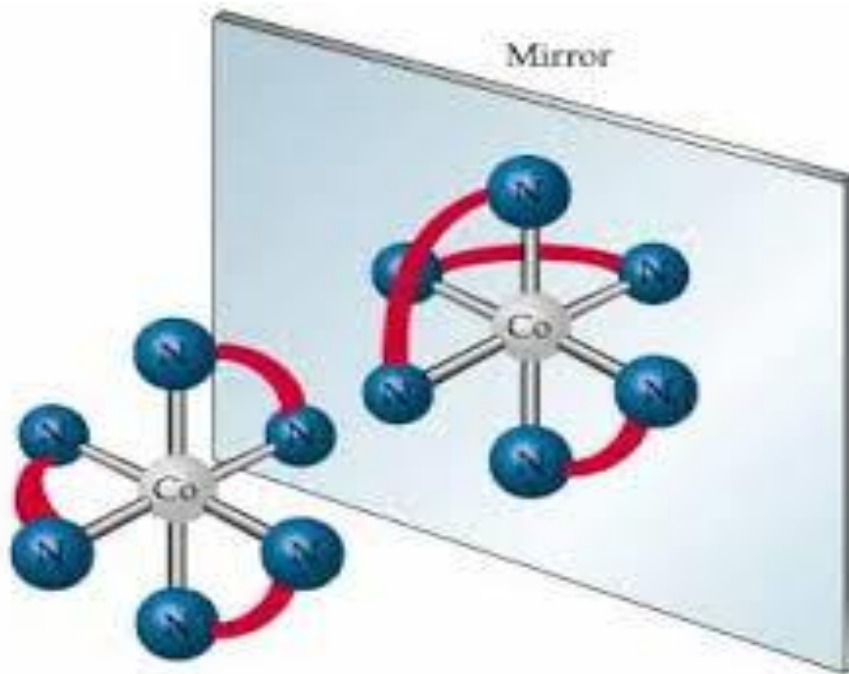


# Symmetry Elements

Symmetry element	Symmetry operation	Symbol
axis of rotation	rotation by $360^\circ/n$	$C_n$
mirror plane	reflection	$\sigma$
center of inversion*	inversion	$i$
improper axis of rotation	rotation of $360^\circ/n$ followed by mirror reflection that is perpendicular to the rotational axis.	$S_n$

\*For  $S_1$  and  $S_2 = \sigma$  and  $i$ , respectively.

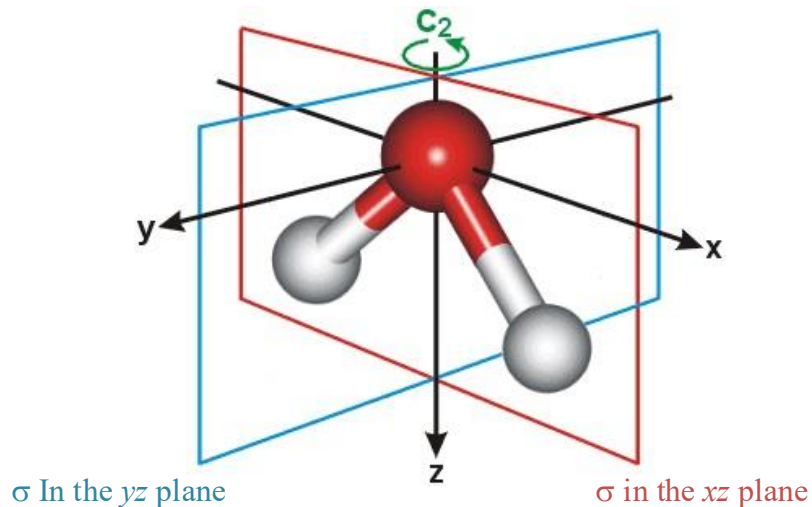


# Symmetry Elements

Symmetry element	Symmetry operation	Symbol
axis of rotation	rotation by $360^\circ/n$	$C_n$
mirror plane	reflection	$\sigma$
center of inversion*	inversion	$i$
improper axis of rotation	rotation of $360^\circ/n$ followed by mirror reflection that is perpendicular to the rotational axis.	$S_n$

\*For  $S_1$  and  $S_2 = \sigma$  and  $i$ , respectively.

