

Key


Name: \_\_\_\_\_

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(Print your name clearly!)

**Sametz: CHEM 322 2010**  
**Organic Chemistry Exam 3**

All answers should be written CLEARLY in the space provided. (If it's not clear, it's wrong).

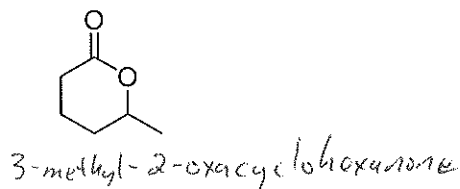
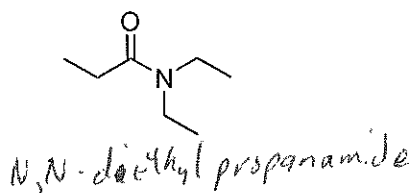


|   |              |              |             |              |              |             |             |             |             |             |             |             |             |              |             |              |             |             |    |             |    |              |    |              |
|---|--------------|--------------|-------------|--------------|--------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|--------------|-------------|--------------|-------------|-------------|----|-------------|----|--------------|----|--------------|
| 1 | H<br>1.008   | 2            |             |              |              |             |             |             |             |             |             |             | 18          | He<br>4.003  |             |              |             |             |    |             |    |              |    |              |
| 2 | Li<br>6.941  | Be<br>9.012  |             |              |              |             |             |             |             |             |             |             | 13          | B<br>10.81   | 14          | C<br>12.011  | 15          | N<br>14.007 | 16 | O<br>15.999 | 17 | F<br>18.998  | 18 | Ne<br>20.18  |
| 3 | Na<br>22.989 | Mg<br>24.305 |             |              |              |             |             |             |             |             |             |             | 13          | Al<br>26.982 | 14          | Si<br>28.086 | 15          | P<br>30.974 | 16 | S<br>32.06  | 17 | Cl<br>35.453 | 18 | Ar<br>39.948 |
| 4 | K<br>39.098  | Ca<br>40.08  | Sc<br>44.96 | Ti<br>47.88  | V<br>50.94   | Cr<br>52.00 | Mn<br>54.94 | Fe<br>55.85 | Co<br>58.93 | Ni<br>58.71 | Cu<br>63.55 | Zn<br>65.38 | Ga<br>69.72 | Ge<br>72.59  | As<br>74.92 | Se<br>78.96  | Br<br>79.90 | Kr<br>83.8  |    |             |    |              |    |              |
| 5 | Rb<br>85.468 | Sr<br>87.62  | Y<br>88.906 | Zr<br>91.22  | Nb<br>92.906 | Mo<br>95.94 | Tc<br>(98)  | Ru<br>101.1 | Rh<br>102.9 | Pd<br>106.4 | Ag<br>107.9 | Cd<br>112.4 | In<br>114.8 | Sn<br>118.7  | Sb<br>121.8 | Te<br>127.60 | I<br>126.9  | Xe<br>131.3 |    |             |    |              |    |              |
| 6 | Cs<br>132.9  | Ba<br>137.3  | La<br>138.9 | Hf<br>178.49 | Ta<br>180.9  | W<br>183.8  | Re<br>186.2 | Os<br>190.2 | Ir<br>192.2 | Pt<br>195.1 | Au<br>197   | Hg<br>200.6 | Tl<br>204.4 | Pb<br>207.2  | Bi<br>209   | Po<br>(209)  | At<br>(210) | Rn<br>(222) |    |             |    |              |    |              |
| 7 | Fr<br>(223)  | Ra<br>226    | Ac<br>227   | Rf<br>(261)  | Db<br>(262)  | Sg<br>(266) | Bh<br>(264) | Hs<br>(269) | Mt<br>(268) |             |             |             |             |              |             |              |             |             |    |             |    |              |    |              |
| 6 | Ce<br>140.1  | Pr<br>140.9  | Nd<br>144.2 | Pm<br>(145)  | Sm<br>150.4  | Eu<br>152   | Gd<br>157.3 | Tb<br>158.9 | Dy<br>162.5 | Ho<br>164.9 | Er<br>167.3 | Tm<br>168.9 | Yb<br>173   | Lu<br>175    |             |              |             |             |    |             |    |              |    |              |
| 7 | Th<br>232    | Pa<br>231    | U<br>238    | Np<br>237    | Pu<br>(244)  | Am<br>(243) | Cm<br>(247) | Bk<br>(247) | Cf<br>(251) | Es<br>(252) | Fm<br>(257) | Md<br>(258) | No<br>(259) | Lr<br>(262)  |             |              |             |             |    |             |    |              |    |              |

