Dr. Peter Wipf

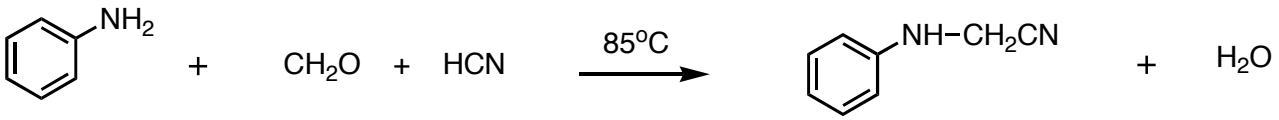
Chemistry 1310/2370 - Synthetic Organic Chemistry

Solution Set 1

A. Propose syntheses for the following compounds (include reagents):

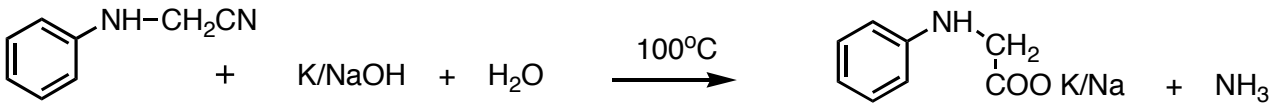
a) **Indigo**, from aniline and using a Strecker reaction as the first step.

1. Phenylglycine nitrile



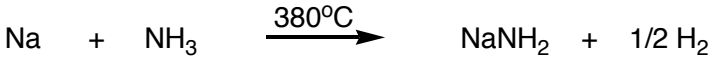
Phenylglycine nitrile (97%)

2. Saponification

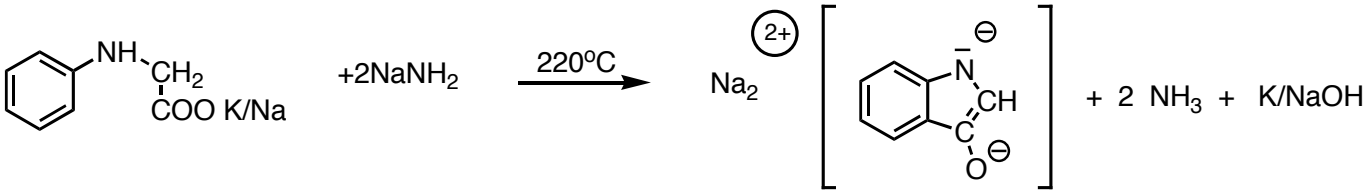


Phenylglycine-K/Na-salt (97.2%)

