



TUG

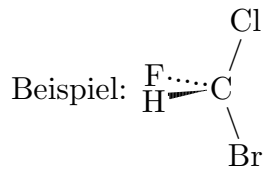
Technische Universität Graz
Erzherzog-Johann-Universität

Institut für
Physikalische und Theoretische Chemie
Brockmanngasse 27, A-8010 Graz

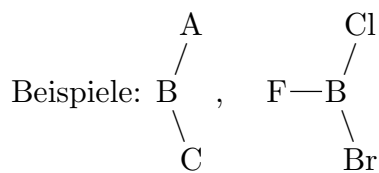
Dr. Michael Ramek
Tel.: +43 (0)316 873 8227
Fax: +43 (0)316 873 8720
e-mail: michael.ramek@tugraz.at

Charaktertafeln der gängigen Punktgruppen

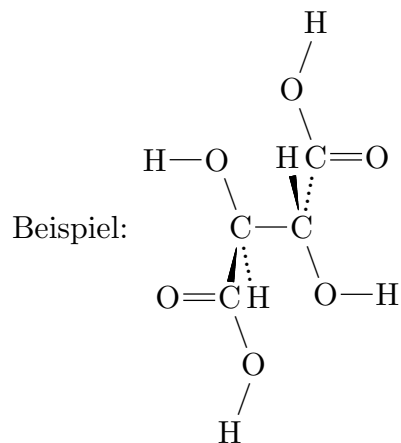
C_1	E
(1)	
A	1



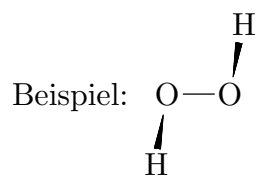
$C_s = C_h$	E	σ_h		
(m)				
A'	1	1	x, y, R_z	x^2, y^2, z^2, xy
A''	1	-1	z, R_x, R_y	xy, xz



$C_i = S_2$	E	i		
<hr/>				
A_g	1	1	R_x, R_y, R_z	$x^2, y^2, z^2, xy, xz, yz$
A_u	1	-1	x, y, z	



C_2	E	C_2		
<hr/>				
A	1	1	z, R_z	x^2, y^2, z^2, xy
B	1	-1	x, y, R_x, R_y	xz, yz



C_3	E	C_3	C_3^2		
<hr/>					
A	1	1	1	z, R_z	$x^2 + y^2, z^2$
E	$\begin{cases} 1 & \alpha & \alpha^* \\ 1 & \alpha^* & \alpha \end{cases}$			$(x, y), (R_x, R_y)$	$(x^2 - y^2, xy), (xz, yz)$

$$\alpha = \exp(2\pi i/3)$$

C_4	E	C_4	C_2	C_4^3			
(4)							
A	1	1	1	1	z, R_z		$x^2 + y^2, z^2$
B	1	-1	1	-1			$x^2 - y^2, xy$
E	$\begin{cases} 1 & i & -1 & -i \\ 1 & -i & -1 & i \end{cases}$				$(x, y), (R_x, R_y)$		(xz, yz)

C_5	E	C_5	C_5^2	C_5^3	C_5^4		
A							
	1	1	1	1	1	z, R_z	$x^2 + y^2, z^2$
E_1	$\begin{cases} 1 & \alpha & \alpha^2 & \alpha^{*2} & \alpha^* \\ 1 & \alpha^* & \alpha^{*2} & \alpha^2 & \alpha \end{cases}$					$(x, y)(R_x, R_y)$	(xz, yz)
E_2	$\begin{cases} 1 & \alpha^2 & \alpha^* & \alpha & \alpha^{*2} \\ 1 & \alpha^{*2} & \alpha & \alpha^* & \alpha^2 \end{cases}$						$(x^2 - y^2, xy)$

$\alpha = \exp(2\pi i/5)$

C_6	E	C_6	C_3	C_2	C_3^2	C_6^5		
(6)								
A	1	1	1	1	1	1	z, R_z	$x^2 + y^2, z^2$
B	1	-1	1	-1	1	-1		
E_1	$\begin{cases} 1 & \alpha & -\alpha^* & -1 & -\alpha & \alpha^* \\ 1 & \alpha^* & -\alpha & -1 & -\alpha^* & \alpha \end{cases}$						$(x, y)(R_x, R_y)$	(xz, yz)
E_2	$\begin{cases} 1 & -\alpha^* & -\alpha & 1 & -\alpha^* & -\alpha \\ 1 & -\alpha & -\alpha^* & 1 & -\alpha & -\alpha^* \end{cases}$							$(x^2 - y^2, xy)$

