Isomers

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Isomers are molecules of the same molecular formula

but differing in their structures

A) structural isomers (different **constitution** of molecules)

B) stereoisomers (different **configuration** of molecules
= spatial arrangement)

Important terms

constitution = the type and the arrangement of both atoms and bonds in a molecule; *it doesn´t describe spatial arrangement*

conformation = any of the large number of possible shapes of a molecule resulting from rotation of one part of the molecule about a single bond

configuration = the spatial arrangement of atoms or groups in a molecule

saturated hydrocarbon = hydrocarbon in which there are no carbon-carbon double or triple bonds (all carbon atoms are bound to the maximum number of hydrogen atoms)

Important types of isomers

A) structural isomers (different constitution of molecules)

1. <u>different position</u> of

- **multiple bonds**
- **substituents (functional groups)**
- **side chains (branches)**

but-2-ene	/	*but-1-ene*
1-chloropropane	/	*2-chloropropane*
o-xylene	/	*m-xylene*
2,2-dimethylbutane	/	*2,3-dimethylbutane*
pentane	/	*2-methylbutane (isopentane)*

Important types of isomers

A) structural isomers (different constitution of molecules)

2. **different order of atoms**: different derivatives

   propanal / *propanone*

3. **keto-enol isomers** (tautomers)

   propanone / *propene-2-ol*

   bases of nucleic acids (e.g. uracil)

Important types of isomers

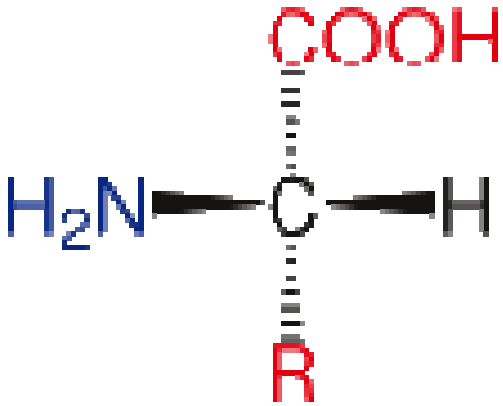
B) stereoisomers (different configuration of molecules)

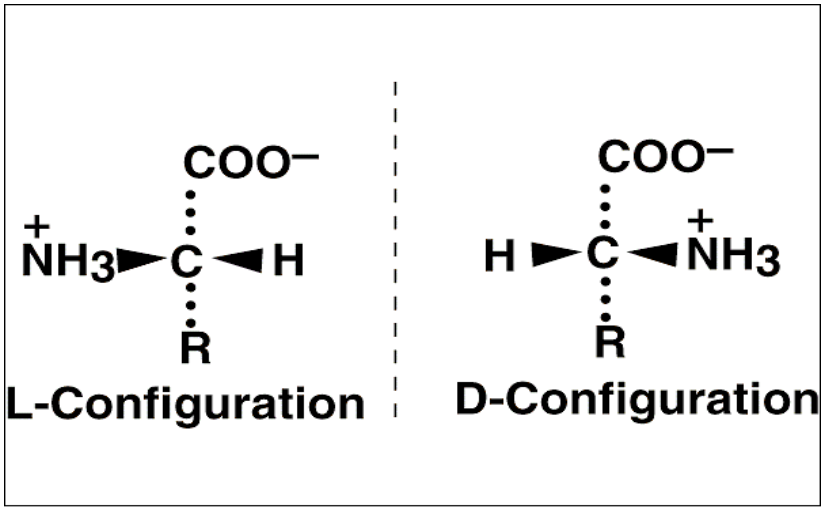
1. **cis-trans isomers** (geometrical isomers)

