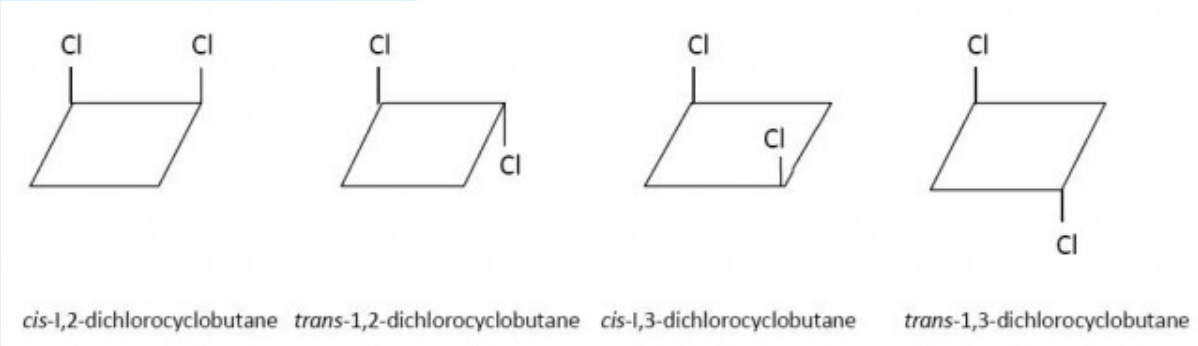
HL Answers to Stereoisomerism questions

1. Six. 1,1-dichlorocyclobutane (for which there are no *cis*- and *trans*- forms) and



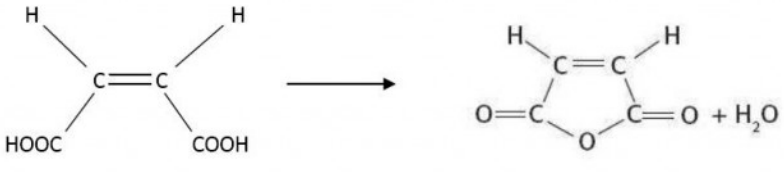
cis-I,2-dichlorocyclobutane *trans*-1,2-dichlorocyclobutane *cis*-I,3-dichlorocyclobutane *trans*-1,3-dichlorocyclobutane

In addition trans-1,2-dichlorocyclobutane exists in two enantiomeric forms. (These are (1S,2S)-1,2-dichlorocyclobutane and (1R,2R)-1,2-dichlorocyclobutane but the use of S and R convention to name enantiomers is not required by the IB).

2. i. 1,2-dichloroethane has free rotation about the carbon-carbon single bond. In 1,2-dichloroethene there is no free rotation as it would involve breaking the π bond.

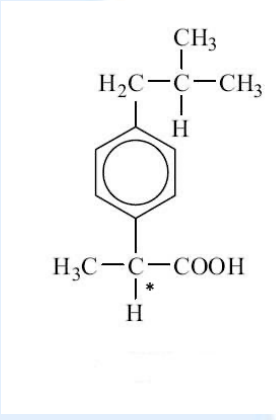
ii. 1,2-dichloroethane can show conformational isomerism as the two chlorine atoms are in different planes (axial and equatorial) to each other when the carbon-carbon bond rotates.

3. In *cis*-butenedioic acid the –COOH groups are held close together so they can react to eliminate water and form the cyclic compound. In the *trans*- isomer the two –COOH groups are too far apart to react.



4. Glycine, H_2NCH_2COOH, does not contain an asymmetric carbon atom. All the other 2-amino acids have four different groups around the central carbon atom.

5. i. Ibuprofen can show optical isomerism as it possesses a chiral carbon atom.



ii. Penicillin can show optical isomerism as two of the carbon atoms in the four-membered beta-lactam ring are chiral.

6. Since four carbon atoms in in the primary chain of glucose have both a hydrogen and a hydroxyl group attached, most of the carbon atom are chiral. This makes for a large number of diastereomers (actually 14) as well as the two enantiomers.

7. A: (*Z*)-but-2-ene
B: (*E*)-2-bromobut-2-ene.