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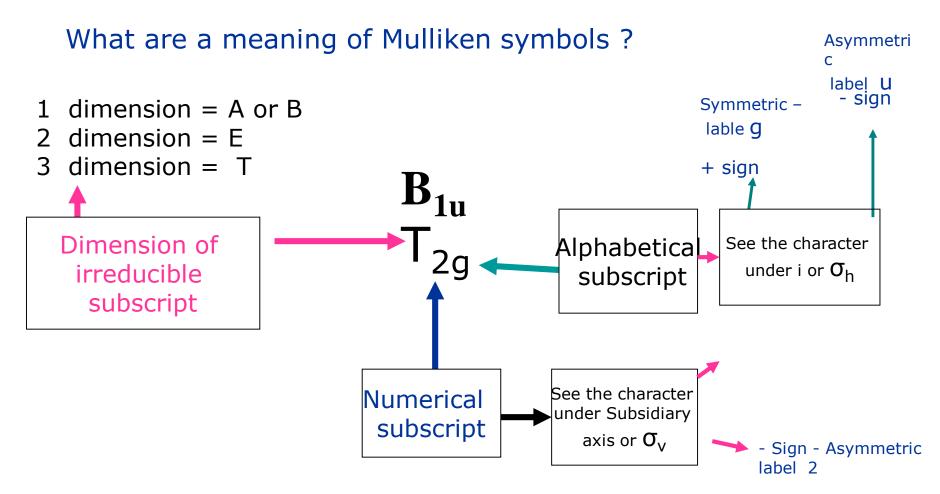
- **Direct product of irreducible representation**
- Standard reduction formula

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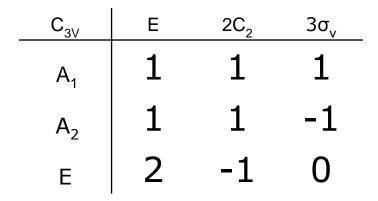
Mulliken symbol.

A, B, E, T, A_g, A_{1g}, A_{2g}, B_g, B_{1g}, B_{2g}, A_u, B_u, E, E_g, T_{1g}, T_{2g} T_{2u}



Mulliken symbolism Rules for Irreducible representation .

* Consider character table for C_{3v} point group.



 A_1, A_2 , E be the Mulliken symbol which has certain meaning

See the character under E class and represent symbol A, B, E and T using following rule. 1. Dimensionality Rule :

> All one dimensional representation s are designated by either A or B symbol Two dimensional IRs representation n is designated by E Three dimensional IRs representation n is designated by T

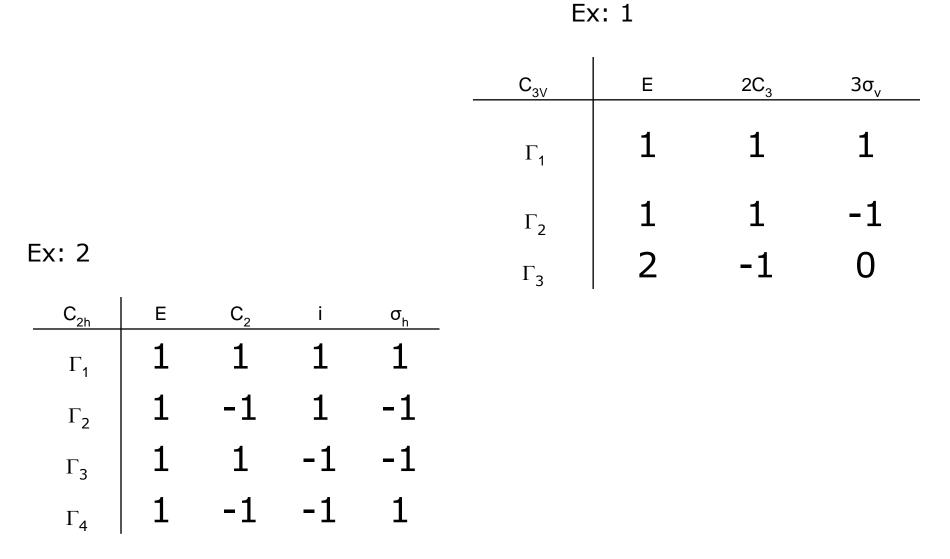
2. See the character under Principle axis for labeling one dimensional A & B if $\chi(C_n) = +1$ ------ symmetric representation --- label A if $\chi(C_n) = -1$ ------ asymmetric representation --- label B

3. Numerical Subscript rule : 1 &2 numerical subscript are attached A , B, T representation for that see the character under secondary axis C_2

- if $\chi(C_2) = +1$ ------ symmetric representation --- label '1' if $\chi(C_2) = -1$ ------ asymmetric representation ---- label '2'
- if Secondary axis is absent then see the character under vertical plane if $\chi(\sigma_v) = +1$ ------ symmetric representation --- label "1" if $\chi(\sigma_v) = -1$ ------ asymmetric representation --- label "2"

4. Alphabetical subscript rule : g &u subscript are attached to A , B, T representation for that see the character under center of inversion (i) class

if $\chi(i) = +1$ ------ symmetric representation --- label 'g 'subscript if $\chi(i) = -1$ ------ asymmetric representation --- label 'u' subscript Question1 : Transform the $\Gamma_{1,}\Gamma_{2}$, Γ_{3} , Γ_{4} into Mulliken symbols of the following character table



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Direct product of irreducible representation :

C _{2V}	E	C ₂	σ _{xz}	σ _{yz}	Direct product
A ₁	1	1	1	1	
A ₂	1	1	-1	-1	
B_1	1	-1	-1	1	
B ₂	1	-1	1	-1	
$A_1 x A_2$	1	1	-1	-1	A ₂
$A_2 x A_2$ $A_2 x B_1$	1	1	1	1	A ₂ A ₁
$A_2 x B_1$	1	-1	1	-1	?

Product of Dimension : A, B, E, T AxA= A, BxB =A AxB =BxA= B AxE =BxE =E ExE =A+T or B +T depend on P. G ExT = A+E+T TxT = A +E+T +T

Product of subscript : 1,2,g,u1x1=1gxg=g1x2=1gxu=u2x2=1uxu=g

[symmetric]x[symmetri] = symmetric

[symmetric]x[asymmetri] = asymmetric

[asymmetric]x[asymmetric] = symmetric

Standard reduction formula :

n(Γ_i)= [g(R). χ_{IR} (R). χ_{RR} (R)]/h

Where

g(R) - multiplying factor of respective class

 χ_{IR} (R). – character if IRs representation under respective class

 χ_{RR} (R - character if RRs representation under respective class h- order of group

Q1. Find out number of time A_1 , A_2 , B_1 , and B_2 will appear in the following table order of group

C _{2V}	Е	C ₂	σ_{xz}	σ_{yz}
A_1	1	1	1	1
A ₂	1	1	-1	-1
B ₁	1	-1	1	-1
B ₂	1	-1	-1	-1
χ _{RR} (R)	15	-1	3	3

Q1. Find out number of time A_1, A_2 , E will appear in the following table order of group

C _{3V}	E	2C ₃	$3\sigma_v$
A1	1	1	1
A2	1	1	-1
E	2	-1	0
χ _{RR} (R)	21	0	3

THE END