

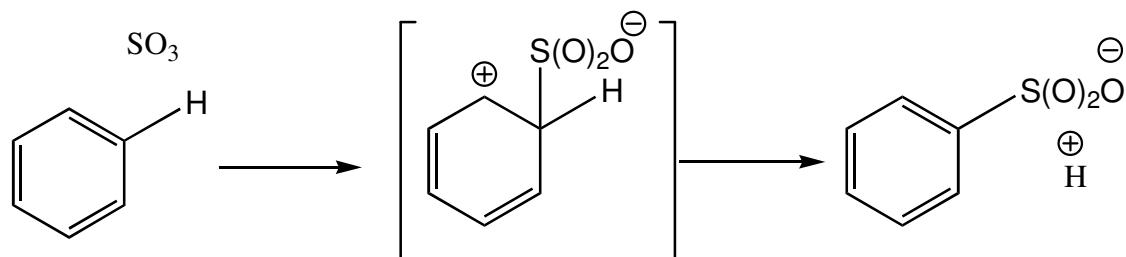
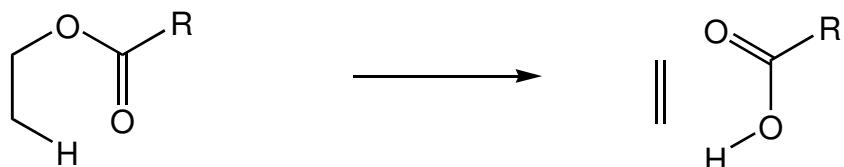
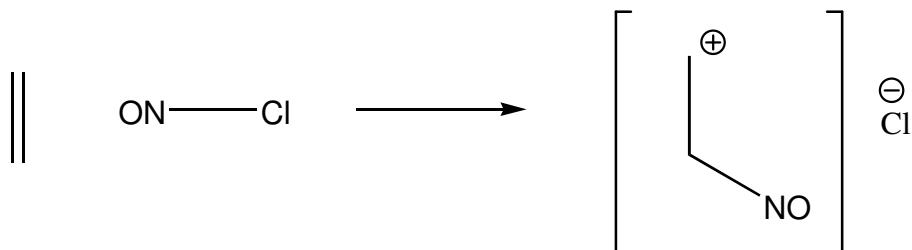
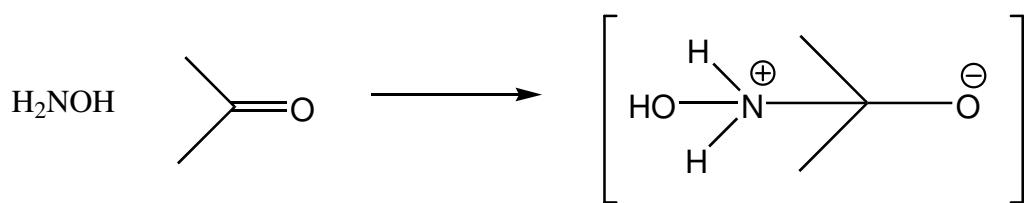
# ORGANIC TUTORIAL PROBLEMS AUTUMN TERM

