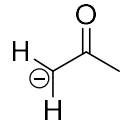
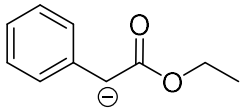
Experiment 24

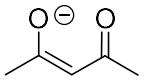
Aldol Condensation: Synthesis of Tetracyclone

Study Questions

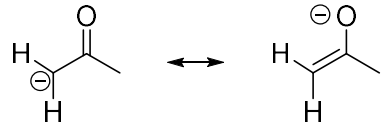
1) Draw the resonance structures for the following enolate ions:

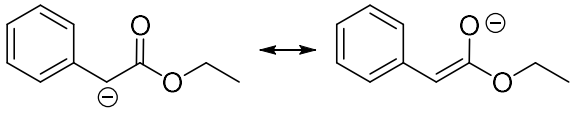
a. 

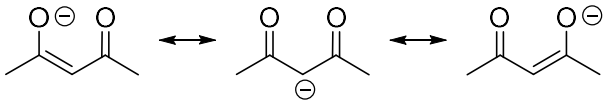
b. 

c. 

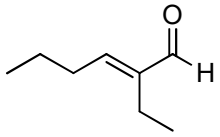
Answer:

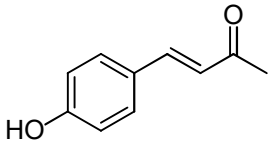
a. 

b. 

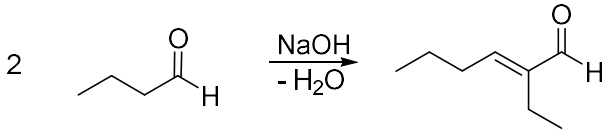
c. 

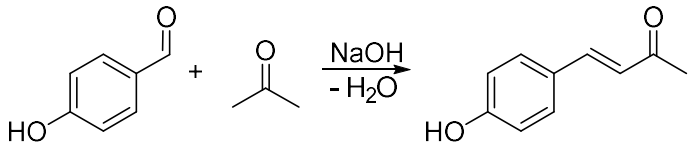
2) Using an aldol or crossed aldol condensation, suggest a synthesis of the following compounds:

a. 

b. 

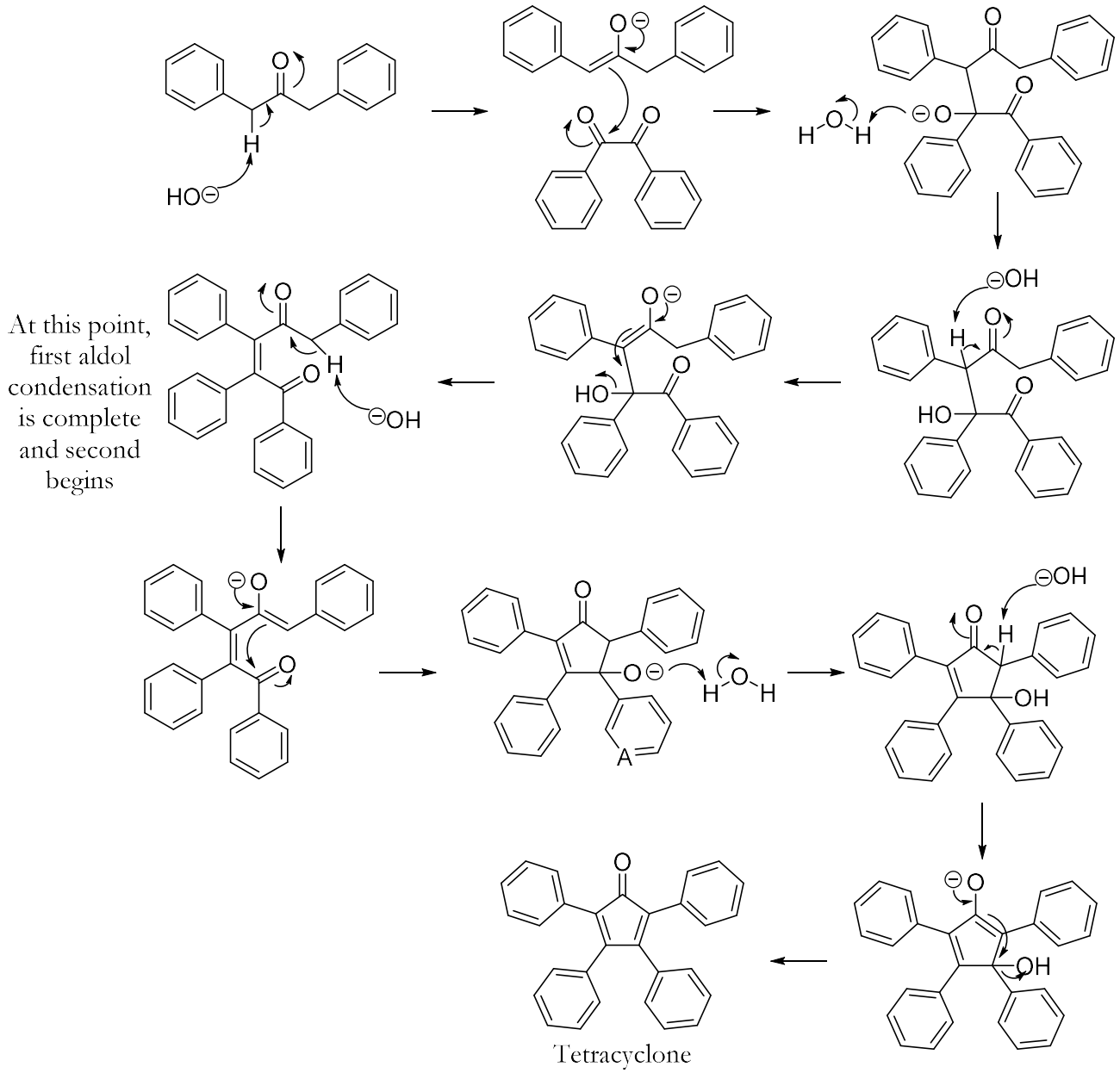
Answer:

