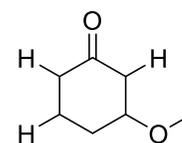
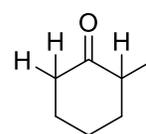
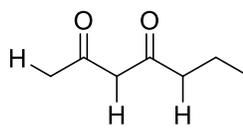
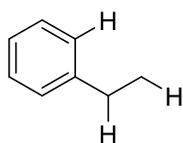
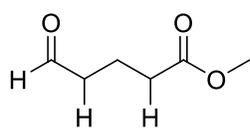


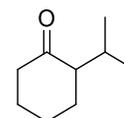
1. In each case, circle the most acidic proton of the ones indicated.



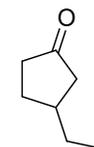
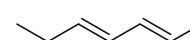
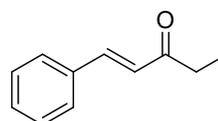
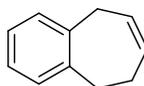
2. Give the structure of...

- ...LDA
- ...a tautomer of pentane-2,4-dione
- ...the product of an intramolecular aldol *reaction*
- ...a quaternary ammonium salt
- ...the best base to use for the alkylation of *ethyl 3-oxopentanoate*
- ...a  $\gamma$ -lactone that would be more acidic than water
- ...the species that would transfer a vinyl group to palladium in a Suzuki reaction
- ...a compound that could be the product of an alkylation followed by ring closing metathesis

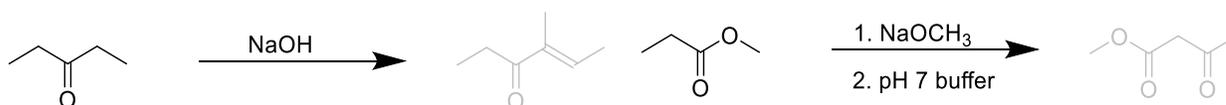
3. Discuss the issue of thermodynamic vs. kinetic control in relation to the alkylation of the compound shown on the right with methyl bromide. What is the issue? What conditions have synthetic organic chemists developed to solve this problem? Use full sentences. Be specific.



4. Provide the reactants and reagents that could be used to produce the following compounds in one step utilizing organometallic reagents:



5. Provide a mechanism for each of the two following reaction. Note that the products shown in gray are just sketches of the products. *They are not complete.* You will have to provide additional alkyl groups to complete them.



6. Depict the organometallic mechanistic step **for any four** of the following six types that are seen in a Heck or Suzuki reaction. You can use "L" for ligands such as  $\text{PPh}_3$ , but use actual appropriate organic structures, not just "R" or "RX", for organic groups. Indicate both reactants or both products if there are more than one of those. If the organometallic reactant of one reaction is the product of another that you have already written, you can write something like "product of a" instead of redrawing it. **Indicate "Heck" or "Suzuki" with the arrow** so I know what you are talking about.

- oxidative addition
- reductive elimination
- ligand transfer or transmetalation
- $\pi$  complexation
- $\beta$ -hydride elimination

7. Give the reactant(s), reagent, or major product, as needed, in each case.

