Prelab: Multistep synthesis

Step 1
How can you use spectroscopy to determine whether you have, in fact, synthesized trans-cinnamic acid rather than cis-cinnamic acid? Explain, be specific, and assume that you do not have access to an authentic sample.

Step 2
1. Which of the compounds below (erythro or threo) would result...
   a. From a syn addition of bromine to trans-cinnamic acid?
   b. From an anti-addition of bromine to trans cinnamic acid?
   c. From a syn addition of bromine to cis-cinnamic acid?
   d. From an anti-addition of bromine to cis-cinnamic acid?

   ![Diagrams of erythro and threo dibromides]

2. Draw a Newman projection of the erythro dibromide down the C2-C3 bond, in which the carboxylate and the bromide on carbon 3 are anti to one another. Do the same for the threo diastereomer.

Step 3:
1. Starting with the compound you formed in step 2 (erythro or threo), draw an E2 mechanism for this decarboxylation/elimination. Which product forms, or is there a mixture of major/minor product?
2. Starting with the compound you formed in step 2 (erythro or threo), draw an E1 mechanism for this decarboxylation/elimination. Which product forms, or is there a mixture of major/minor product?
3. Explain, with reference to questions 1 and 2 above, whether you will use water or acetone as a solvent in step 3.