$\alpha = \exp(2\pi i/6)$

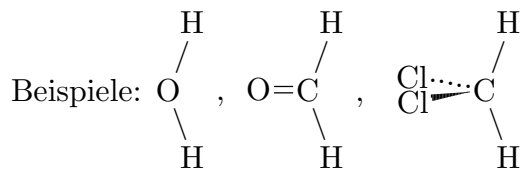
C_7	E	C_7	C_7^2	C_7^3	C_7^4	C_7^5	C_7^6		
(7)									
A	1	1	1	1	1	1	1	z, R_z	$x^2 + y^2, z^2$
E_1	$\begin{cases} 1 & \alpha & \alpha^2 & \alpha^3 & \alpha^{*3} & \alpha^{*2} & \alpha^* \\ 1 & \alpha^* & \alpha^{*2} & \alpha^{*3} & \alpha^3 & \alpha^2 & \alpha \end{cases}$							$(x, y)(R_x, R_y)$	(xz, yz)
E_2	$\begin{cases} 1 & \alpha^2 & \alpha^{*3} & \alpha^* & \alpha & \alpha^3 & \alpha^{*2} \\ 1 & \alpha^{*2} & \alpha^3 & \alpha & \alpha^* & \alpha^{*3} & \alpha^2 \end{cases}$								$(x^2 - y^2, xy)$
E_3	$\begin{cases} 1 & \alpha^3 & \alpha^* & \alpha^2 & \alpha^{*2} & \alpha & \alpha^{*3} \\ 1 & \alpha^{*3} & \alpha & \alpha^{*2} & \alpha^2 & \alpha^* & \alpha^3 \end{cases}$								

$\alpha = \exp(2\pi i/7)$

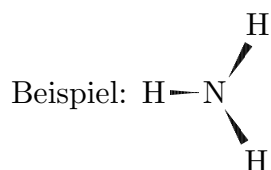
C_8	E	C_8	C_4	C_2	C_4^3	C_8^3	C_8^5	C_8^7		
(8)										
A	1	1	1	1	1	1	1	1	z, R_z	$x^2 + y^2, z^2$
B	1	-1	1	-1	1	-1	1	-1		
E_1	$\begin{cases} 1 & \alpha & i & -1 & -i & -\alpha^* & -\alpha & \alpha^* \\ 1 & \alpha^* & -i & -1 & i & -\alpha & -\alpha^* & \alpha \end{cases}$								$(x, y)(R_x, R_y)$	(xz, yz)
E_2	$\begin{cases} 1 & i & -1 & 1 & -1 & -i & i & -i \\ 1 & -i & -1 & 1 & -1 & i & -i & i \end{cases}$									$(x^2 - y^2, xy)$
E_3	$\begin{cases} 1 & -\alpha & i & -1 & -i & \alpha^* & \alpha & -\alpha^* \\ 1 & -\alpha^* & -i & -1 & i & \alpha & \alpha^* & -\alpha \end{cases}$									

$$\alpha = \exp(2\pi i/8)$$

C_{2v}	E	C_2	$\sigma_v(xz)$	$\sigma'_v(yz)$		
($2mm$)						
A_1	1	1	1	1	z	x^2, y^2, z^2
A_2	1	1	-1	-1	R_z	xy
B_1	1	-1	1	-1	x, R_y	xz
B_2	1	-1	-1	1	y, R_x	yz



C_{3v}	E	C_3, C_3^2	$3\sigma_v$		
($3m$)					
A_1	1	1	1	z	$x^2 + y^2, z^2$
A_2	1	1	-1	R_z	
E	2	-1	0	$(x, y)(R_x, R_y)$	$(x^2 - y^2, xy)(xz, yz)$



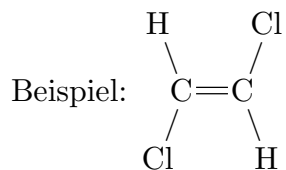
C_{4v}	E	C_4, C_4^3	C_2	$2\sigma_v$	$2\sigma_d$		
$(4mm)$							
A_1	1	1	1	1	1	z	$x^2 + y^2, z^2$
A_2	1	1	1	-1	-1	R_z	
B_1	1	-1	1	1	-1		$x^2 - y^2$
B_2	1	-1	1	-1	1		xy
E	2	0	-2	0	0	$(x, y)(R_x, R_y)$	(xz, yz)

Beispiel: SF_5Cl

C_{5v}	E	C_5, C_5^4	C_5^2, C_5^3	$5\sigma_v$		
A_1	1	1	1	1	z	$x^2 + y^2, z^2$
A_2	1	1	1	-1	R_z	
E_1	2	$2 \cos 72^\circ$	$2 \cos 144^\circ$	0	$(x, y)(R_x, R_y)$	(xz, yz)
E_2	2	$2 \cos 144^\circ$	$2 \cos 72^\circ$	0		$(x^2 - y^2, xy)$

