Name of the Student:_____
Max. Marks : 27 Marks **Time : 27 Minutes**

Q1.

The reaction of bromine with ethane is similar to that of chlorine with ethane. Three steps in the bromination of ethane are shown below.

Step **1** $Br_2 \longrightarrow 2Br^{\bullet}$

Step **2** $Br^{\bullet} + CH_3CH_3 \longrightarrow CH_3CH_2^{\bullet} + HBr$

Step **3** $CH_3CH_2^{\bullet} + Br_2 \longrightarrow CH_3CH_2Br + Br^{\bullet}$

(a) (i) Name this type of mechanism.

_____

(ii) Suggest an essential condition for this reaction.

_____

(iii) Steps **2** and **3** are of the same type. Name this type of step.

_____

(iv) In this mechanism, another type of step occurs in which free-radicals combine. Name this type of step. Write an equation to illustrate this step.

Type of step _____

*Equation*_____

(5)

(b) Further substitution in the reaction of bromine with ethane produces a mixture of liquid organic compounds.

(i) Name a technique which could be used to separate the different compounds in this mixture.

_____

(ii) Write an equation for the reaction between bromine and ethane which produces hexabromoethane, C_2Br_6, by this substitution reaction.

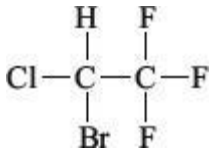
_____

(2)

(c) The compound 1,2-dibromo-1,1,2,2-tetrafluoroethane is used in some fire extinguishers. Draw the structure of this compound.

(1)

(d) Halothane is used as an anaesthetic and has the following structure.



(i) Give the systematic name of *halothane*.

_____

(ii) Calculate the M_r of halothane.

_____

(iii) Calculate the percentage by mass of fluorine in halothane.

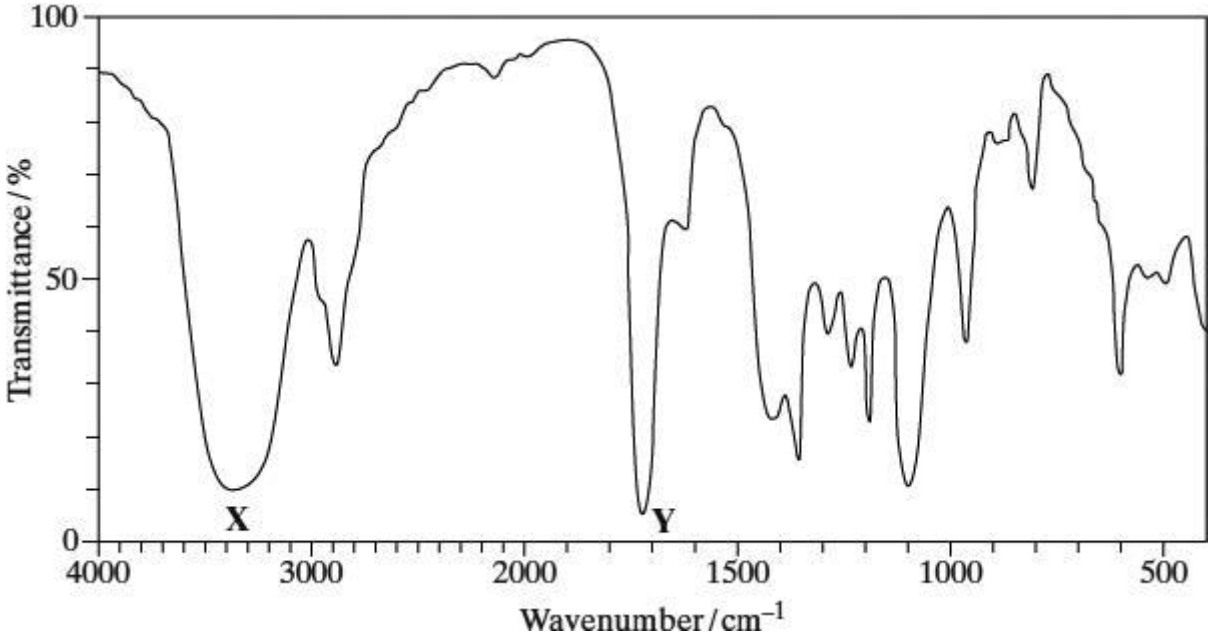
_____

(3)

(Total 11 marks)

Q2.

(a) The infra-red spectrum of compound **A**, $C_3H_6O_2$, is shown below.



Identify the functional groups which cause the absorptions labelled **X** and **Y**.

Using this information draw the structures of the three possible structural isomers for **A**.

Label as **A** the structure which represents a pair of optical isomers.

(6)

(b) Draw the structures of the three **branched-chain** alkenes with molecular formula C_5H_{10}

Draw the structures of the three dibromoalkanes, $C_5H_{10}Br_2$, formed when these three alkenes react with bromine.

One of these dibromoalkanes has only three peaks in its proton n.m.r. spectrum. Deduce the

integration ratio and the splitting patterns of these three peaks.

(10)
(Total 16 marks)