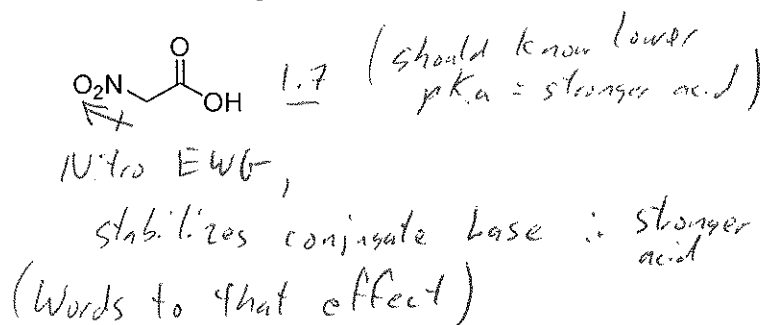
You may raise your hand to ask a question if you are unsure what a question is asking of you.

## Part 1 Short Answer

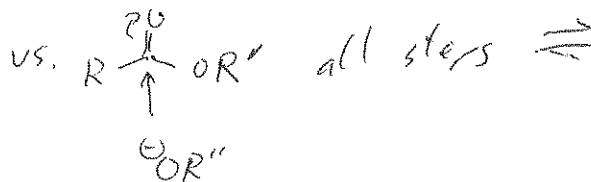
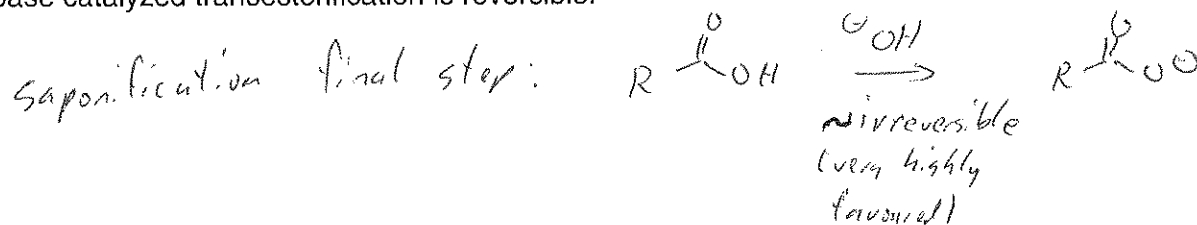
1. (6 points) Name the following compounds:



2. (4 points) Shown below are the structures of acetic acid and of 2-nitroacetic acid. One has a pKa of 1.7, and the other has a pKa of 4.8. Assign each structure with the correct pKa, and explain how you determined this. (Note: zero credit for a correct assignment with no rationale)



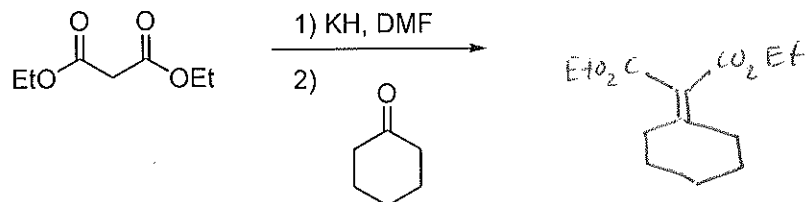
3. (10 points) Explain why hydrolysis of an ester in base (i.e. saponification) is irreversible, but base catalyzed transesterification is reversible.



