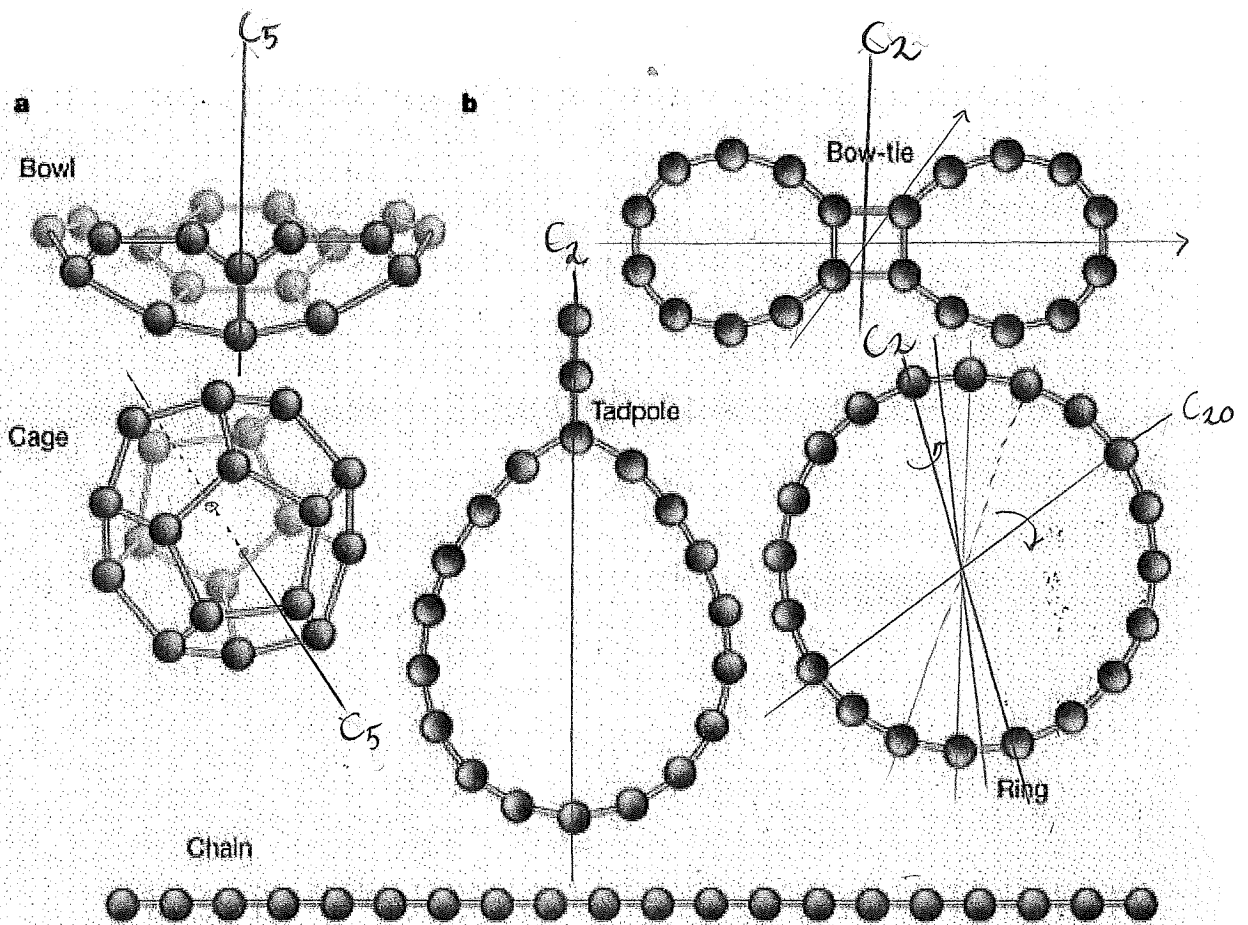


Ks. kaavio (kuva 12-7, kalvo s.13)  
symmetrioiden määrittämistä varten.



Bowl: ei lineaarinen, 1  $C_5$ , ei löydy 5  $C_2$ :sta kohtisuorassa  $C_5$ :sta vastaan, ei löydy horisontaalista heijastustasoa  $\sigma_h$ , löytyy 5 vertikaalista heijastustasoa  $\sigma_v$  ("NNYNNY" kaaviossa)  $\rightarrow C_{5v}$

5-kert. kiertokseli: (akselin suhteen kierrettäessä  $360/5$  verran molekyylit näyttää samalta.)