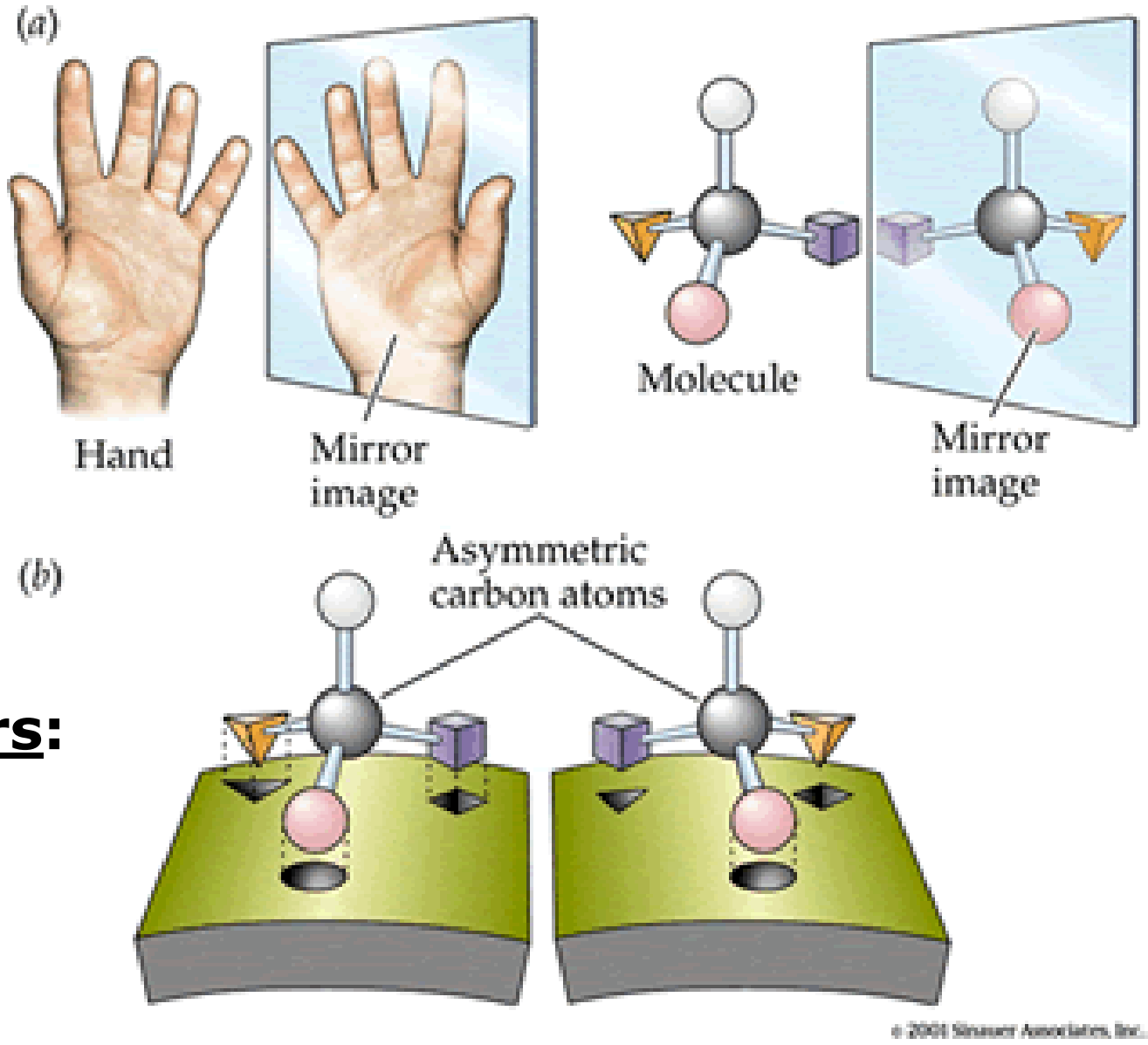
   cis-but-2-ene / *trans*-but-2-ene

2. **enantiomers** (optical isomers = mirror images)

   L-amino acid







2 enantiomers:

http://www.imb-jena.de/~rake/Bioinformatics_WEB/gifs/amino_acids_chiral.gif *(October 2007)*

Homework

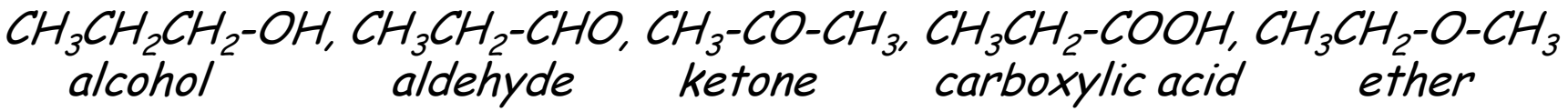
Draw structural formulas of all possible isomers desribed by given molecular formulas:

1) C_5H_{12}

2) $C_5H_{10}O$

IUPAC (systematic) names

of hydrocarbon derivatives can be of two types:



1. **using substitutional principle**
   hydrocarbon name + suffix

   (propanol, propanal, propanone, propanoic acid, NONE)

2. **using radical functional principle**
   alkyl name + derivative name

   (propyl alcohol, NONE, dimethyl ketone, NONE, ethyl methyl ether)