Quiz (Geometrical Isomerism)

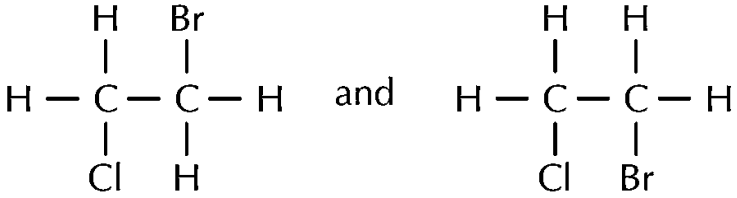
1. Consider the following compound that exists in two isomeric forms.

$$(COOH)HC=CHCH_2CH_3$$

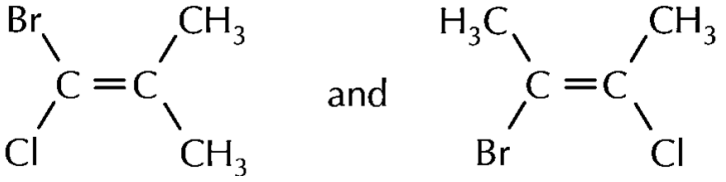
   (a) Draw the structure of each isomer. Give the systematic name of each of them.

   (b) State the type of isomerism involved.

2. Explain why the following pairs of compounds are not *cis-trans* isomers.
   (a)



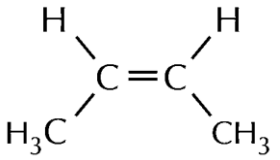
   (b)



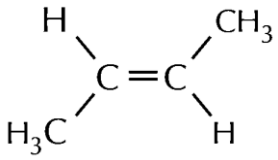
3. Predict the structures and give the systematic names of the isomers of a straight-chain alkene with molecular formula C_6H_{12}.

4. Compound *Z* is an alcohol with one carbon-carbon double bond. It has a molecular formula of C_4H_8O. Predict the structural formulae of all possible isomers of compound *Z* and give the systematic names of the isomers.

5. The structures of compounds *A* and *B* are shown below.



Compound *A*



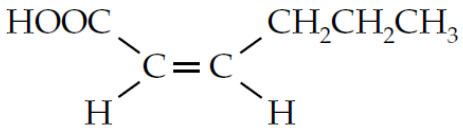
Compound *B*

   (a) Give the systematic names of compound *A* and compound *B*.

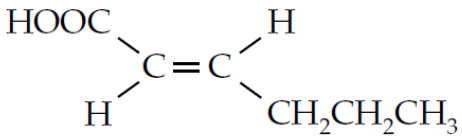
   (b) Which compound, *A* or *B*, has a higher melting point? Explain your answer.

Suggested Answer

1. (a)



cis-hex-2-enoic acid



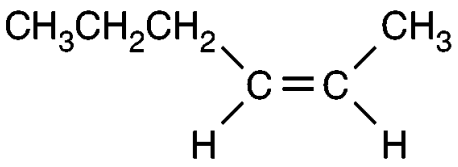
trans-hex-2-enoic acid

(b) *Cis-trans* isomerism

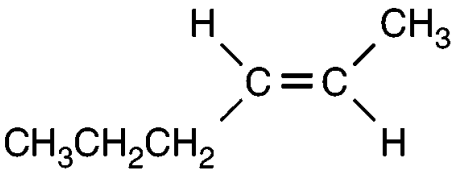
2. (a) Rotation about the C–C single bond is possible and the two compounds are identical.

(b) They are structural isomers in which their atoms are joined in different orders.

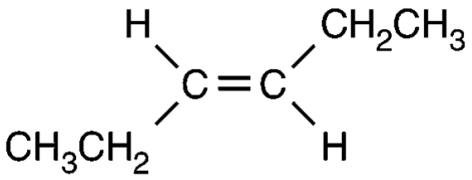
3.



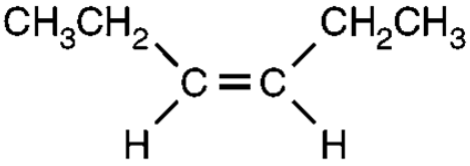
Cis-hex-2-ene



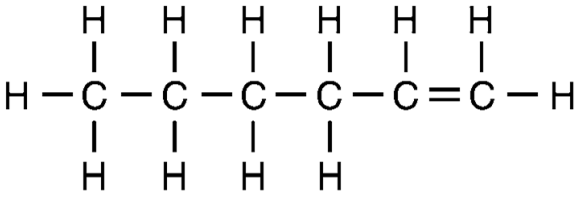
Trans-hex-2-ene



Trans-hex-3-ene

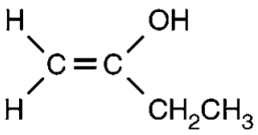


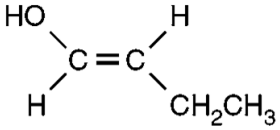
Cis-hex-3-ene

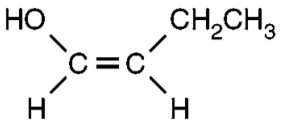


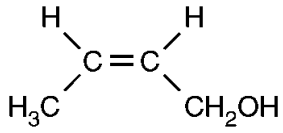
Hex-1-ene

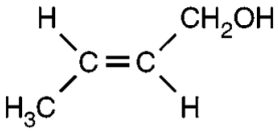
4.

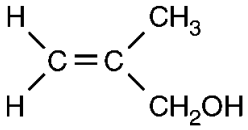

But-1-en-2-ol

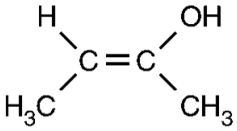

Trans-but-1-en-1-ol

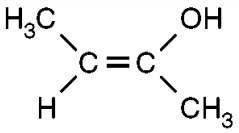

Cis-but-1-en-1-ol

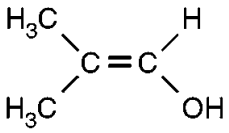

Cis-but-2-en-1-ol

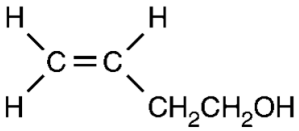

Trans-but-2-en-1-ol

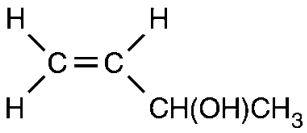

2-methylprop-2-en-1-ol


Cis-but-2-en-2-ol


Trans-but-2-en-2-ol


2-methylprop-1-en-1-ol


But-3-en-1-ol


But-3-en-2-ol

5. (a) Compound *A*: *cis*-but-2-ene; compound *B*: *trans*-but-2-ene

(b) Compound *B* has a higher melting point as it has a more symmetrical structure.

Its molecules can pack more closely in the solid state.

Thus, the intermolecular forces holding the molecules are stronger.

More energy is needed to overcome these forces during melting of compound *B*.