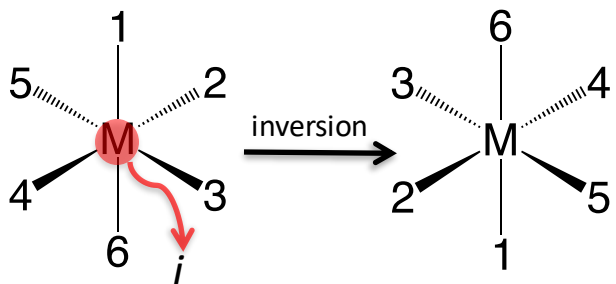
Symmetry elements of water, which has a  $C_2$  axis of rotation and two mirror planes,  $\sigma$



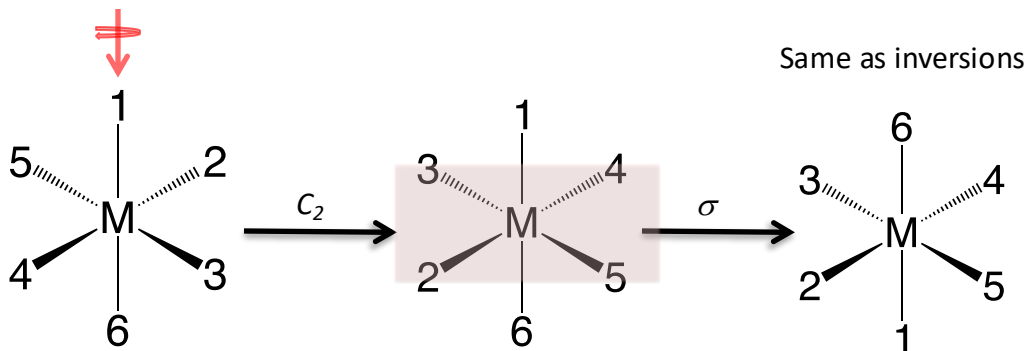
# Symmetry Elements

Symmetry element	Symmetry operation	Symbol
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\*For  $S_1$  and  $S_2 = \sigma$  and  $i$ , respectively.

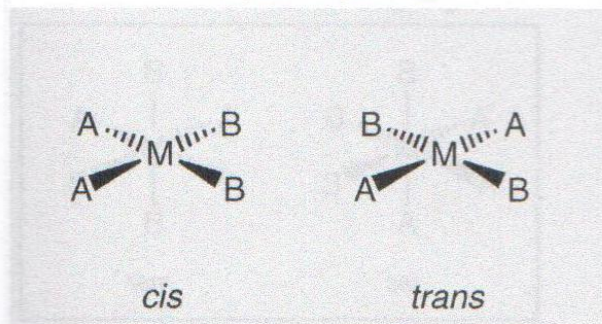


For  $S_2$  this is a  $360^\circ/2$  rotation followed by a mirror perpendicular to the 1-fold rotation axis.