C_{6v}	E	C_6, C_6^5	C_3, C_3^2	C_2	$3\sigma_v$	$3\sigma_d$		
$(6mm)$								
A_1	1	1	1	1	1	1	z	$x^2 + y^2, z^2$
A_2	1	1	1	1	-1	-1	R_z	
B_1	1	-1	1	-1	1	-1		
B_2	1	-1	1	-1	-1	1		
E_1	2	1	-1	-2	0	0	$(x, y)(R_x, R_y)$	(xz, yz)
E_2	2	-1	-1	2	0	0		$(x^2 - y^2, xy)$

C_{2h}	E	C_2	i	σ_h		
$(2/m)$						
A_g	1	1	1	1	R_z	x^2, y^2, z^2, xy
B_g	1	-1	1	-1	R_x, R_y	xz, yz
A_u	1	1	-1	-1	z	
B_u	1	-1	-1	1	x, y	



C_{3h}	E	C_3	C_3^2	σ_h	S_3	S_3^5		
$(\bar{6})$								
A'	1	1	1	1	1	1	R_z	$x^2 + y^2, z^2$
E'	$\begin{cases} 1 & \alpha & \alpha^* & 1 & \alpha & \alpha^* \\ 1 & \alpha^* & \alpha & 1 & \alpha^* & \alpha \end{cases}$						(x, y)	$(x^2 - y^2, xy)$
A''	1	1	1	-1	-1	-1	z	
E''	$\begin{cases} 1 & \alpha & \alpha^* & -1 & -\alpha & -\alpha^* \\ 1 & \alpha^* & \alpha & -1 & -\alpha^* & -\alpha \end{cases}$						(R_x, R_y)	(xy, yz)

$$\alpha = \exp(2\pi i/3)$$

C_{4h}	E	C_4	C_2	C_4^3	i	S_4^3	σ_h	S_4		
$(4/m)$										
A_g	1	1	1	1	1	1	1	1	R_z	$x^2 + y^2, z^2$
B_g	1	-1	1	-1	1	-1	1	-1		$x^2 - y^2, xy$
E_g	$\begin{cases} 1 & i & -1 & -i & 1 & i & -1 & -i \\ 1 & -i & -1 & i & 1 & -i & -1 & i \end{cases}$								(R_x, R_y)	(xz, yz)
A_u	1	1	1	1	-1	-1	-1	-1	z	
B_u	1	-1	1	-1	-1	1	-1	1		
E_u	$\begin{cases} 1 & i & -1 & -i & -1 & -i & 1 & i \\ 1 & -i & -1 & i & -1 & i & 1 & -i \end{cases}$								(x, y)	

C_{5h}	E	C_5	C_5^2	C_5^3	C_5^4	σ_h	S_5	S_5^7	S_5^3	S_5^9		
A'	1	1	1	1	1	1	1	1	1	1	R_z	$x^2 + y^2, z^2$
E'_1	$\begin{cases} 1 & \alpha & \alpha^2 & \alpha^{*2} & \alpha^* \\ 1 & \alpha^* & \alpha^{*2} & \alpha^2 & \alpha \end{cases}$					1	α	α^2	α^{*2}	α^*	(x, y)	
E'_2	$\begin{cases} 1 & \alpha^2 & \alpha^* & \alpha & \alpha^{*2} \\ 1 & \alpha^{*2} & \alpha & \alpha^* & \alpha^2 \end{cases}$					1	α^2	α^*	α	α^{*2}		$(x^2 - y^2, xy)$
A''	1	1	1	1	1	-1	-1	-1	-1	-1	z	
E''_1	$\begin{cases} 1 & \alpha & \alpha^2 & \alpha^{*2} & \alpha^* \\ 1 & \alpha^* & \alpha^{*2} & \alpha^2 & \alpha \end{cases}$					-1	$-\alpha$	$-\alpha^2$	$-\alpha^{*2}$	$-\alpha^*$	(R_x, R_y)	(xz, yz)
E''_2	$\begin{cases} 1 & \alpha^2 & \alpha^* & \alpha & \alpha^{*2} \\ 1 & \alpha^{*2} & \alpha & \alpha^* & \alpha^2 \end{cases}$					-1	$-\alpha^2$	$-\alpha^*$	$-\alpha$	$-\alpha^{*2}$		