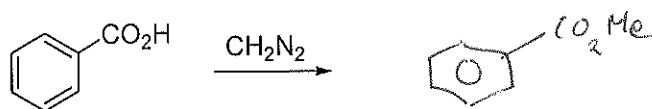
### Part 2: Reactions and Synthesis

4. (30 points) Give the major organic product(s) for 10 of the following 11 reactions. **CLEARLY INDICATE THE QUESTION THAT YOU DON'T WANT GRADED!** Otherwise, the first 10 questions that show work will be graded.

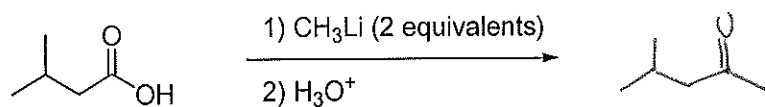
a)



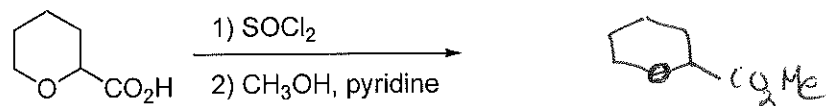
b)



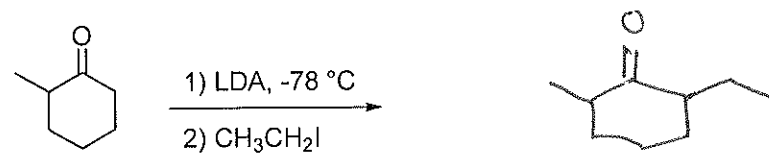
c)

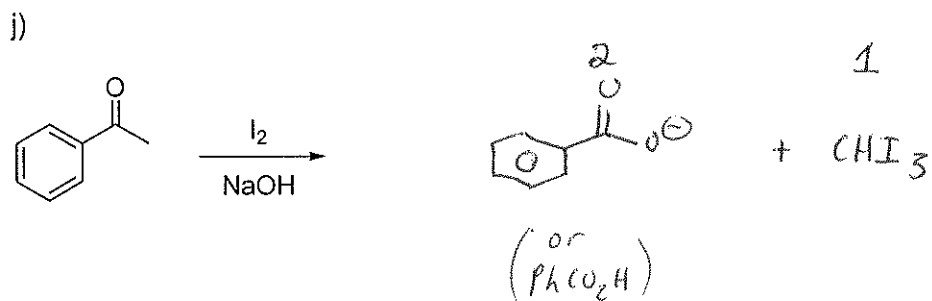
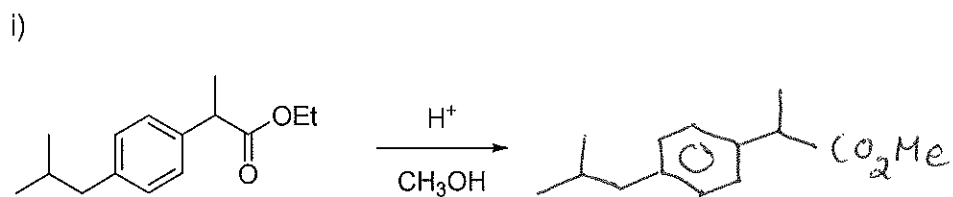
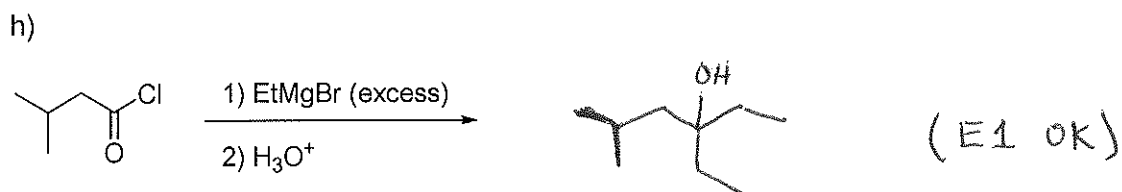
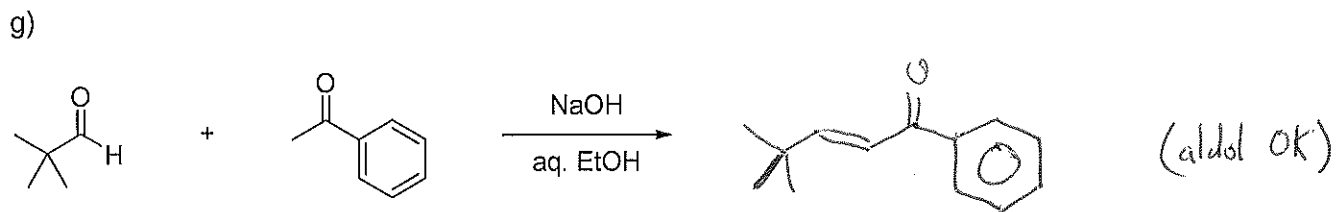
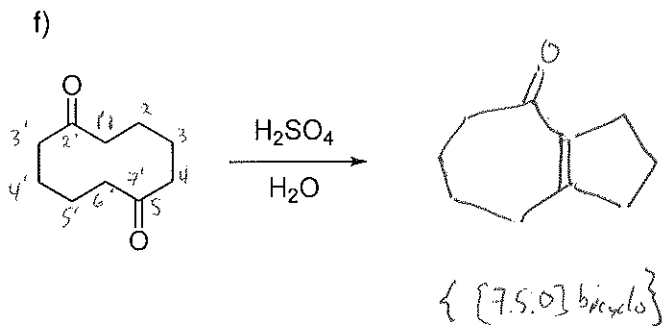


