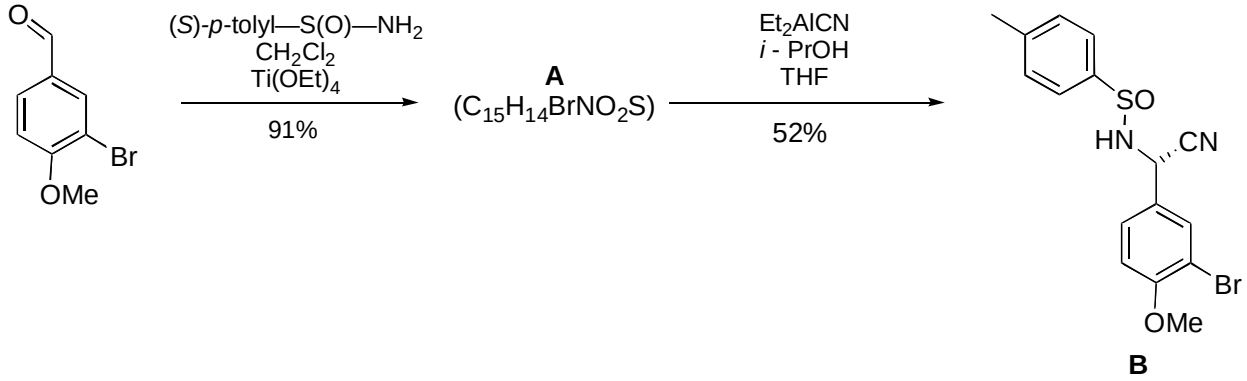
2nd Year Synoptic Organic Problem Sheets 2005-6

Set 2: Answers

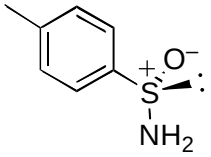
The following sequence is the start of an asymmetric synthesis of a natural product.



$Ti(OEt)_4$ is effectively a dehydrating agent (TiO_2, the Ti containing product is very stable) and Et_2AlCN can be considered to be a more electrophilic version of HCN. *p*-Tolyl is 4-methylphenyl.

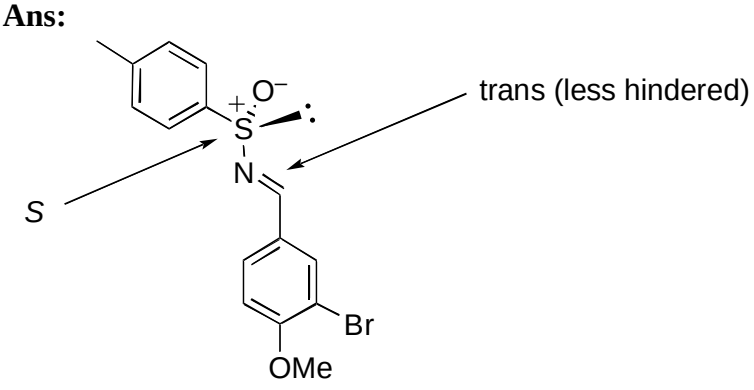
i. Draw a full stereostructure of the reagent (*S*)-*p*-tolyl—S(O)—NH_2.

Ans:



ii. Suggest a structure for **A**, paying particular attention to the sterochemistries involved and justify your proposal.

Ans:

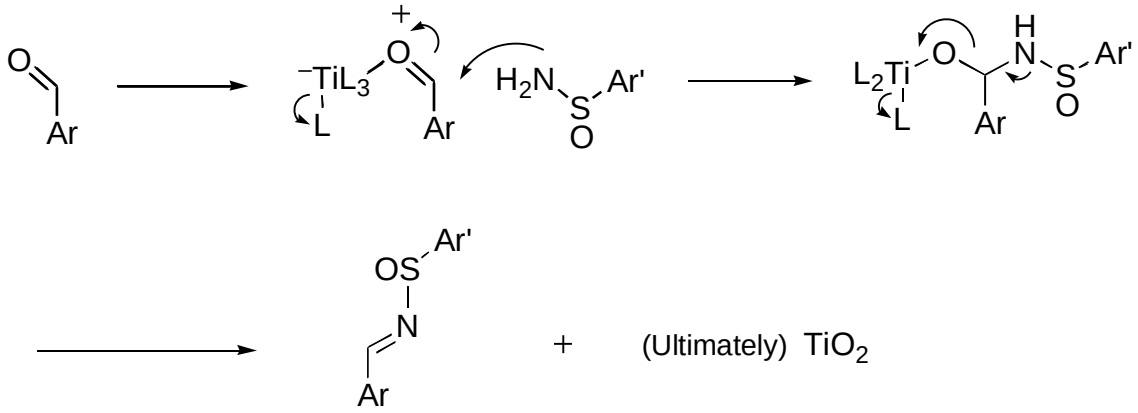


iii. By careful consideration of the chemical shifts, multiplicities and coupling constants, assign the proton nmr spectrum (given below) of **A**.

Ans:
A: δ_H (270 Mz) 8.60 (1H, s, imine), 8.09 (1H, d, *J* 2.2 Hz *o*- to Br, *m*-coupled only), 7.69 (2H, dd, *J* 8.6, 2.2 Hz, *p*- to Br, *o*-and *m*-coupled), 7.60 (2H, d, *J* 8.1 Hz, 3,5-H on tolyl, next to electron donating Me, higher field, *o*-coupled), 7.30 (2H, d, *J* 8.1 Hz, 2,6-H on tolyl, next to electron withdrawing S-O, lower field, *o*-coupled), 6.92 (1H, d, *J* 8.6 Hz, *o*- to electron donating MeO, high field, *o*-coupled only), 3.93 (3H, s, O-Me), 2.38 (3H, s, C-Me).

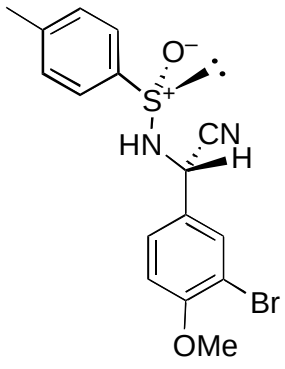
iv. Suggest a mechanism for the formation of **A**.

Ans: Hard (oxaphilic) Ti coordinates carbonyl O, then:—



v. Draw a full stereostructure of **B**.

Ans:



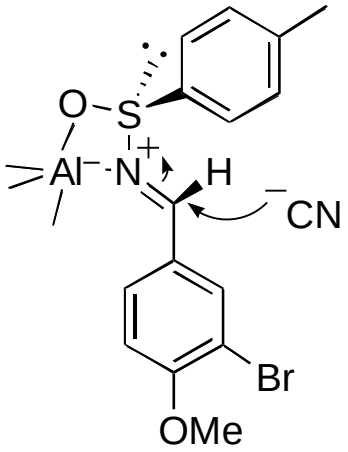
B

vi. By use of a suitable transition state model (use your molecular models and try a Felkin-Ahn type rationale), propose a mechanism for the formation of **B**.

PTO

Ans: There are several possibilities here:—

1. Coordinate the Al on both the N and the O^- atoms, this puts the Ar group on the upper face and the CN^- will attack from the lower face.



2. Coordinate Al to N only; choose conformer with bulky Al between lone pair and O (small and medium groups); attack with CN^- from side remote from O^- (underside as drawn below).