$$\alpha = \exp(2\pi i/5)$$

C_{6h}	E	C_6	C_3	C_2	C_3^2	C_6^5	i	S_3^5	S_6^5	σ_h	S_6	S_3		
A_g	1	1	1	1	1	1	1	1	1	1	1	1	R_z	$x^2 + y^2, z^2$
B_g	1	-1	1	-1	1	-1	1	-1	1	-1	1	-1		
E_{1g}	$\begin{cases} 1 & \alpha & -\alpha^* & -1 & -\alpha & \alpha^* \\ 1 & \alpha^* & -\alpha & -1 & -\alpha^* & \alpha \end{cases}$					1	α	$-\alpha^*$	-1	$-\alpha$	α^*		(R_x, R_y)	(xz, yz)
E_{2g}	$\begin{cases} 1 & -\alpha^* & -\alpha & 1 & -\alpha^* & -\alpha \\ 1 & -\alpha & -\alpha^* & 1 & -\alpha & -\alpha^* \end{cases}$					1	$-\alpha$	$-\alpha^*$	1	$-\alpha$	$-\alpha^*$			$(x^2 - y^2, xy)$
A_u	1	1	1	1	1	1	-1	-1	-1	-1	-1	-1	z	
B_u	1	-1	1	-1	1	-1	-1	1	-1	1	-1	1		
E_{1u}	$\begin{cases} 1 & \alpha & -\alpha^* & -1 & -\alpha & \alpha^* \\ 1 & \alpha^* & -\alpha & -1 & -\alpha^* & \alpha \end{cases}$					-1	$-\alpha$	α^*	1	α	$-\alpha^*$		(x, y)	
E_{2u}	$\begin{cases} 1 & -\alpha^* & -\alpha & 1 & -\alpha^* & -\alpha \\ 1 & -\alpha & -\alpha^* & 1 & -\alpha & -\alpha^* \end{cases}$					-1	α	α^*	-1	α	α^*			

$$\alpha = \exp(2\pi i/6)$$

D_2	E	$C_2(x)$	$C_2(y)$	$C_2(z)$		
(222)						
A	1	1	1	1		x^2, y^2, z^2
B_1	1	1	-1	-1	z, R_z	xy
B_2	1	-1	1	-1	y, R_y	xz
B_3	1	-1	-1	1	x, R_x	yz

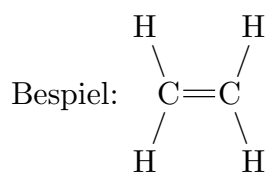
D_3	E	C_3, C_3^2	$3C_2$			
(32)						
A_1	1	1	1			$x^2 + y^2, z^2$
A_2	1	1	-1	z, R_z		
E	2	-1	0	$(x, y)(R_x, R_y)$		$(x^2 - y^2, xy)(xz, yz)$

D_4	E	C_4, C_4^3	C_4^2	$2C_2'$	$2C_2''$		
(422)							
A_1	1	1	1	1	1		$x^2 + y^2, z^2$
A_2	1	1	1	-1	-1	z, R_z	
B_1	1	-1	1	1	-1		$x^2 - y^2$
B_2	1	-1	1	-1	1		xy
E	2	0	-2	0	0	$(x, y)(R_x, R_y)$	(xz, yz)

D_5	E	C_5, C_5^4	C_5^2, C_5^3	$5C_2$			
A_1	1	1	1	1			$x^2 + y^2, z^2$
A_2	1	1	1	-1	z, R_z		
E_1	2	$2 \cos 72^\circ$	$2 \cos 144^\circ$	0	$(x, y)(R_x, R_y)$		(xz, yz)
E_2	2	$2 \cos 144^\circ$	$2 \cos 72^\circ$	0			$(x^2 - y^2, xy)$

D_6	E	C_6, C_6^5	C_3, C_3^2	C_2	$3C_2'$	$3C_2''$		
(622)								
A_1	1	1	1	1	1	1		$x^2 + y^2, z^2$
A_2	1	1	1	1	-1	-1	z, R_z	
B_1	1	-1	1	-1	1	-1		
B_2	1	-1	1	-1	-1	1		
E_1	2	1	-1	-2	0	0	$(x, y)(R_x, R_y)$	(xz, yz)
E_2	2	-1	-1	2	0	0		$(x^2 - y^2, xy)$

D_{2h}	E	$C_2(z)$	$C_2(y)$	$C_2(x)$	i	$\sigma(xy)$	$\sigma(xz)$	$\sigma(yz)$		
(mmm)										
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}	E	C_3, C_3^2	$3C_2$	σ_h	S_3, S_3^5	$3\sigma_v$		
$(\bar{6}m2)$								
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)

