Two atoms are *chemically equivalent* when they are related by *symmetry operations* e.g. rotational axis, plane of symmetry, center of inversion, etc., or by normal *molecular motion* e.g. rotation of σ bonds, ring flip, chair axial and equatorial positions, etc.

H_o.

H_m











Ho

H_m

Reflection

H_o=H_o H_m=H_m

H_p

Chemical Equivalence

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"Substitution" Tests for CHEMICAL EQUIVALENCE

Two types of *equivalence*: HOMOTOPIC and ENANTIOTOPIC (*equivalent* and do not couple).

Two atoms are *homotopic* if substitution of one atom generates the *same* species to that generated by substitution of the other atom.



Two atoms are *enantiotopic* if substitution of one atom generates the *enantiomer* of the species by substitution of the other atom.





DIASTEREOTOPIC atoms are <u>NOT</u> CHEMICALLY EQUIVALENT (and may couple).

Two atoms are *diastereotopic* if substitution of one atom generates a *diastereomer* of the species by substitution of the other atom.

