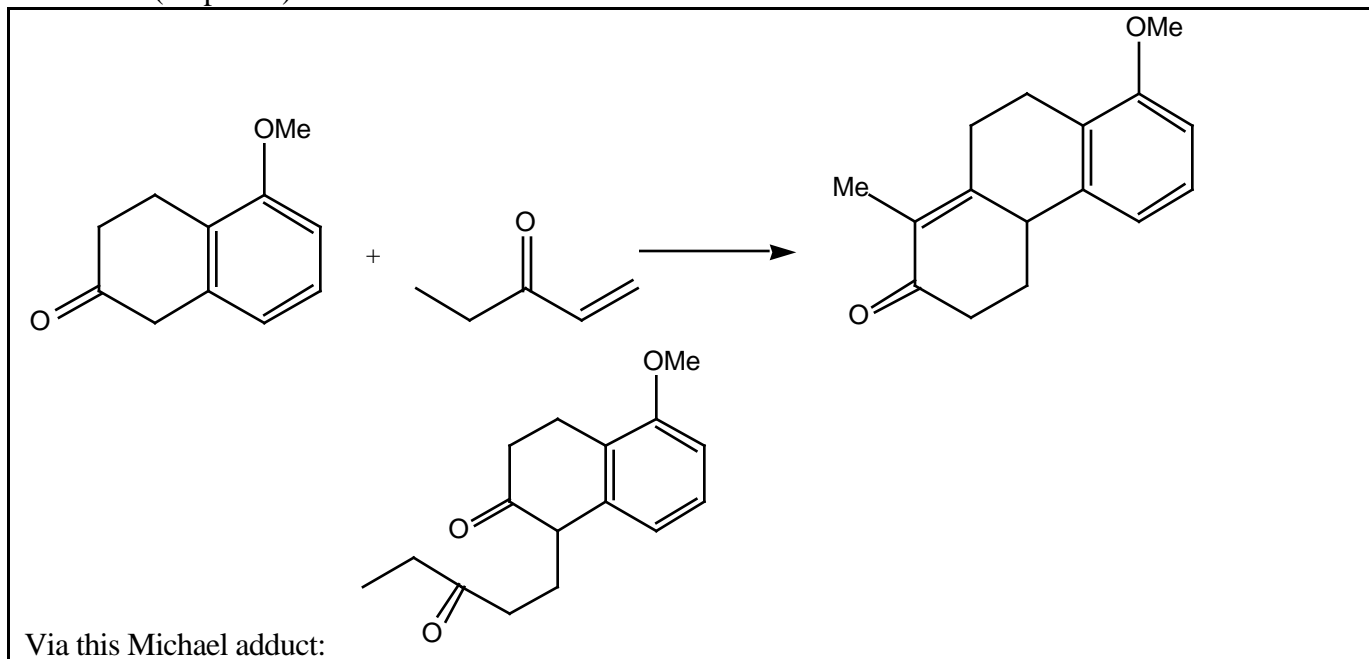


GTQ on Robinson Annulation. (20 points, synthesis, recognition, disconnection)

(a) Methyl vinyl ketones and its derivatives show a special behavior in Michael reactions. The initially formed 1,5-diketone will undergo a subsequent intramolecular aldol reaction to yield a cyclohexenone. This combination of **Michael reaction plus aldol reaction** is the Robinson annulation. This reaction has been useful for the synthesis of complex natural products such as steroids. For the substrates shown, draw the product of the overall reaction. Also provide the intermediate formed by the initial Michael addition. (10 points)



(b) The spiro compound shown can be synthesized via a Robinson annulation. Analyze this molecule and determine the “disconnections” necessary to deduce the starting materials for the synthesis. (10 points)

