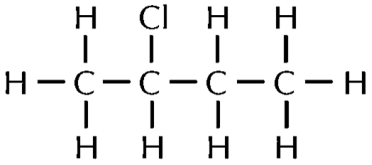
Quiz (Structural Isomerism)

1. Write the structural formulae for all the structural isomers of
   (a) an alkane with the molecular formula of C_7H_{16}.

   (b) a haloalkane with the molecular formula of $C_3H_5Cl_3$.

2. A chloroalkane has a molecular formula of C_4H_9Cl. One of the isomers of the chloroalkane has the following structure.



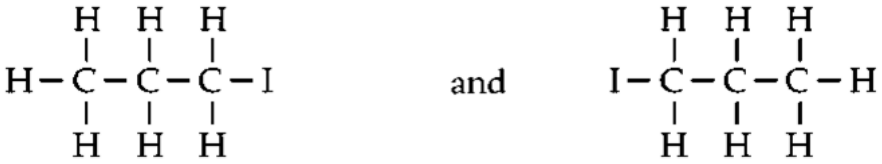
   (a) Give the systematic name of the carbon compound.

   (b) Write the structural formula of the chain isomer of this chloroalkane compound.

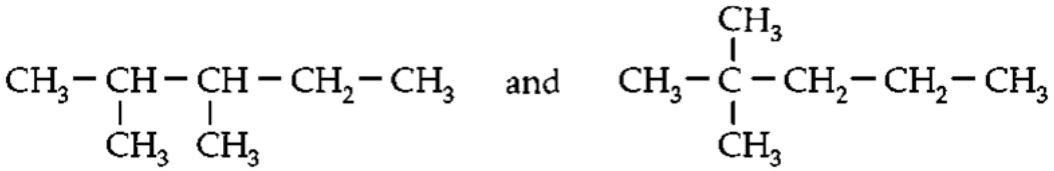
   (c) Write the structural formula of the position isomer of this chloroalkane.

   (d) Which isomers, the one in (b) or (c), has a higher boiling point? Explain your answer.

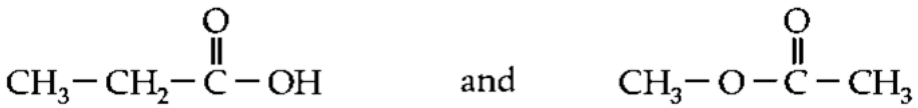
3. For each of the following pairs of molecules, state whether they are 'identical molecules', 'chain isomers', 'position isomers' or 'functional group isomers'.
   (a)



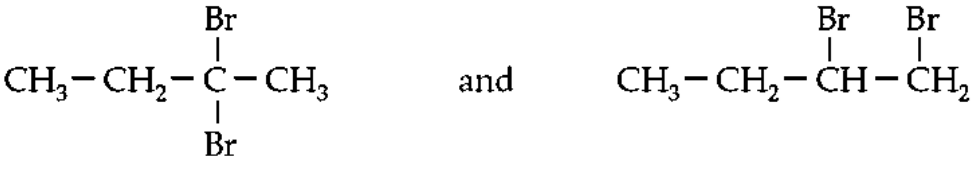
   (b)



   (c)

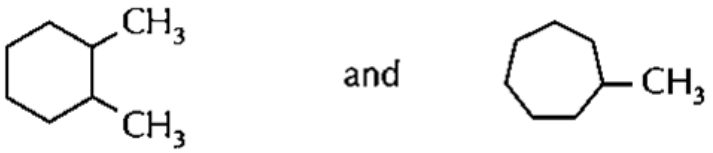


   (d)



4. For each of the following pairs of molecules, state whether they are 'identical molecules', 'chain isomers', 'position isomers' or 'functional group isomers'.