d)



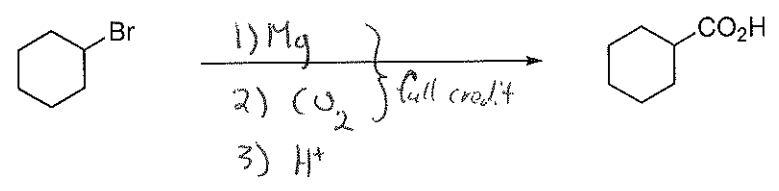
e)



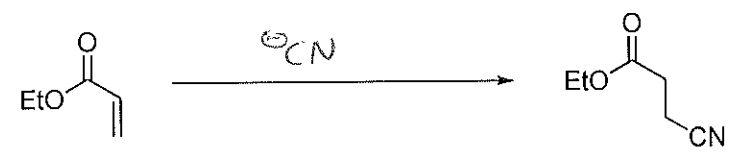


5. (30 points) Give reagents for the following transformations:

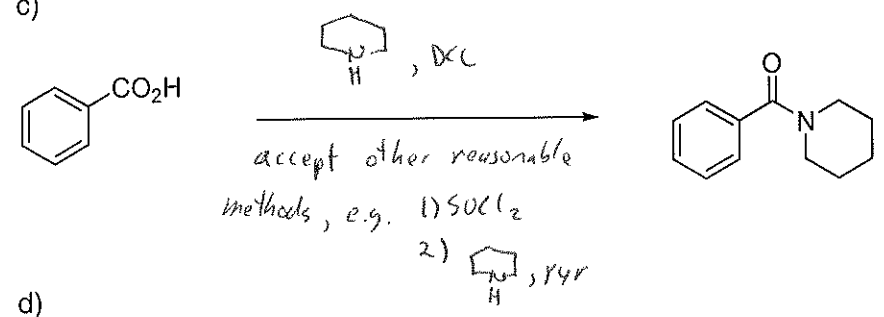
a)



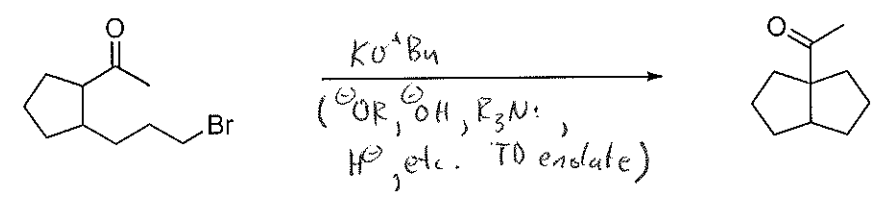
b)



