**Exam 3, April 28th, 50 minutes**

Provide the organic products, reactants, or reagents necessary to complete the following reaction schemes.

**1)**

**2)**

**3)**

**4)**



**5)**



**6)**



**7)**



**8)** Please show both organic products.



**9)**

**10)** Show both organic products.



**11)** Make this acyl chloride in one step.



**12)**



**13)**



**14)**



**15)** Show both products.



Please give the ***mechanism*** for ***all*** of the following three transformations. Include all ***lone pairs*** and correct ***formal charges***.

**16)**



**17)**



**18)**



**Grading Rubric (93)**

**Questions 1 – 15 (47 points)**

 **In general 3 points for each organic product and 1 point for each step of reagent**

 **Intermediates shown instead of product (half credit)**

 **1/3rd penalty for the following…**

 **Formal charge error**

 **Showing one hydrogen on a carbon but not all of them**

 **Too few or too many hydrogens on a carbon**

 **Conjugate acid or conjugate base of the correct compound shown**

 **Questions 8, 10, and 15 (-1.5 points for each product)**

 **Question 6 (O=PPh3) is not counted for points**

 **Question 5 was missing a reagent HCl (+3.5 points for everyone)**

**Question 16 (16 points)**

**5-6 arrows (12 points)**

**Initial protonation could be shown with one or two arrows (2 points either way)**

**(1 point for each arrow thereafter)**

**2 intermediates (4 points)**

**Conceptual Errors (-2 points each)**

 **Common conceptual errors**

 ***Missing a step***

 ***Step out of order***

 **Formal charge error (-1 point)**

 **Lone pair errors (-1 point)**

**Question 17 (10 points)**

**6 arrows (6 points)**

**2 intermediates (4 points)**

**Conceptual Errors (-2 points each)**

 **Common conceptual errors**

 ***Missing a step***

 ***Step out of order***

 **Formal charge error (-1 point)**

 **Lone pair errors (-1 point)**

**Question 18 (20 points)**

**10 arrows (10 points)**

**(1 point each)**

**Protonation could be shown with one or two arrows and are each worth 1 point for this question.**

**5 Intermediates (10 points)**

**Conceptual Errors (-2 points each)**

 **Common conceptual errors**

 ***Missing a step***

 ***Step out of order***

**Formal charge error (-1 point)**

**Lone pair errors (-1 point)**

**Reasons for change in grading intermediates**

1. **Same conceptual error (Step out of order) giving two different penalties when individual intermediates are graded.**
2. **The penalties are inconsistent with the # of conceptual errors when individual intermediates are graded.**