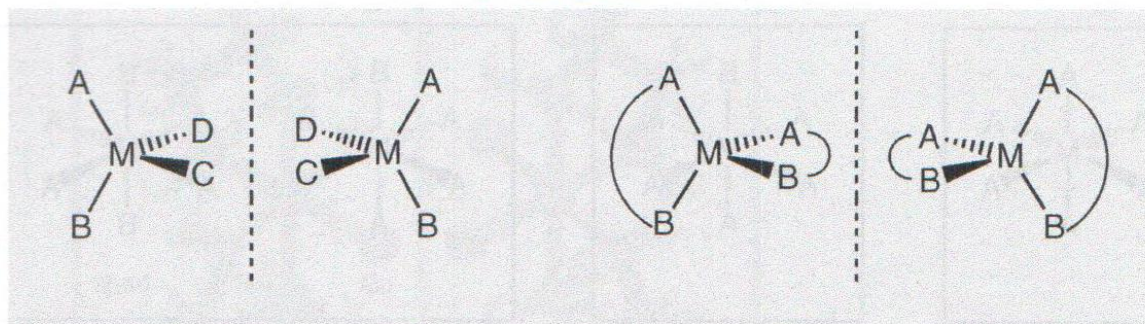
# Enantiomers of 4-coordinate complexes

*square planar*

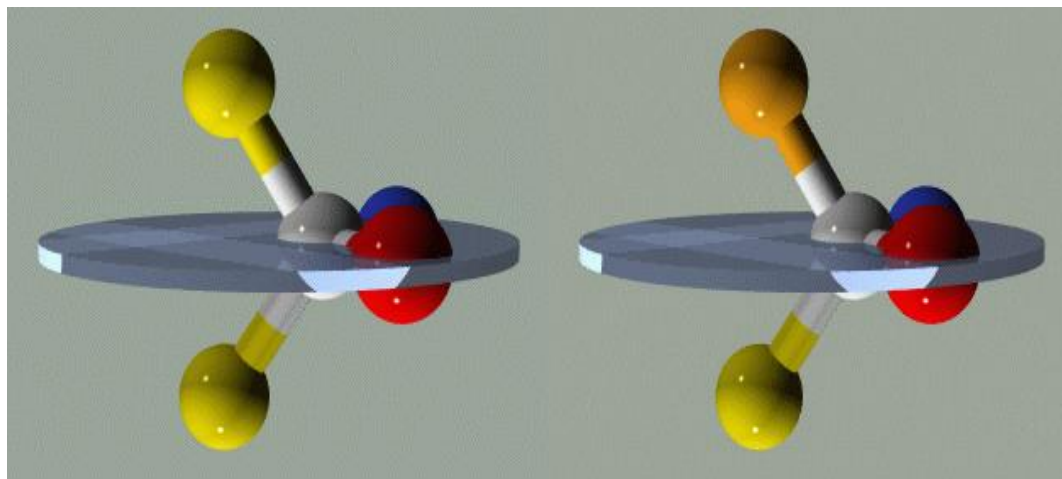


geometric isomers (diastereomers)

*tetrahedral*

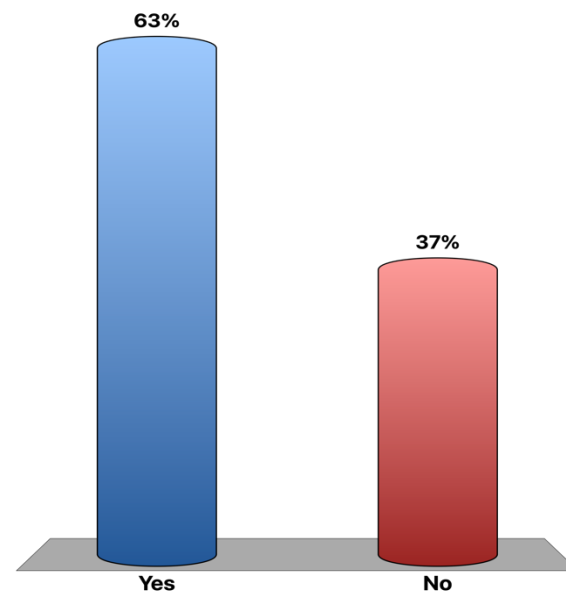
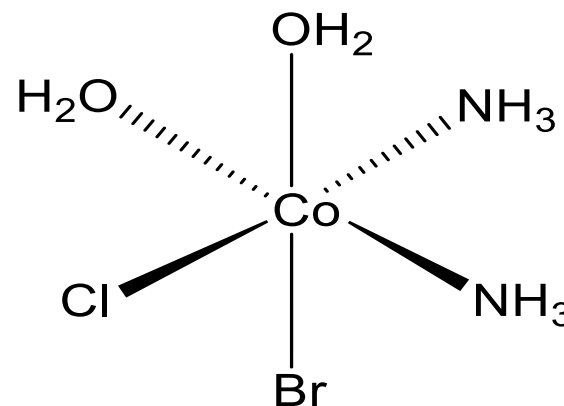


optical isomers (enantiomers)  
(non-superimposable mirror images)



