SECTION B

Long-answer questions

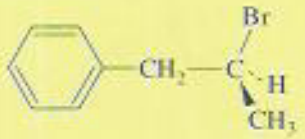
Attempt **ONE** *of the following three questions, and* **ONE** *other question from this Section* **or** *from Sections C and D. All questions carry 15 per cent of the total marks for the examinable component. Section B tests the material in Book 5 (Parts 2 and 3), Book 7 and Book 10. You are advised to spend no more than* **30 minutes** *on each question. Write your answer(s) in a separate answer book from those used for Sections A, C and D.*

Question 13

(*a*) (*9 marks*) Describe the main features of an S_N1 substitution reaction. Your answer should include the mechanism (using curly arrows), a reaction-coordinate diagram, the rate equation, and a discussion of the stereochemistry of the process.

How is the rate of an S_N1 reaction affected by (i) the nucleophilicity of the nucleophile, and (ii) the structure of the substrate?

(*b*) (*6 marks*) When Compound **5** is heated with water, the substitution product is optically inactive. However, when Compound **5** is heated with aqueous sodium hydroxide, the reaction is much faster, and an optically active substitution product is obtained. Explain these observations.



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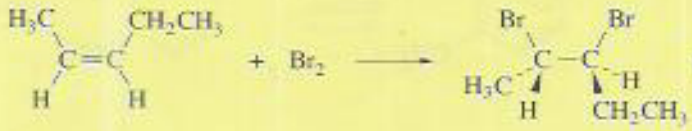
Question 14

(*a*) (*10 marks*) Using curly arrows, draw out the mechanism by which *each* of the following reactions proceeds. Show clearly the different steps in each reaction. Where appropriate, draw out all the resonance forms of the intermediates involved, and discuss the stereochemistry of the reaction.

(i) 

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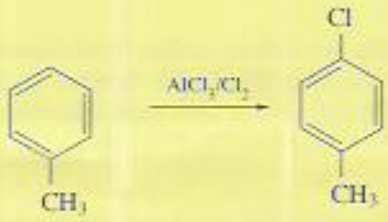
(ii) 

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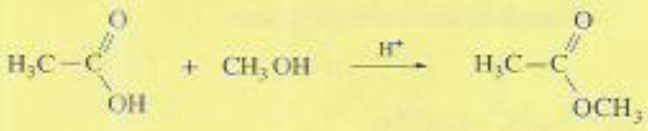
(iii) 

(8)

(*b*) (*5 marks*) In Reaction 7, what other isomers of Compound **6** will be formed? Explain in mechanistic terms why Compound **6** is one of the isomers that predominate.