Beispiele: CO_3^{2-} , 1,3,5-Trichlorbenzol

D_{4h}	E	C_4, C_4^3	C_2	$2C'_2$	$2C''_2$	i	S_4, S_4^3	σ_h	$2\sigma_v$	$2\sigma_d$	
$(4/mmm)$											
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)
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)

Beispiele: AuCl_4^- , $[\text{CuCl}_4]^{2-}$ (quadratisch planar)

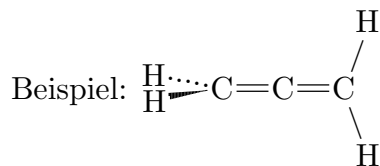
D_{5h}	E	C_5, C_5^4	C_5^2, C_5^3	$5C_2$	σ_h	S_5, S_5^9	S_5^3, S_5^7	$5\sigma_v$	
A_1'	1	1	1	1	1	1	1	1	$x^2 + y^2, z^2$
A_2'	1	1	1	-1	1	1	1	-1	R_z
E_1'	2	$2 \cos 72^\circ$	$2 \cos 144^\circ$	0	2	$2 \cos 72^\circ$	$2 \cos 144^\circ$	0	(x, y)
E_2'	2	$2 \cos 144^\circ$	$2 \cos 72^\circ$	0	2	$2 \cos 144^\circ$	$2 \cos 72^\circ$	0	$(x^2 - y^2, xy)$
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	$(R_x, R_y) \quad (xz, yz)$
E_2''	2	$2 \cos 144^\circ$	$2 \cos 72^\circ$	0	-2	$-2 \cos 144^\circ$	$-2 \cos 72^\circ$	0	

Beispiele: Cyclopentadienylanion (regelmäßiges Fünfeck), IF_7 (pentagonale Bipyramide)

D_{6h}	E	C_6, C_6^5	C_3, C_3^2	C_2	$3C_2'$	$3C_2''$	i	S_3, S_3^5	S_6, S_6^5	σ_h	$3\sigma_d$	$3\sigma_v$	
$(6/mmm)$													
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	$(R_x, R_y) \quad (xz, yz)$
E_{2g}	2	-1	-1	2	0	0	2	-1	-1	2	0	0	$(x^2 - y^2, xy)$
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	

Beispiel: Benzol

$D_{2d} = V_d$ ($\bar{4}2m$)	E	S_4, S_4^3	C_2	$2C_2'$	$2\sigma_d$		
A_1	1	1	1	1	1		$x^2 + y^2, z^2$
A_2	1	1	1	-1	-1	R_z	
B_1	1	-1	1	1	-1		$x^2 - y^2$
B_2	1	-1	1	-1	1	z	xy
E	2	0	-2	0	0	$(x, y), (R_x, R_y)$	(xz, yz)



D_{3d} ($\bar{3}m$)	E	C_3, C_3^2	$3C_2$	i	S_6, S_6^5	$3\sigma_d$	
A_{1g}	1	1	1	1	1	1	$x^2 + y^2, z^2$
A_{2g}	1	1	-1	1	1	-1	R_z
E_g	2	-1	0	2	-1	0	(R_x, R_y) $(x^2 - y^2, xy)(xz, yz)$
A_{1u}	1	1	1	-1	-1	-1	
A_{2u}	1	1	-1	-1	-1	1	z
E_u	2	-1	0	-2	1	0	(x, y)

D_{4d}	E	S_8, S_8^7	C_4, C_4^3	S_8^3, S_8^5	C_2	$4C_2'$	$4\sigma_d$	
A_1	1	1	1	1	1	1	1	$x^2 + y^2, z^2$
A_2	1	1	1	1	1	-1	-1	R_z
B_1	1	-1	1	-1	1	1	-1	
B_2	1	-1	1	-1	1	-1	1	z
E_1	2	$\sqrt{2}$	0	$-\sqrt{2}$	-2	0	0	(x, y)
E_2	2	0	-2	0	2	0	0	$(x^2 - y^2, xy)$
E_3	2	$-\sqrt{2}$	0	$\sqrt{2}$	-2	0	0	(R_x, R_y) (xz, yz)