a. 

b. 

3) Draw the mechanism for the reaction you will perform during today's experiment.

Answer:

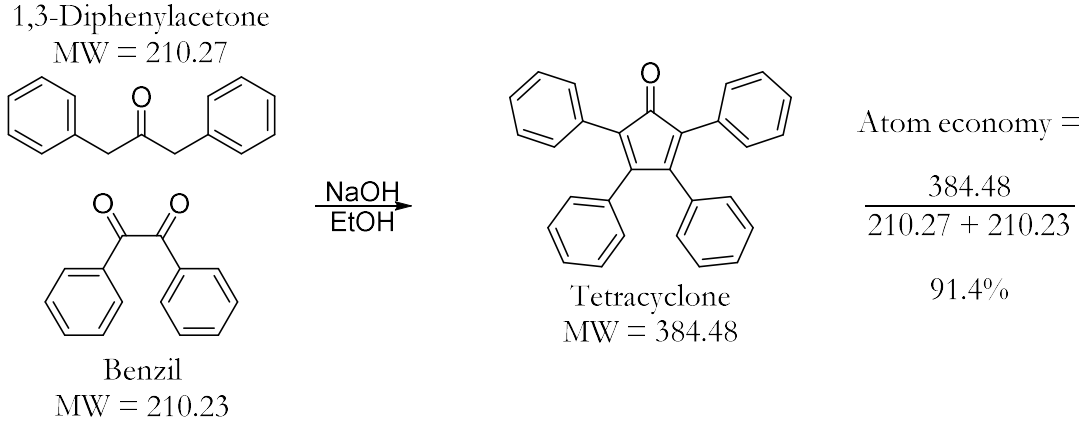


4) Even though both the starting materials for this experiment are white or yellow, the final product is a dark purplish-black. Explain this information, based on what you know about light absorption and conjugation.

Answer: The more conjugation a molecule has, the smaller the HOMO-LUMO gap will be, and the lower the absorption peak (λ_{max}). Tetracyclone is so extensively conjugated that it absorbs most light in the visible region.

5) Calculate the atom economy for this experiment.

Answer:



$$\text{Atom economy} = \frac{384.48}{210.27 + 210.23}$$

91.4%