Bow-tie: ei lin.,  $C_2$ ,  $2C_2'$ ,  $\sigma_h$   $\rightarrow D_{2h}$  ("NNYY")  
pääakseli      kohtisuorassa pääakselia vastaan

Tadpole: ei lin.,  $C_2$ , ei  $2C_2'$ , ei  $\sigma_h$ ,  $2\sigma_v$   $\rightarrow C_{2v}$  ("NNYNNY")

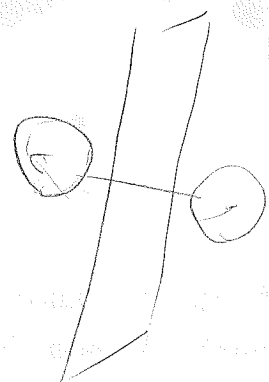
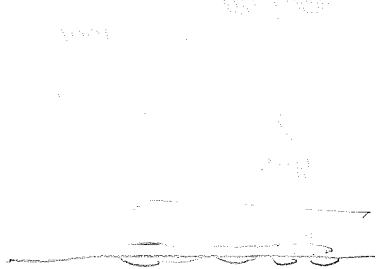
Ring: ei lin.,  $C_{20}$ ,  $20C_2'$ ,  $\sigma_h$   $\rightarrow D_{20h}$  ("NNYY")

Chain: lin.,  $i$   $\rightarrow D_{\infty h}$  ("YY")

Cage: ei lin.,  $12C_5$ ,  $i$   $\rightarrow I_h$  ("NYYY")  
 $\geq 2$        $\geq 2$

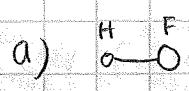
Handwritten notes at the top of the page, including the number '100' and some illegible text.

Main body of handwritten notes, appearing as a list or series of entries, though the text is mostly illegible due to fading and bleed-through.



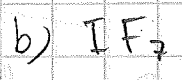
Handwritten notes at the bottom of the page, including the number '100' and some illegible text.

②



lin., ei  $i \rightarrow \underline{\underline{C_{\infty v}}}$

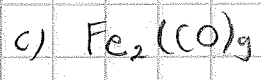
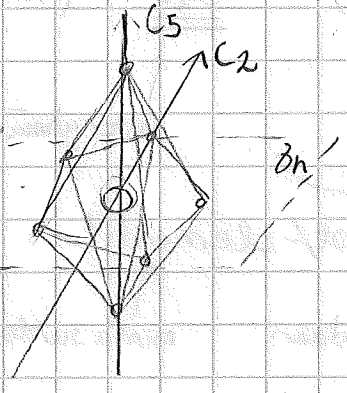
("YN")



ei lin., alle  $2C_n \ n > 2, C_5, 5C_2$   
kohtisuorassa  $C_5$ :een,  $\sigma_h$

$\rightarrow \underline{\underline{D_{5h}}}$

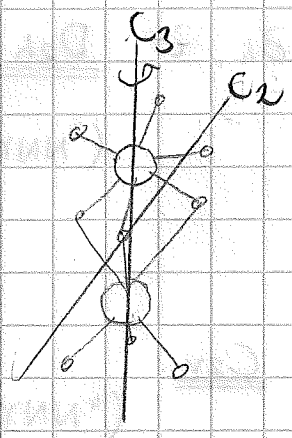
("NNYYY")



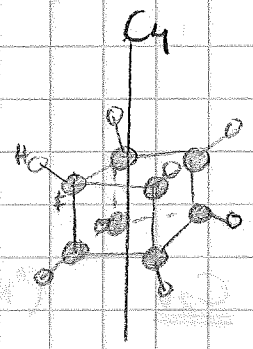
ei lin., alle  $2C_n \ n > 2, C_3, 3C_2 \perp, \sigma_h$

$\rightarrow \underline{\underline{D_{3h}}}$

("NNYYY")



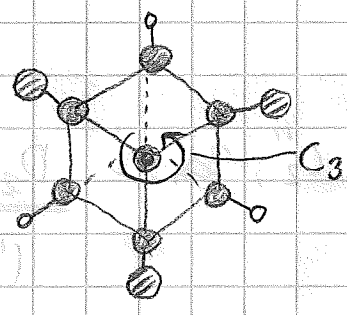
d)



ei lin., enemmän kuin  $2C_n \ n > 2,$   
 $i, \text{ ei } C_5 \rightarrow \underline{\underline{O_h}}$

("NYYYY")

e)