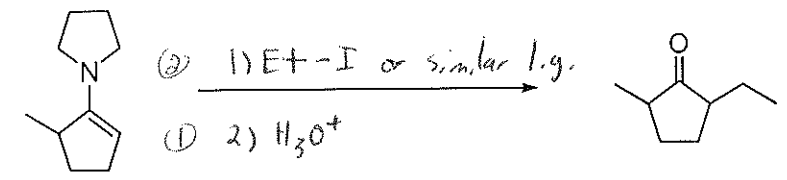
c)



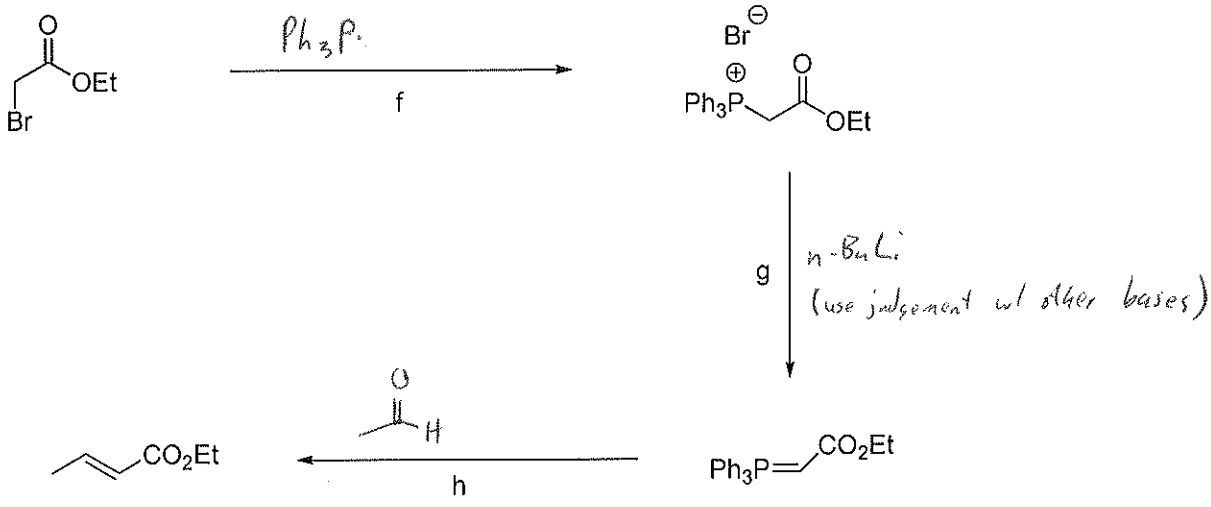
d)



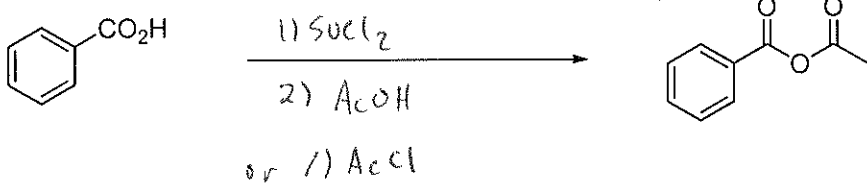
e)



f-h)

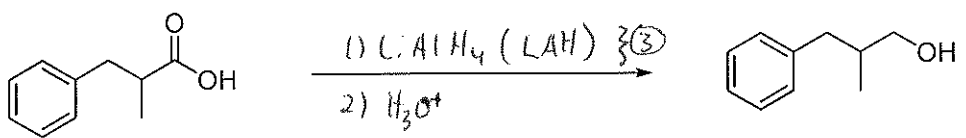


i)



No AcOH: -1

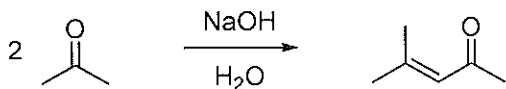
j)



