2. (a) Define the following:
   (i) isomers
   (ii) isomerism. **(2 marks)**

(b) Write the structural formulae of the following:
   (i) 3-methyl-1 pentene
   (ii) 2-methyl-2-pentene
   (iii) 2,2-dimethyl pentane
   (iv) 4-methyl pent-2-yne. **(4 marks)**

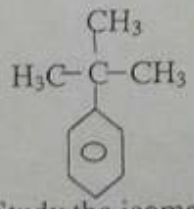
(c) Identify a simple chemical test that can be used to distinguish between the following compounds.
   (i) 1-butyne and 2-butyne
   (ii) Butane and butene. **(4 marks)**

3. (a) (i) Outline the stages in the formation of chloromethane from methane and chlorine at 450°C.
   (ii) Give reason why the chloromethane obtained in (a) (i) is not pure. **(5 marks)**

(b) Bromoalkanes may react with alcoholic potassium hydroxide solution to form alkenes. Basing on this statement answer the following questions:
   (i) What type of organic reaction is this reaction?
   (ii) Write an equation for the reaction of 1-bromobutane with alcoholic potassium hydroxide. Show all mechanisms involved.
   (iii) Draw the strucural formula of the alkene obtained by reaction between 2-bromobutane and alcoholic potassium hydroxide. **(5 marks)**

4. (a) Briefly explain the following:
   (i) The C-C bonds are all equal and intermidiate in length between a single and a double bond in benzene.
   (ii) Dry ether is necessary in the preparation and use of the Grignard reagent. **(7 marks)**

(b) The chlorination of methyl benzene and 1,1-dimethylethyl benzene yield the following isomers:

	2	3	4
	60%	0.5%	39.5%
	22%	8%	70%

Study the isomers and then explain the observed different product ratio. **(3 marks)**

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