Coraxeniolide A is a natural product found in pink coral. It was synthesised in 2000 by Christian Leumann by a route featuring the steps highlighted below.

(a) For the reaction that converts vinyl ether 2 into aldehyde 3:
   i) Draw a mechanism.  
      (4 marks)
   ii) What type of reaction is this?  
       (2 marks)
   iii) Provide a Woodward-Hoffmann analysis to confirm that the observed inversion of stereochemistry is “allowed” under thermal conditions.  
        (4 marks)

(b) For the reaction that converts intermediate 4 into 5:
   i) Draw a mechanism.  
      (3 marks)
   ii) What type of reaction is this?  
       (1 mark)
   iii) Draw a conformational diagram of compound 4 and highlight the key bonds that are involved in this reaction. Explicitly indicate which orbitals are involved in the reaction and their relative orientations.  
        (4 marks)
   iv) Account for the stereochemistry of the alkene in product 5.  
      (2 marks)