(a)



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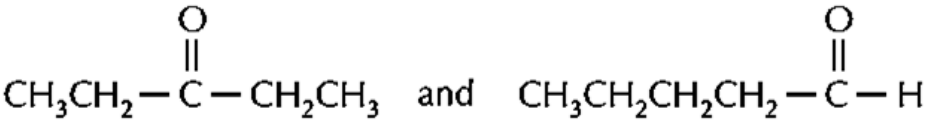

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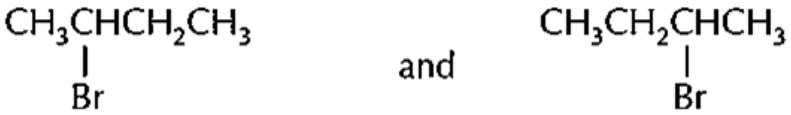
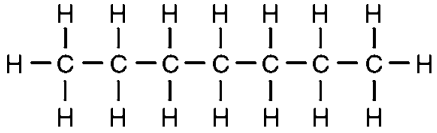
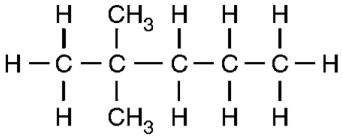
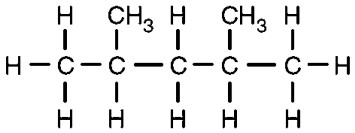
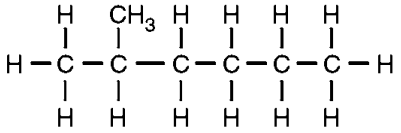
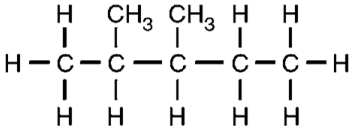
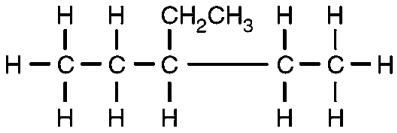
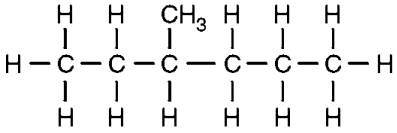
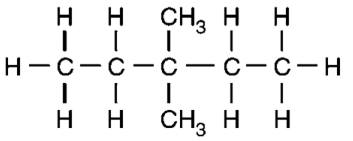
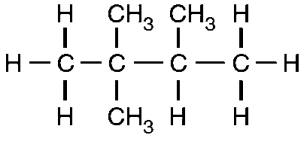


(d)

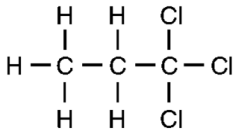
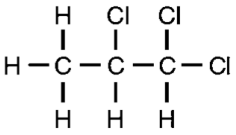
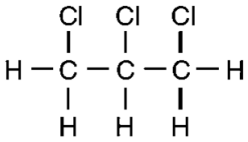
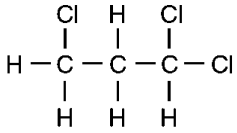
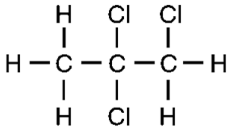
5. Write the structural formulae for all the structural isomers with the molecular formula of $C_4H_{10}O$.

Suggested Answer

1. (a)

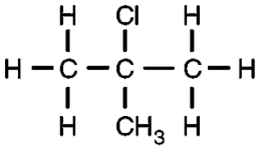










(b)

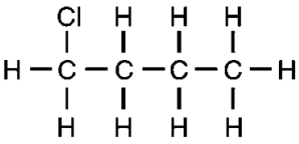






2. (a) 2-chlorobutane

(b)



(c)



(d) The isomer in (c) has a higher boiling point.

The molecules of isomer in (c) are rod-shaped, while the molecules of isomer in (b) have a spherical shape.

The molecules of the isomer in (c) have a greater area of contact.

Thus, the van der Waals' forces between the molecules of isomer in (c) are stronger and more energy is needed to separate the molecules.

3. (a) Identical molecules
(Note: When the first structure is flipped from left to right, the second structure is obtained. Besides, both structures have the same systematic name.)

(b) Chain isomers

(c) Functional group isomers

(d) Position isomers

4. (a) Chain isomers

(b) Functional group isomers

(c) Identical molecules

(d) Position isomers

5.