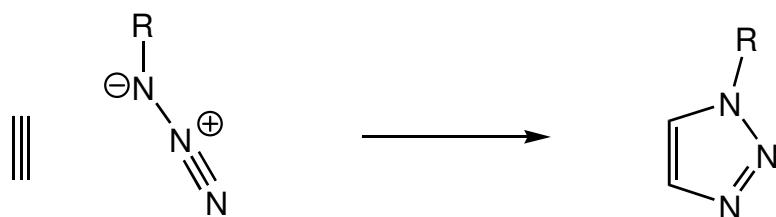
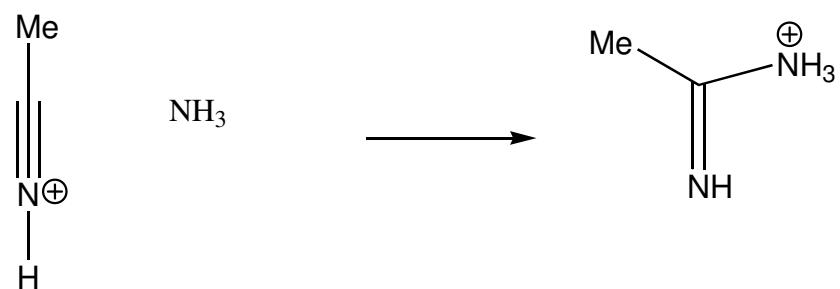
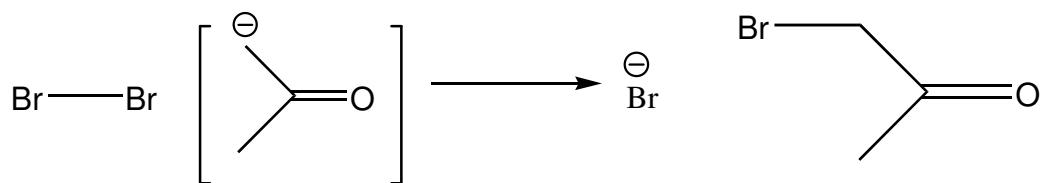
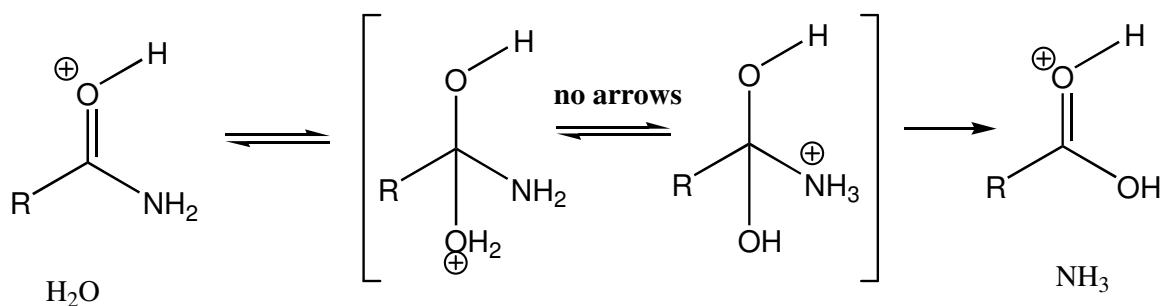
## Question 1 (Weeks 2-3)

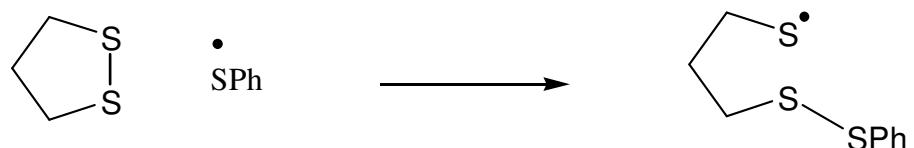
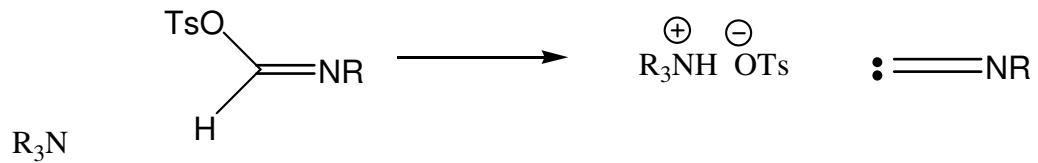
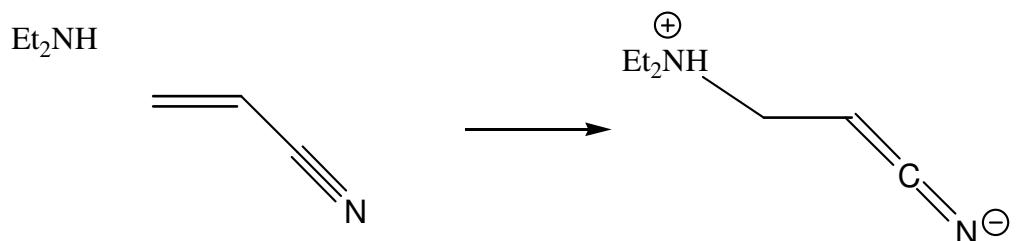
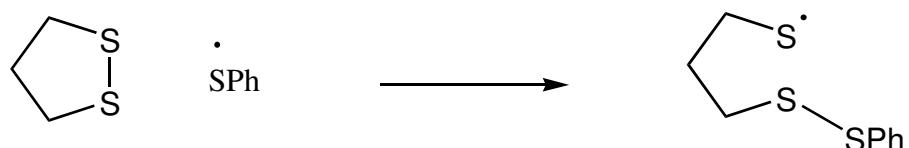
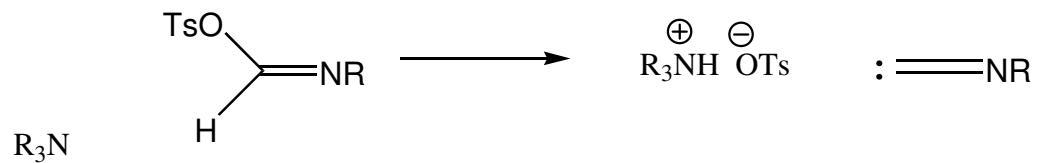
Draw as many structures as you can think of which fit the molecular formula  $C_6H_{10}$  (you might need a large piece of paper). Of these, from your knowledge of A-level chemistry, tick the ones which can be reduced by hydrogen and a catalyst. Of the ticked cases, circle those which can exist as enantiomers.

