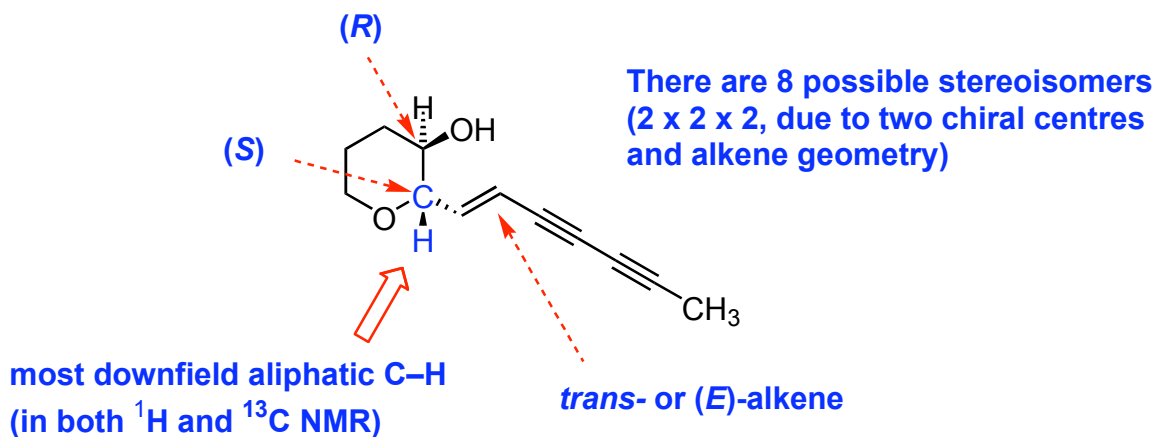
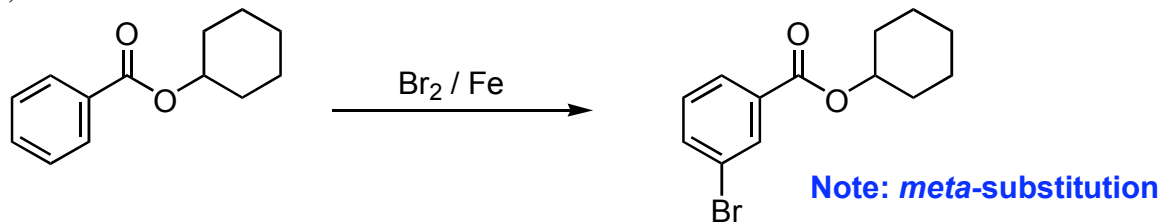


Answer Guide to Examination 1
CHEMISTRY 249S:
February 12th 2008

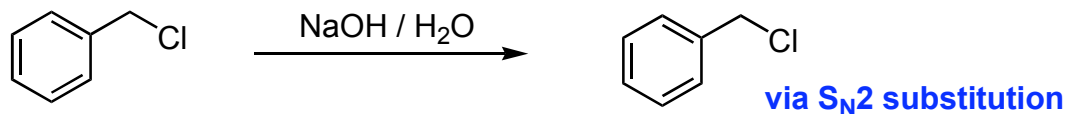
1.



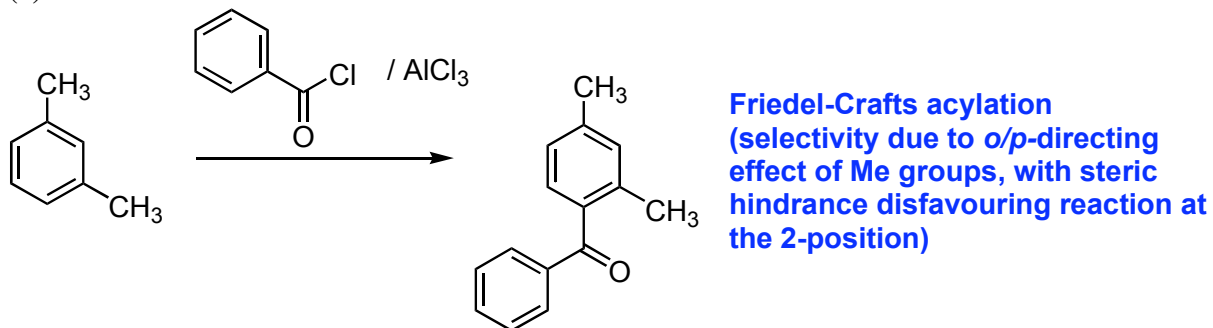
2. (a)



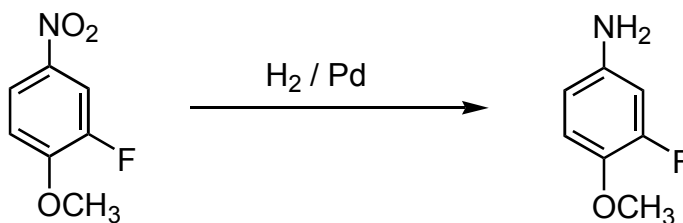
(b)



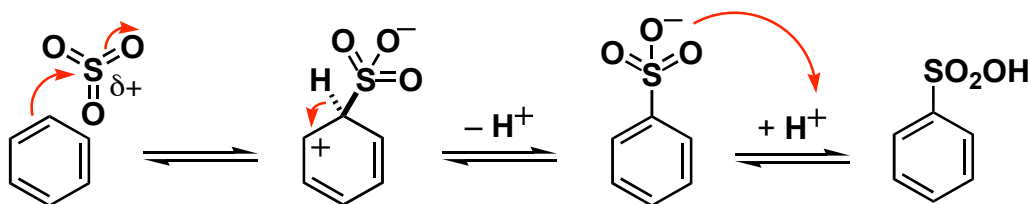
(c)



(d)



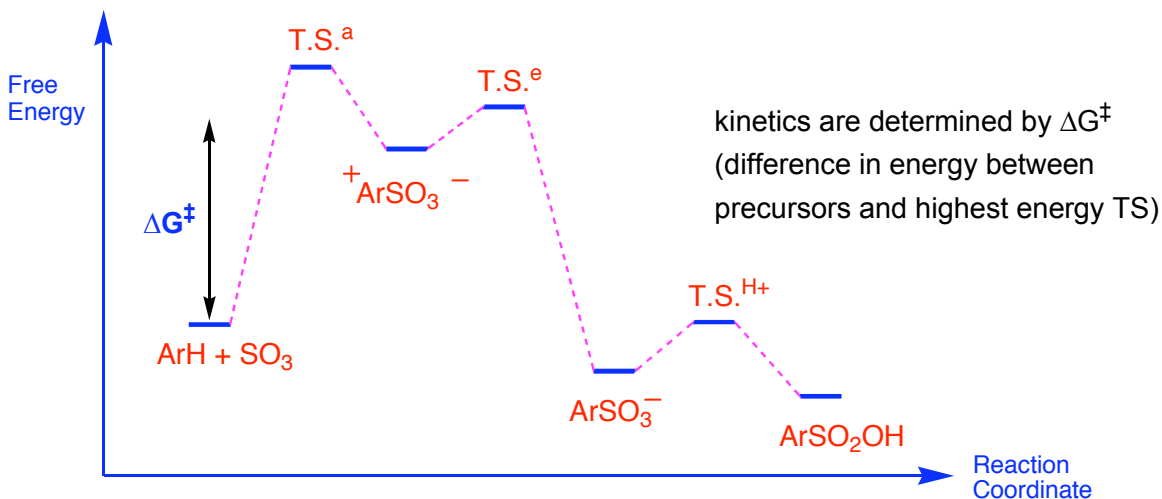
3. (a) Draw a full mechanism for this transformation. Your answer should include curved arrows to show electron movement.



(b) Is the reaction shown slower or faster than electrophilic sulfonation of benzene under the same conditions?

The reaction is faster because of the activating influence of the OEt group.

(c) Draw a reaction profile diagram (energy versus reaction coordinate) for the transformation. Clearly indicate on the reaction profile diagram the energy difference that controls the overall kinetics of the reaction.



(d) Is the selective formation of the *para* and *ortho* products over the *meta* product an example of kinetic or thermodynamic control?

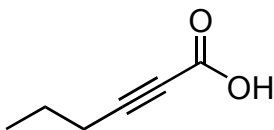
As for most electrophilic aromatic substitutions the reaction is occurring under kinetic control.

(e) The *para* and *ortho* products are selectively formed. Why is the *para* product (or the *ortho* product) selectively over the *meta* product? Draw appropriate chemical structures to support your argument.

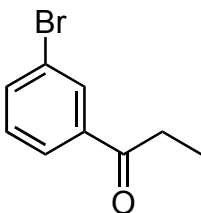
The selectivity of the reaction is due to the lower energy of the *ortho/para* transition states over the *meta* transition state. Using Hammond's postulate we can understand the lower energy for the *ortho/para* transition states as due to the greater resonance stabilization that occurs in these transition states (because of the electron donating character of the OEt group) and the corresponding Wheland intermediate.

See Lecture Notes for the structures of the *ortho/para* and *meta* intermediates.

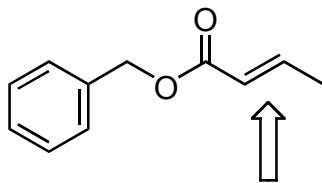
4. COMPOUND A:



COMPOUND B:



COMPOUND C:



Note: *trans* geometry of alkene