D_{5d}	E	C_5, C_5^4	C_5^2, C_5^3	$5C_2$	i	S_{10}^3, S_{10}^7	S_{10}, S_{10}^9	$5\sigma_d$		
A_{1g}	1	1	1	1	1	1	1	1		$x^2 + y^2, z^2$
A_{2g}	1	1	1	-1	1	1	1	-1	R_z	
E_{1g}	2	$2 \cos 72^\circ$	$2 \cos 144^\circ$	0	2	$2 \cos 72^\circ$	$2 \cos 144^\circ$	0	(R_x, R_y)	(xz, yz)
E_{2g}	2	$2 \cos 144^\circ$	$2 \cos 72^\circ$	0	2	$2 \cos 144^\circ$	$2 \cos 72^\circ$	0		$(x^2 - y^2, xy)$
A_{1u}	1	1	1	1	-1	-1	-1	-1		
A_{2u}	1	1	1	-1	-1	-1	-1	1	z	
E_{1u}	2	$2 \cos 72^\circ$	$2 \cos 144^\circ$	0	-2	$-2 \cos 72^\circ$	$-2 \cos 144^\circ$	0	(x, y)	
E_{2u}	2	$2 \cos 144^\circ$	$2 \cos 72^\circ$	0	-2	$-2 \cos 144^\circ$	$-2 \cos 72^\circ$	0		

D_{6d}	E	S_{12}, S_{12}^{11}	C_6, C_6^5	S_4, S_4^3	C_3, C_3^2	S_{12}^5, S_{12}^7	C_2	$6C_2'$	$6\sigma_d$		
A_1	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	-1	R_z	
B_1	1	-1	1	-1	1	-1	1	1	-1		
B_2	1	-1	1	-1	1	-1	1	-1	1	z	
E_1	2	$\sqrt{3}$	1	0	-1	$-\sqrt{3}$	-2	0	0	(x, y)	
E_2	2	1	-1	-2	-1	1	2	0	0		$(x^2 - y^2, xy)$
E_3	2	0	-2	0	2	0	-2	0	0		
E_4	2	-1	-1	2	-1	-1	2	0	0		
E_5	2	$-\sqrt{3}$	1	0	-1	$\sqrt{3}$	-2	0	0	(R_x, R_y)	(xz, yz)

S_4	E	S_4	C_2	S_4^3		
($\bar{4}$)						
A	1	1	1	1	R_z	$x^2 + y^2, z^2$
B	1	-1	1	-1	z	$x^2 - y^2, xy$
E	$\begin{cases} 1 & i & -1 & -i \\ 1 & -i & -1 & i \end{cases}$				$(x, y)(R_x, R_y)$	(xz, yz)

Beispiel: Tetraphenylmethan

S_6	E	C_3	C_3^2	i	S_6^5	S_6		
$(\bar{3})$								
A_g	1	1	1	1	1	1	R_z	$x^2 + y^2, z^2$
E_g	$\begin{cases} 1 & \alpha & \alpha^* & 1 & \alpha & \alpha^* \\ 1 & \alpha^* & \alpha & 1 & \alpha^* & \alpha \end{cases}$						(R_x, R_y)	$(x^2 - y^2, xy), (xz, yz)$
A_u	1	1	1	-1	-1	-1	z	
E_u	$\begin{cases} 1 & \alpha & \alpha^* & -1 & -\alpha & -\alpha^* \\ 1 & \alpha^* & \alpha & -1 & -\alpha^* & -\alpha \end{cases}$						(x, y)	

$$\alpha = \exp(2\pi i/3)$$

S_8	E	S_8	C_4	S_8^3	C_2	S_8^5	C_4^3	S_8^7		
A	1	1	1	1	1	1	1	1	R_z	$x^2 + y^2, z^2$
B	1	-1	1	-1	1	-1	1	-1	z	
E_1	$\begin{cases} 1 & \alpha & i & -\alpha^* & -1 & -\alpha & -i & \alpha^* \\ 1 & \alpha^* & -i & -\alpha & -1 & -\alpha^* & i & \alpha \end{cases}$								$(x, y), (R_x, R_y)$	
E_2	$\begin{cases} 1 & i & -1 & -i & 1 & i & -1 & -i \\ 1 & -i & -1 & i & 1 & -i & -1 & i \end{cases}$								$(x^2 - y^2, xy)$	
E_3	$\begin{cases} 1 & -\alpha^* & -i & \alpha & -1 & \alpha^* & i & -\alpha \\ 1 & -\alpha & i & \alpha^* & -1 & \alpha & -i & -\alpha^* \end{cases}$								(xz, yz)	