## Question 2 (Weeks 3-5)

For each of the following reactions define the type of reaction and draw its arrow pushing mechanism (if you get stuck, use your arrow pushing workshop examples to help):

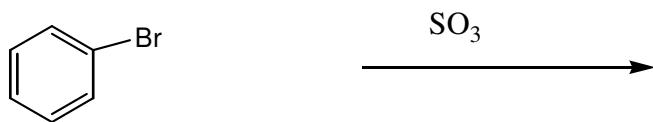
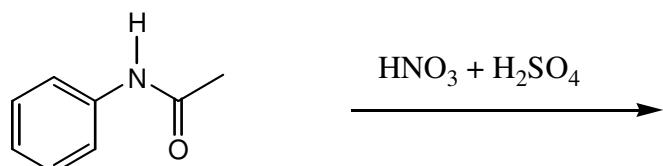
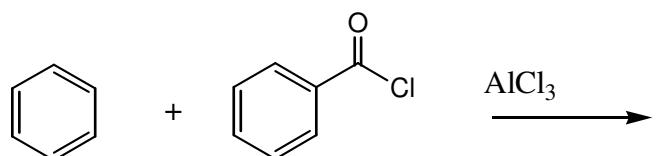






**Question 3 (Weeks 5-7)**

Identify the products expected from the following reactions:

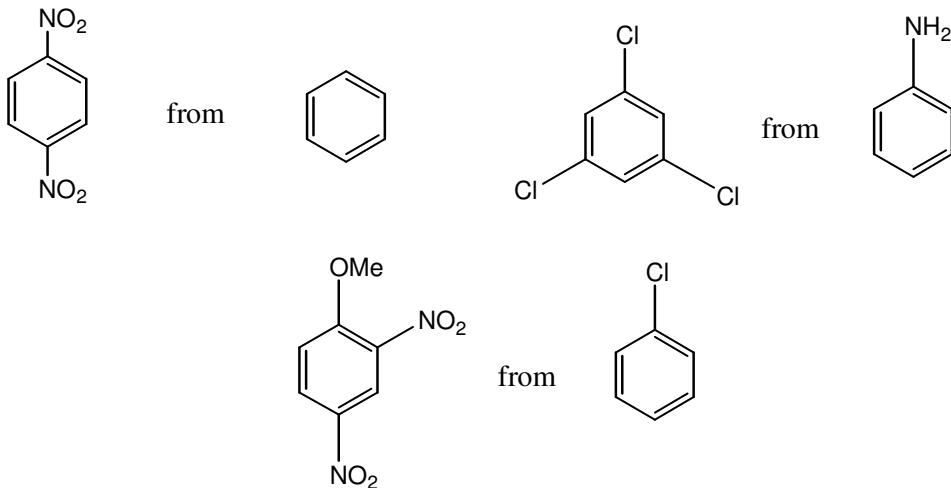


**Question 5 (Weeks 7-9)**

Explain the following observations:

- Friedel-Crafts alkylation reactions often result in polysubstitution products whereas Friedel-Crafts acylation reactions only give the monosubstituted product.
- Bromination of ethyl 4-methyl benzoate gives only one product
- Treatment of 4-chlorotoluene with  $\text{NaNH}_2$  in liquid ammonia gives two products

Suggest a synthetic route to each of the following compounds from the precursors indicated:



### Question 6 (Weeks 9-11)

For each reaction in the following synthetic sequence give one or more spectroscopic techniques (IR, NMR, MS) which will allow you to clearly differentiate between the product and the starting material, stating what the differences will be in each case:

