Chemistry II (Organic): Heterocyclic Chemistry

TUTORIAL PROBLEMS

Prof Alan Spivey; Office: 835 C1; e-mail: a.c.spivey@imperial.ac.uk; Tel.: 45841

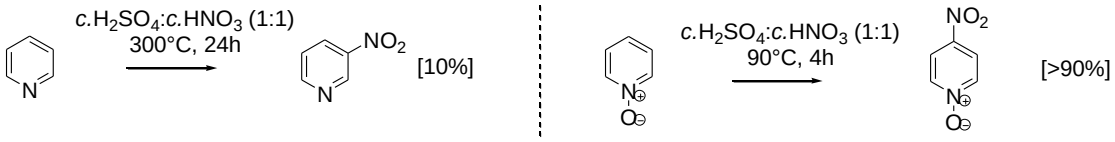
1. Draw the following heteroaromatic structures and give at one alternative tautomeric structure for each:

   (a) 1-hydroxyisoquinoline
   (b) 3-aminoquinoline
   (c) 2-hydroxyfuran
   (d) 4-hydroxypyridine
   (e) 2-aminothiophene

2. Show how Huckel's rule is in accord with MO energy diagrams of:

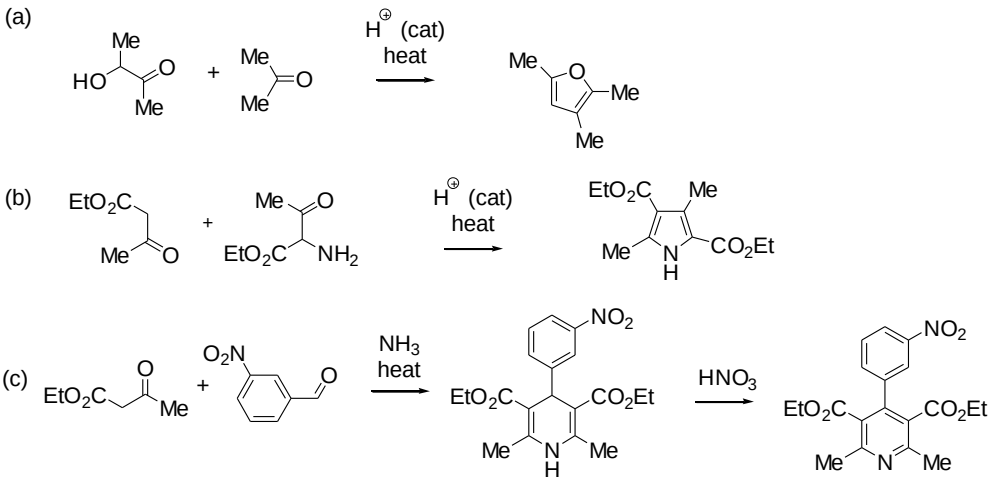
   (a) pyridine
   (b) furan

3. Nitration of pyridine using a mixture of *c*.H_2SO_4 and *c*. HNO_3 at 300 °C results in 10% conversion to 3-nitropyridine in 24 h. By contrast, treatment of pyridine-*N*-oxide under milder conditions for 4 h furnishes 4-nitropyridine-*N*-oxide in 90% yield:



   (a) provide a mechanism for the reaction of pyridine and account for the regioselectivity observed.
   (b) explain why the *N*-oxide displays higher reactivity in this type of reaction and gives different regioselectivity compared to pyridine.

4. Give reasonable mechanisms for the following transformations:



5. Provide the missing reactant for each of the following transformations and draw out a mechanism.