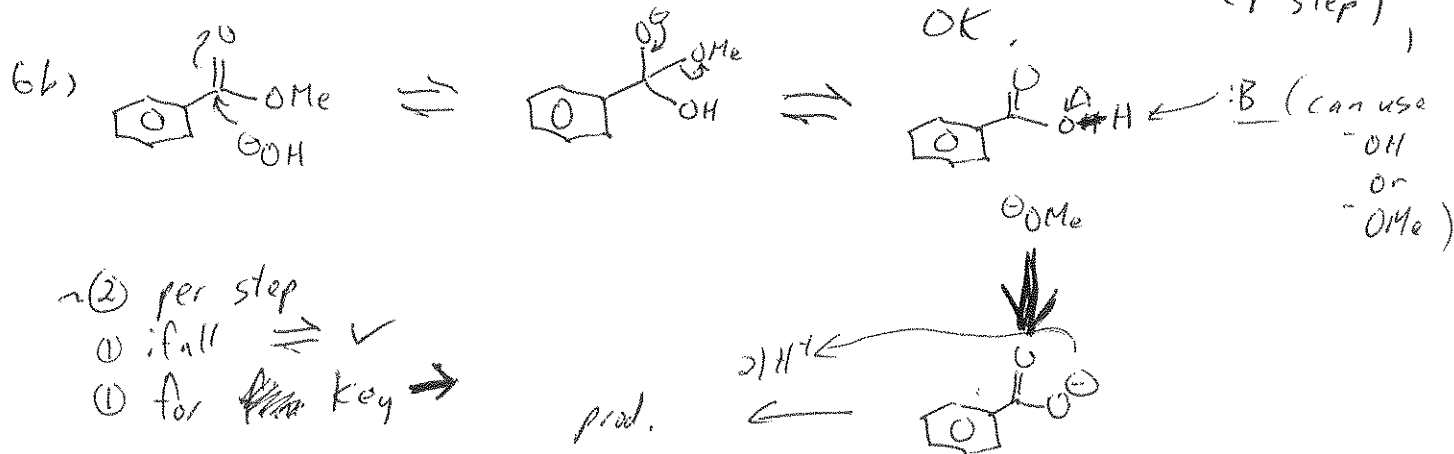
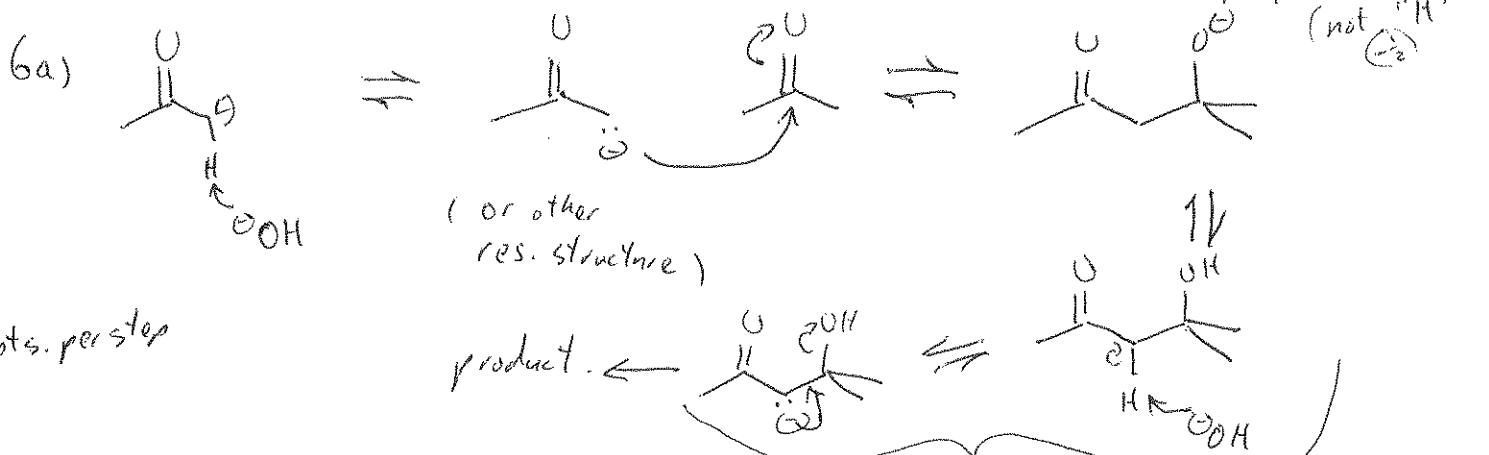
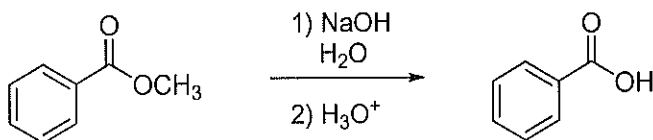
$\text{NaBH}_4$ : -2