$$\alpha = \exp(2\pi i/8)$$

S_{10}	E	C_5	C_5^2	C_5^3	C_5^4	i	S_{10}^7	S_{10}^9	S_{10}	S_{10}^3		
A_g	1	1	1	1	1	1	1	1	1	1	R_z	$x^2 + y^2, z^2$
E_{1g}	$\begin{cases} 1 & \alpha & \alpha^2 & \alpha^{*2} & \alpha^* & 1 & \alpha & \alpha^2 & \alpha^{*2} & \alpha^* \\ 1 & \alpha^* & \alpha^{*2} & \alpha^2 & \alpha & 1 & \alpha^* & \alpha^{*2} & \alpha^2 & \alpha \end{cases}$										(R_x, R_y)	(xz, yz)
E_{2g}	$\begin{cases} 1 & \alpha^2 & \alpha^* & \alpha & \alpha^{*2} & 1 & \alpha^2 & \alpha^* & \alpha & \alpha^{*2} \\ 1 & \alpha^{*2} & \alpha & \alpha^* & \alpha^2 & 1 & \alpha^{*2} & \alpha & \alpha^* & \alpha^2 \end{cases}$											$(x^2 - y^2, xy)$
A_u	1	1	1	1	1	-1	-1	-1	-1	-1	z	
E_{1u}	$\begin{cases} 1 & \alpha & \alpha^2 & \alpha^{*2} & \alpha^* & -1 & -\alpha & -\alpha^2 & -\alpha^{*2} & -\alpha^* \\ 1 & \alpha^* & \alpha^{*2} & \alpha^2 & \alpha & -1 & -\alpha^* & -\alpha^{*2} & -\alpha^2 & -\alpha \end{cases}$										(x, y)	
E_{2u}	$\begin{cases} 1 & \alpha^2 & \alpha^* & \alpha & \alpha^{*2} & -1 & -\alpha^2 & -\alpha^* & -\alpha & -\alpha^{*2} \\ 1 & \alpha^{*2} & \alpha & \alpha^* & \alpha^2 & -1 & -\alpha^{*2} & -\alpha & -\alpha^* & -\alpha^2 \end{cases}$											

$$\alpha = \exp(2\pi i/5)$$

T	E	$4C_3$	$4C_3^2$	$3C_2$		
(23)						
A	1	1	1	1		$x^2 + y^2 + z^2$
E	$\begin{cases} 1 & \alpha & \alpha^* & 1 \\ 1 & \alpha^* & \alpha & 1 \end{cases}$					$(x^2 - y^2, 2z^2 - x^2 - y^2)$
T	3	0	0	-1	$(x, y, z)(R_x, R_y, R_z)$	(xy, xz, yz)

$\alpha = \exp(2\pi i/3)$

T_d	E	$4C_3, 4C_3^2$	$3C_2$	$3S_4, 3S_4^3$	$6\sigma_d$	
$(\bar{4}3m)$						
A_1	1	1	1	1	1	$x^2 + y^2 + z^2$
A_2	1	1	1	-1	-1	
E	2	-1	2	0	0	$(x^2 - y^2, 2z^2 - x^2 - y^2)$
T_1	3	0	-1	1	-1	(R_x, R_y, R_z)
T_2	3	0	-1	-1	1	(x, y, z) (xy, xz, yz)

Beispiele: CH_4 , Adamantan, Urotropin

T_h	E	$4C_3$	$4C_3^2$	$3C_2$	i	$4S_6$	$4S_6^2$	$3\sigma_d$	
$(m\bar{3})$									
A_g	1	1	1	1	1	1	1	1	$x^2 + y^2 + z^2$
E_g	$\begin{cases} 1 & \alpha & \alpha^* & 1 & 1 & \alpha & \alpha^* & 1 \\ 1 & \alpha^* & \alpha & 1 & 1 & \alpha^* & \alpha & 1 \end{cases}$								$(x^2 - y^2, 2z^2 - x^2 - y^2)$
T_g	3	0	0	-1	3	0	0	-1	(R_x, R_y, R_z) (xy, xz, yz)
A_u	1	1	1	1	-1	-1	-1	-1	
E_u	$\begin{cases} 1 & \alpha & \alpha^* & 1 & -1 & -\alpha & -\alpha^* & -1 \\ 1 & \alpha^* & \alpha & 1 & -1 & -\alpha^* & -\alpha & -1 \end{cases}$								
T_u	3	0	0	-1	-3	0	0	1	(x, y, z)

$\alpha = \exp(2\pi i/3)$

O	E	$4C_3, 4C_3^2$	$3C_2$	$3C_4, 3C_4^3$	$6C_2'$	
(432)						
A_1	1	1	1	1	1	$x^2 + y^2 + z^2$
A_2	1	1	1	-1	-1	
E	2	-1	2	0	0	$(x^2 - y^2, 2z^2 - x^2 - y^2)$
T_1	3	0	-1	1	-1	$(x, y, z)(R_x, R_y, R_z)$
T_2	3	0	-1	-1	1	(xy, xz, yz)

