 5, 6$ )**

| $D_{5h}$ | $E$ | $2C_5$             | $2C_5^2$           | $5C_2$ | $\sigma_h$ | $2S_5$              | $2S_5^3$            | $5\sigma_v$ |                         |
|----------|-----|--------------------|--------------------|--------|------------|---------------------|---------------------|-------------|-------------------------|
| $A_1'$   | 1   | 1                  | 1                  | 1      | 1          | 1                   | 1                   | 1           | $x^2 + y^2, z^2$        |
| $A_2'$   | 1   | 1                  | 1                  | -1     | 1          | 1                   | 1                   | -1          | $R_z$                   |
| $E_1'$   | 2   | $2 \cos 72^\circ$  | $2 \cos 144^\circ$ | 0      | 2          | $2 \cos 72^\circ$   | $2 \cos 144^\circ$  | 0           | $(x, y)$                |
| $E_2'$   | 2   | $2 \cos 144^\circ$ | $2 \cos 72^\circ$  | 0      | 2          | $2 \cos 144^\circ$  | $2 \cos 72^\circ$   | 0           | $(x^2 - y^2, 2xy)$      |
| $A_1''$  | 1   | 1                  | 1                  | 1      | -1         | -1                  | -1                  | -1          |                         |
| $A_2''$  | 1   | 1                  | 1                  | -1     | -1         | -1                  | -1                  | 1           | $z$                     |
| $E_1''$  | 2   | $2 \cos 72^\circ$  | $2 \cos 144^\circ$ | 0      | -2         | $-2 \cos 72^\circ$  | $-2 \cos 144^\circ$ | 0           | $(R_x, R_y)$ $(xy, yz)$ |
| $E_2''$  | 2   | $2 \cos 144^\circ$ | $2 \cos 72^\circ$  | 0      | -2         | $-2 \cos 144^\circ$ | $-2 \cos 72^\circ$  | 0           |                         |

| $D_{6h}$<br>( $6/mmm$ ) | $E$ | $2C_6$ | $2C_3$ | $C_2$ | $3C_2'$ | $3C_2''$ | $i$ | $2S_3$ | $2S_6$ | $\sigma_h$ | $3\sigma_d$ | $3\sigma_v$ |                          |
|-------------------------|-----|--------|--------|-------|---------|----------|-----|--------|--------|------------|-------------|-------------|--------------------------|
| $A_{1g}$                | 1   | 1      | 1      | 1     | 1       | 1        | 1   | 1      | 1      | 1          | 1           | 1           | $x^2 + y^2, z^2$         |
| $A_{2g}$                | 1   | 1      | 1      | 1     | -1      | -1       | 1   | 1      | 1      | 1          | -1          | -1          | $R_z$                    |
| $B_{1g}$                | 1   | -1     | 1      | -1    | 1       | -1       | 1   | -1     | 1      | -1         | 1           | -1          |                          |
| $B_{2g}$                | 1   | -1     | 1      | -1    | -1      | 1        | 1   | -1     | 1      | -1         | -1          | 1           |                          |
| $E_{1g}$                | 2   | 1      | -1     | -2    | 0       | 0        | 2   | 1      | -1     | -2         | 0           | 0           | $(R_x - R_y)$ $(xz, yz)$ |
| $E_{2g}$                | 2   | -1     | -1     | 2     | 0       | 0        | 2   | -1     | -1     | 2          | 0           | 0           | $(x^2 - y^2, 2xy)$       |
| $A_{1u}$                | 1   | 1      | 1      | 1     | 1       | 1        | -1  | -1     | -1     | -1         | -1          | -1          |                          |
| $A_{2u}$                | 1   | 1      | 1      | 1     | -1      | -1       | -1  | -1     | -1     | -1         | 1           | 1           | $z$                      |
| $B_{1u}$                | 1   | -1     | 1      | -1    | 1       | -1       | -1  | 1      | -1     | 1          | -1          | 1           |                          |
| $B_{2u}$                | 1   | -1     | 1      | -1    | -1      | 1        | -1  | 1      | -1     | 1          | 1           | -1          |                          |
| $E_{1u}$                | 2   | 1      | -1     | -2    | 0       | 0        | -2  | -1     | 1      | 2          | 0           | 0           | $(x, y)$                 |
| $E_{2u}$                | 2   | -1     | -1     | 2     | 0       | 0        | -2  | 1      | 1      | -2         | 0           | 0           |                          |