6. (10 points) Give mechanisms for ONE of the following two transformations. **CLEARLY INDICATE THE QUESTION THAT YOU WANT GRADED!** Otherwise, the first question that shows work will be graded.

a)

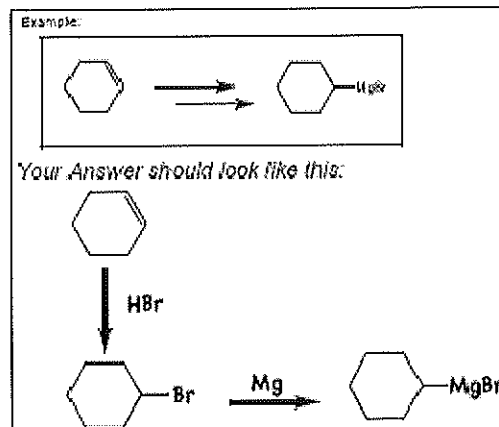


b)

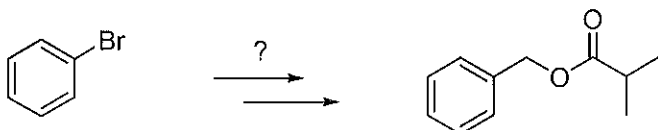


### Part III Multistep Synthesis (9 points)

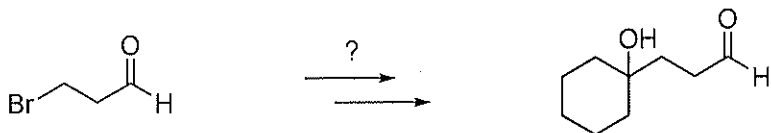
7. (10 points) Choose one of the two following synthesis problems. Show how you can synthesize the product on the right from the indicated starting material on the left. You can show a retrosynthesis for partial credit, but full credit requires writing out a sequence of forward reactions (see box at right for an example).



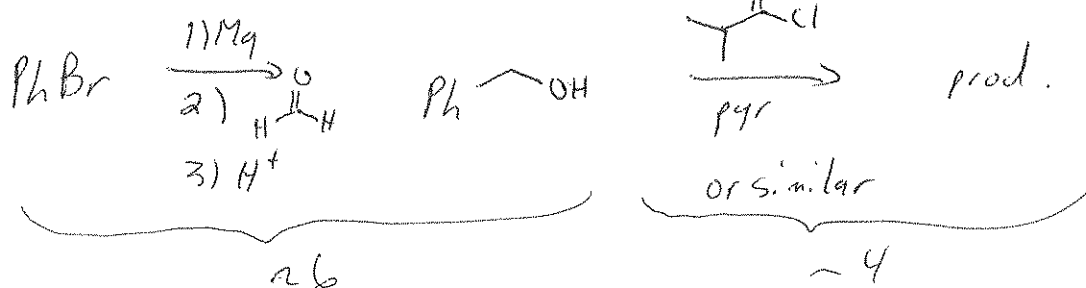
a)



b)



a)



(or: br.ig. with  $\text{CO}_2$  then LAH, or... other ways possible.  
Grade according to feasibility

