trans isomers ... enantiomeric.

2.7 Projection Formula of a Tetrahedral Carbon

It is not easy to represent a tetrahedron on a plane by drawing. The general practice is to form models with ball and stick ; where balls are atoms and sticks are bonds (Fig. 7*a*). Then projection formula for the model is drawn on the plane of the paper ; this shows only two dimensions, the other dimension is imagined.

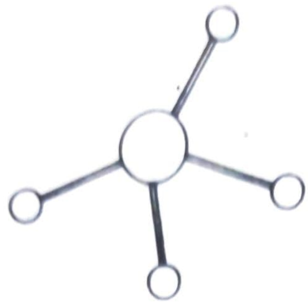


Fig. 7(a).

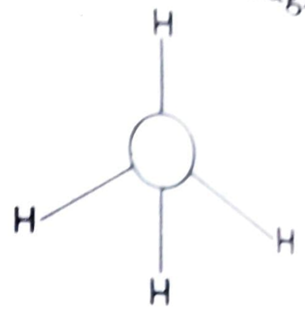


Fig. 7(b).

There are three main methods of doing so, these are :

(I) Newman Projection

In it, circle represents tetrahedral carbon, Atoms away from viewer are shown by vertical lines and atoms towards the viewer are shown by drawing two lines from the two sides of the circle.

(It is shown in Fig. 7*b*)

(II) Wedge Projection

It is written in the plane of paper. Dotted lines represent bonds below the plane of paper and wedge lines represents bonds above the plane of paper. It is shown in Fig. 7*c*.

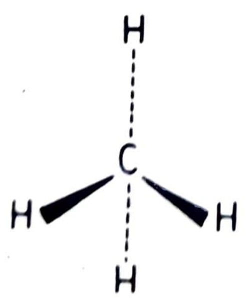


Fig. 7(c).

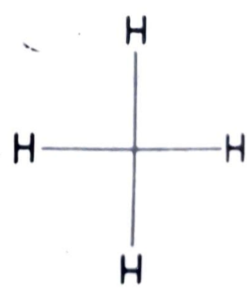


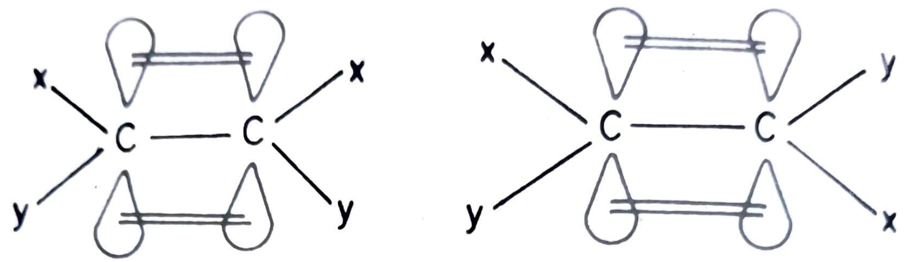
Fig. 7(d).

(III) Fischer Projection

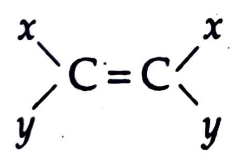
In Fischer projection, the tetrahedral carbon (lies in the plane of paper) ; bonds drawn horizontally are above the plane of paper and those drawn vertically are below it. The position of central tetrahedral carbon is supposed to be at the crossing of the two lines. Fischer projection is shown in Fig. 7*d*.

2.8 Geometrical (or cis-trans) Isomerism

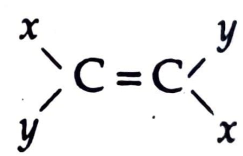
There is sp^2 hybridisation of the carbon atoms of the $C-C$ double bond. The later is made of one σ bond and one π bond. Due to the overlap of sp^2 hybrid orbitals, σ bond is formed. The molecule is 'locked' in one position by the π bond. The alkene molecule has planar shape with the two carbon atoms of the double bond and the four atoms attached to these carbons all lie in one plane, their positions in space being fixed.



Rotation, if any would break the π bond which is the impossible [Because the required energy is not available from molecular collisions at ordinary temperatures] so the rotation about the double bond is prevented. This restriction in the rotation around the double bond leads to 'geometrical isomerism'.



cis



trans

Hence, it is a type of stereoisomerism in which the isomers have the same structure containing a double bond but differ in the spatial arrangement of the groups attached to the two carbon atoms of the double bond. Geometric isomers are named depending on whether the similar groups attached to the carbon atoms at the two ends of the double bond are on the same side (cis-) or opposite side (trans-)

Triply bonded compounds cannot exhibit geometrical isomerism as the $-C\equiv C-$ bond in these molecules is linear.