# Does it have an enantiomer?

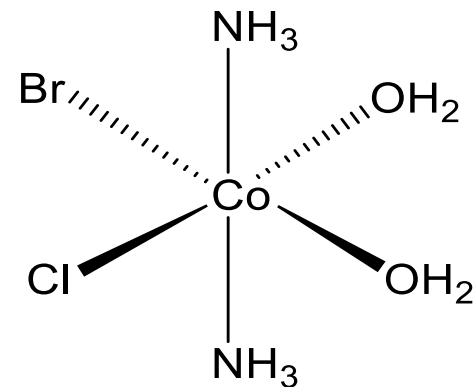
- A. Yes
- B. No



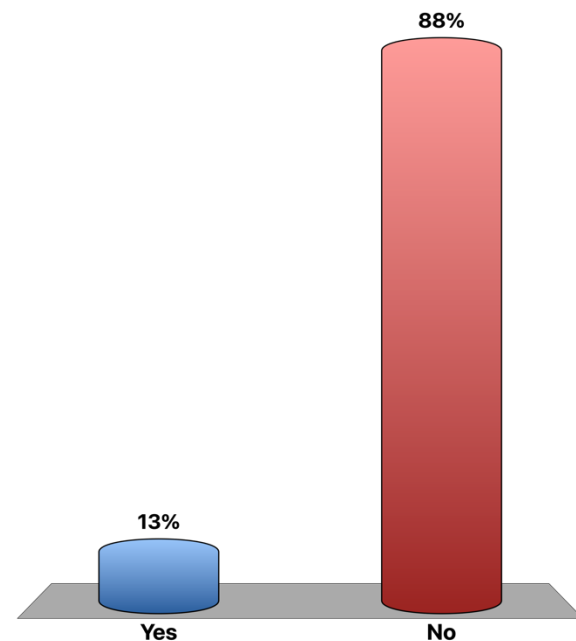
Access: [ttpoll.eu](http://tpoll.eu)  
Access ID: CH222

# Does it have an enantiomer?

- A. Yes
- B. No

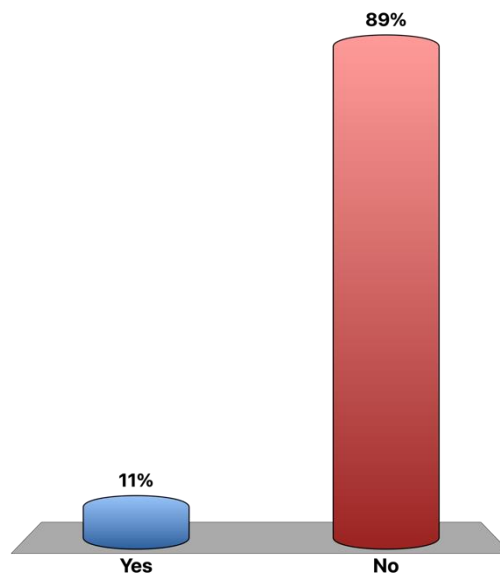
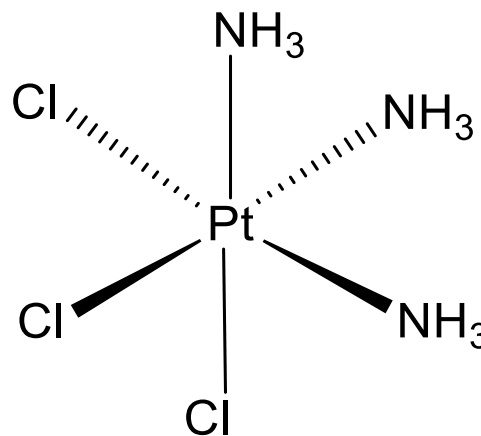


Access: [ttpoll.eu](http://tpoll.eu)  
Access ID: CH222



# Is it chiral?

- A. Yes
- B. No



Access: [ttpoll.eu](http://tpoll.eu)  
Access ID: CH222

Formula	Number of Stereoisomers	Pairs of Enantiomers
Ma <sub>6</sub>	1	0
Ma <sub>5</sub> b	1	0
Ma <sub>4</sub> b <sub>2</sub>	2	0
Ma <sub>3</sub> b <sub>3</sub>	2	0
Ma <sub>4</sub> bc	2	0
Ma <sub>3</sub> bcd	5	1
Ma <sub>2</sub> bcde	15	6
Mabcdef	30	15
Ma <sub>2</sub> b <sub>2</sub> c <sub>2</sub>	6	1
Ma <sub>2</sub> b <sub>2</sub> cd	8	2
Ma <sub>3</sub> b <sub>2</sub> c	3	0
M(AA)(BC)de	10	5
M(AB)(AB)cd	11	5
M(AB)(CD)ef	20	10
M(AB) <sub>3</sub>	4	2
M(ABA)cde	9	3
M(ABC) <sub>2</sub>	11	5
M(ABBA)cd	7	3
M(ABCBA)d	7	3

Uppercase letters represent chelating ligands, and lowercase letters represent monodentate ligands.