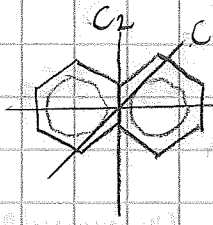


ei lin., enemmän kuin  $2C_n \ n > 2,$   
 $\text{ei } i \rightarrow \underline{\underline{T_d}}$

("NYN")

③

a) naftaleeni



$E, C_2, C_2', C_2'', 3\sigma_h, i$   $D_{2h}$  ("NNYY")

identiteettioperaatio (symmetria on molekyylillä)   
 kierrat (elementti vastavastukset)   
 heijastus (elementti vastavastaus taso)   
 inversio (elementti inversio keskus)

3 vaihtoehtoista pääakselia

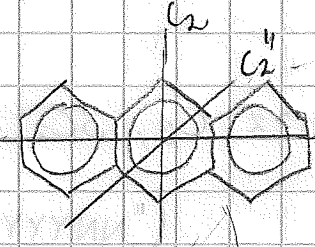
pisteryhmä

symmetriaoperaatiot/elementit

mitä tehdään

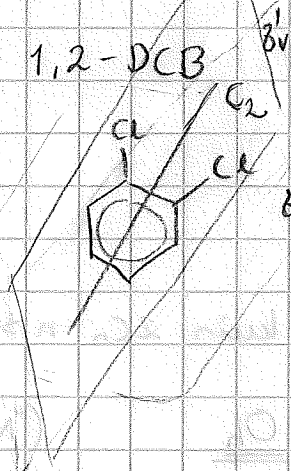
mitkä subgr

b) ontraseeni



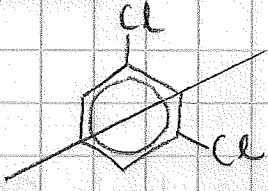
$E, C_2, C_2', C_2'', 3\sigma_h, i$   $D_{2h}$  ("NNYY")

c) 1,2-DCB

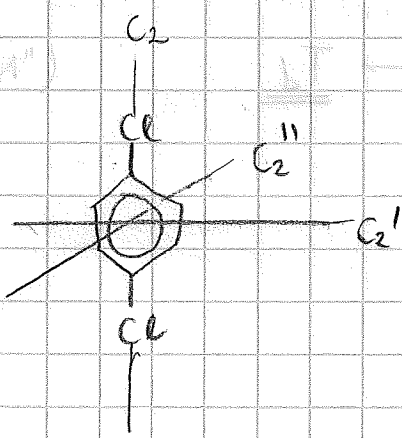


$E, C_2, \sigma_v, \sigma_v'$   $C_{2v}$  ("NNYNNY")

1,3-DCB



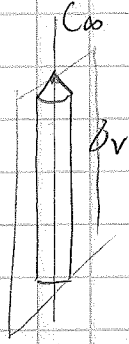
$E, C_2, \sigma_v, \sigma_v'$   $C_{2v}$  ("NNYNNY")



$E, C_2, C_2', C_2'', 3\sigma_h, i$   $D_{2h}$  ("NNYY")

(4)

a)

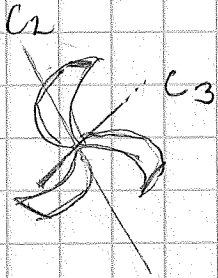


$E, C_{oo}, \delta_v$

$C_{oo}$

("YN")

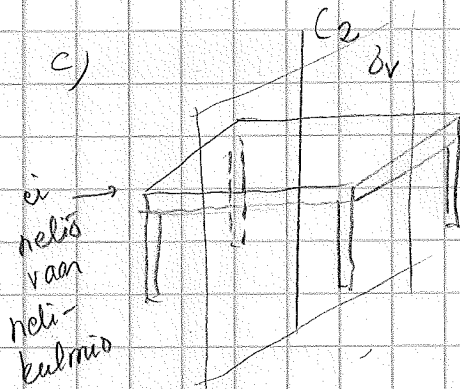
b)



$E, C_3, 3C_2$

$D_3$  ("NNYNN")

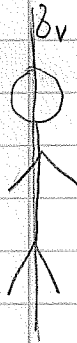
c)



$E, C_2, 2\delta_v$

$C_2$  ("NNYNNY")

d)



$E, \delta_v$  (approksimaatio)

$C_s$  ("NNNY")

(1000) 1000 1000 1000

1000 1000 1000 1000 1000 1000 1000 1000

1000 1000 1000 1000 1000 1000 1000 1000