O_h	E	$8C_3$	$6C_2$	$6C_4$	$3C_4^2$	i	$6S_4$	$8S_6$	$3\sigma_h$	$6\sigma_d$	
($m\bar{3}m$)											
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	
E_g	2	-1	0	0	2	2	0	-1	2	0	$(x^2 - y^2, 2z^2 - x^2 - y^2)$
T_{1g}	3	0	-1	1	-1	3	1	0	-1	-1	(R_x, R_y, R_z)
T_{2g}	3	0	1	-1	-1	3	-1	0	-1	1	(xy, 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	
E_u	2	-1	0	0	2	-2	0	1	-2	0	
T_{1u}	3	0	-1	1	-1	-3	-1	0	1	1	(x, y, z)
T_{2u}	3	0	1	-1	-1	-3	1	0	1	-1	

Beispiel: SF_6

I	E	$12C_5$	$12C_5^2$	$20C_3$	$15C_2$	
A	1	1	1	1	1	$x^2 + y^2 + z^2$
T_1	3	α^+	α^-	0	-1	$(x, y, z), (R_x, R_y, R_z)$
T_2	3	α^-	α^+	0	-1	
G	4	-1	-1	1	0	
H	5	0	0	-1	1	$(x^2 - y^2, 2z^2 - x^2 - y^2, xy, xz, yz)$

$\alpha^\pm = \frac{1}{2}(1 \pm \sqrt{5})$

I_h	E	$12C_5$	$12C_5^2$	$20C_3$	$15C_2$	i	$12S_{10}$	$12S_{10}^3$	$20S_6$	$15\sigma_v$	
A_g	1	1	1	1	1	1	1	1	1	1	$x^2 + y^2 + z^2$
T_{1g}	3	α^+	α^-	0	-1	3	α^-	α^+	0	-1	(R_x, R_y, R_z)
T_{2g}	3	α^-	α^+	0	-1	3	α^+	α^-	0	-1	
G_g	4	-1	-1	1	0	4	-1	-1	1	0	
H_g	5	0	0	-1	1	5	0	0	-1	1	$(2z^2 - x^2 - y^2, x^2 - y^2, xy, xz, yz)$
A_u	1	1	1	1	1	-1	-1	-1	-1	-1	
T_{1u}	3	α^+	α^-	0	-1	-3	$-\alpha^-$	$-\alpha^+$	0	1	(x, y, z)
T_{2u}	3	α^-	α^+	0	-1	-3	$-\alpha^+$	$-\alpha^-$	0	1	
G_u	4	-1	-1	1	0	-4	1	1	-1	0	
H_u	5	0	0	-1	1	-5	0	0	1	-1	

$\alpha^\pm = \frac{1}{2}(1 \pm \sqrt{5})$

Beispiele: $B_{12}H_{12}^{2-}$, C_{60}

$C_{\infty v}$	E	$2C_{\infty}^{\phi}$	\dots	$\infty\sigma_v$		
$A_1 \equiv \Sigma^+$	1	1	\dots	1	z	$x^2 + y^2, z^2$
$A_2 \equiv \Sigma^-$	1	1	\dots	-1	R_z	
$E_1 \equiv \Pi$	2	$2 \cos \phi$	\dots	0	$(x, y), (R_x, R_y)$	(xz, yz)
$E_2 \equiv \Delta$	2	$2 \cos 2\phi$	\dots	0		$(x^2 - y^2, xy)$
$E_3 \equiv \Phi$	2	$2 \cos 3\phi$	\dots	0		
\dots	\dots	\dots	\dots	\dots		

Beispiele: HCN, HCl, COS

$D_{\infty h}$	E	$2C_{\infty}^{\phi}$	\dots	$\infty\sigma_v$	i	$2S_{\infty}^{\phi}$	\dots	∞C_2	
Σ_g^+	1	1	\dots	1	1	1	\dots	1	$x^2 + y^2, z^2$
Σ_g^-	1	1	\dots	-1	1	1	\dots	-1	R_z
Π_g	2	$2 \cos \phi$	\dots	0	2	$-2 \cos \phi$	\dots	0	(R_x, R_y) (xz, yz)
Δ_g	2	$2 \cos 2\phi$	\dots	0	2	$2 \cos 2\phi$	\dots	0	$(x^2 - y^2, xy)$
\dots	\dots	\dots	\dots	\dots	\dots	\dots	\dots	\dots	
Σ_u^+	1	1	\dots	1	-1	-1	\dots	-1	z
Σ_u^-	1	1	\dots	-1	-1	-1	\dots	1	
Π_u	2	$2 \cos \phi$	\dots	0	-2	$2 \cos \phi$	\dots	0	(x, y)
Δ_u	2	$2 \cos 2\phi$	\dots	0	-2	$-2 \cos 2\phi$	\dots	0	
\dots	\dots	\dots	\dots	\dots	\dots	\dots	\dots	\dots	

Beispiel: CO₂