3. Sodium Amide

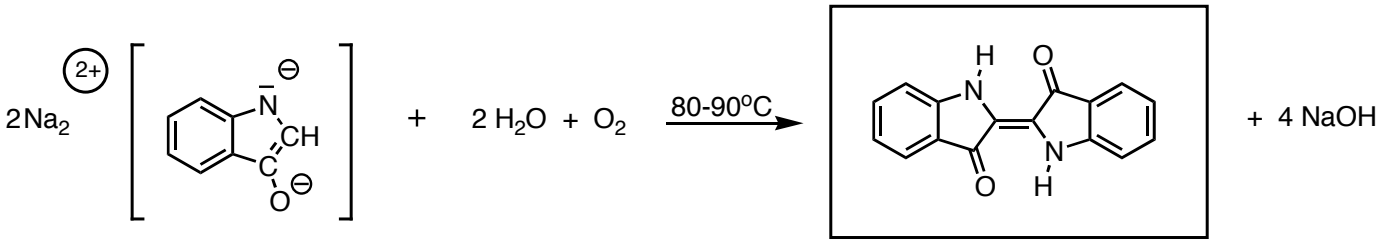


4. Indoxylate-Melt reaction



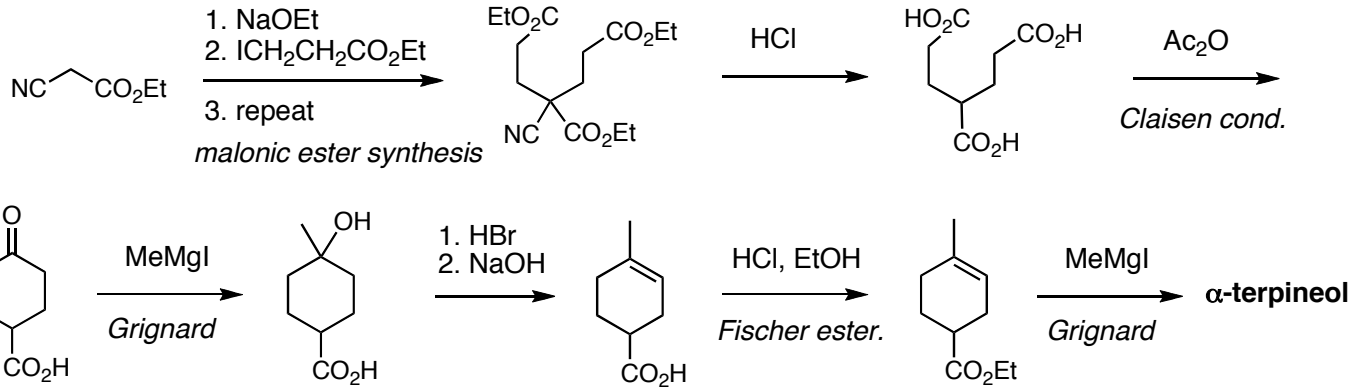
Na-Indoxylate

5. Indigo-Oxidation

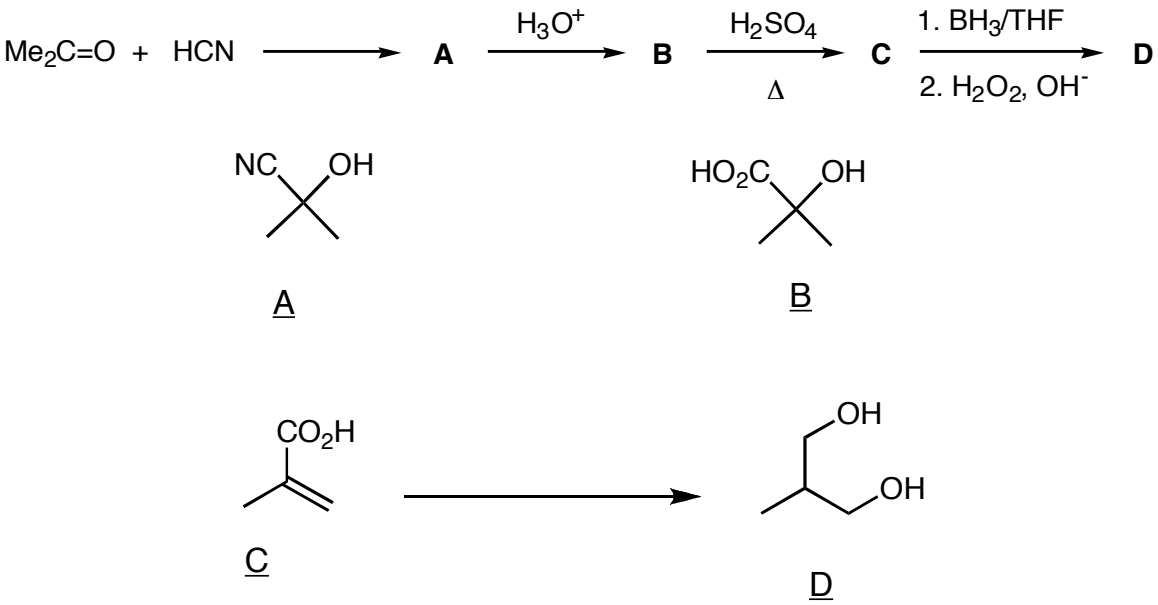


INDIGO (88.9%) from PG-salt
overall yield = 83.8%

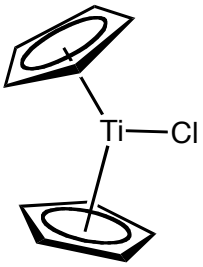
b) **α-Terpineol**, from ethyl cyanoacetate and using malonic ester, Claisen condensation, Grignard, and Fischer esterification reactions.



B. Write structures for **A** through **D**:



C. Determine the oxidation state, the d-electron count, and the total electron count of the titanocene chloride.

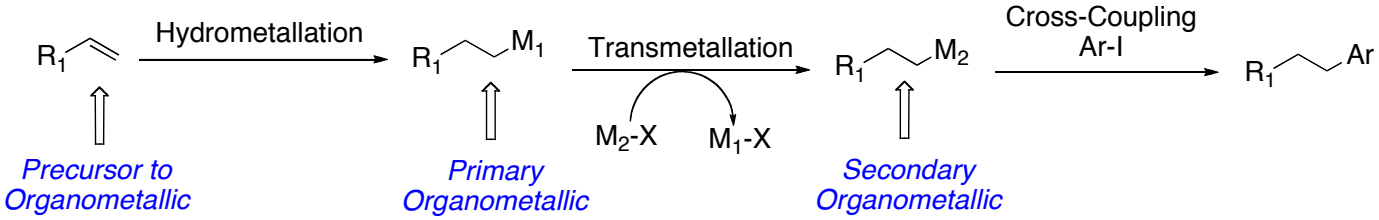


Ox. State: 2 Cp^-, 1 Cl^-
→ Ti(III)

d: 4 ($4d^2 5s^2$) - 3 = 1

electron count: 2 Cp^-: 12
Cl^-: 2
Ti: 1
15 e^-, unsaturated

D. In the following sequence, insert the names of the organometallic mechanisms:



E. Provide a mechanism for the Heck coupling of (*Z*)-β-methylstyrene with 2-bromofuran. Pay particular attention to the stereochemistry of the intermediates and the product.