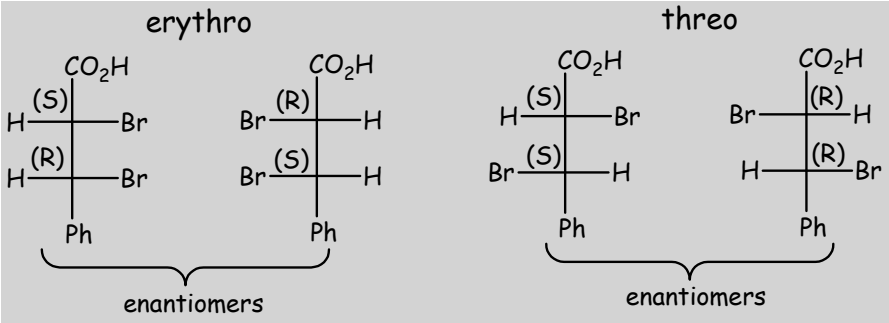
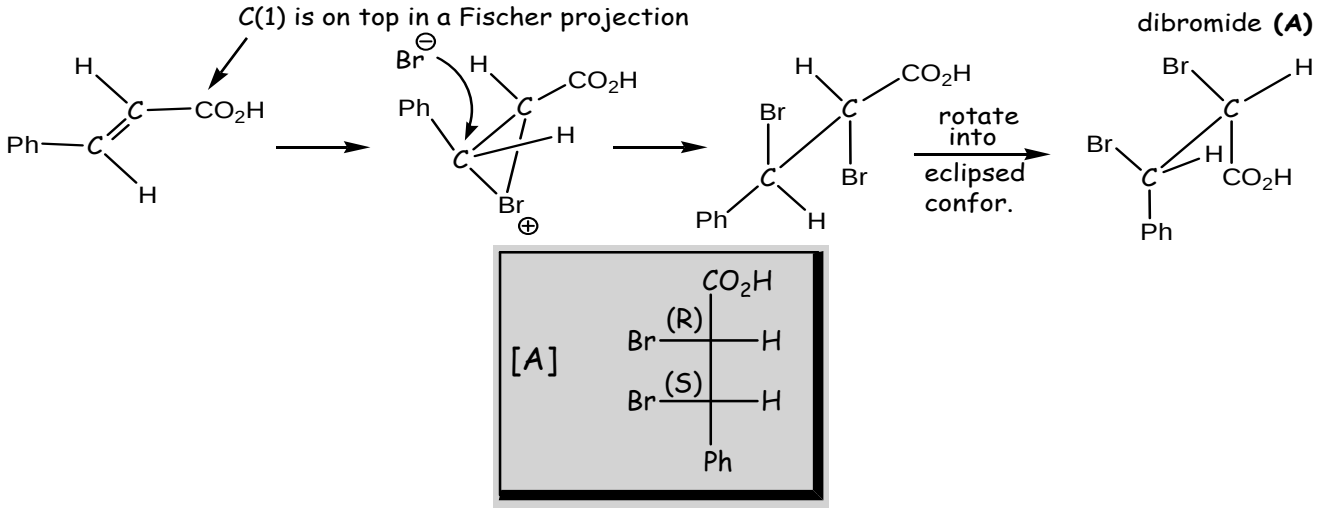
Exercises KEY

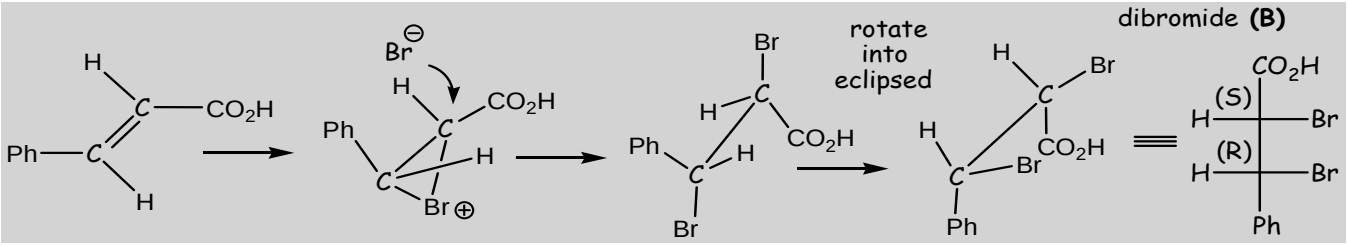
1. **(2 pts)** Draw Fischer projections for all stereoisomers of your reaction product (2,3-dibromo-3-phenylpropanoic acid), assign R,S configuration to each asymmetric center in each structure, label pairs of enantiomers, and identify the threo and erythro structures.



2. **(4 pts)** Draw a Fischer projection for dibromide (A) shown below and assign absolute stereochemistry (R or S) to both asymmetric centers.

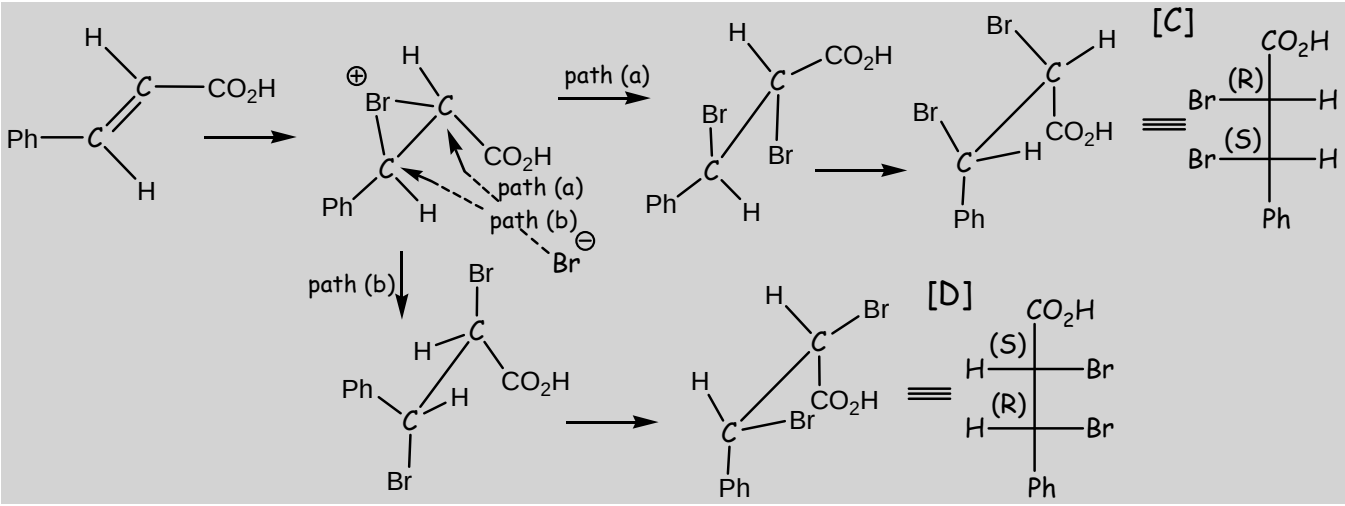


3. **(4 pts)** Draw a mechanism scheme similar to question #2 which illustrates bromide ion attacking the other carbon atom; label this dibromide (B) and assign R,S configuration to both asymmetric centers. (i) What is the stereochemical relationship between dibromides **A and B**, enantiomers, diastereomers or meso? (ii) A 50/50 mixture of **A and B** is erythro or threo? (iii) A 50/50 mixture of **A and B** racemic or not? (iv) A 50/50 mixture of **A and B** is optically active or inactive?



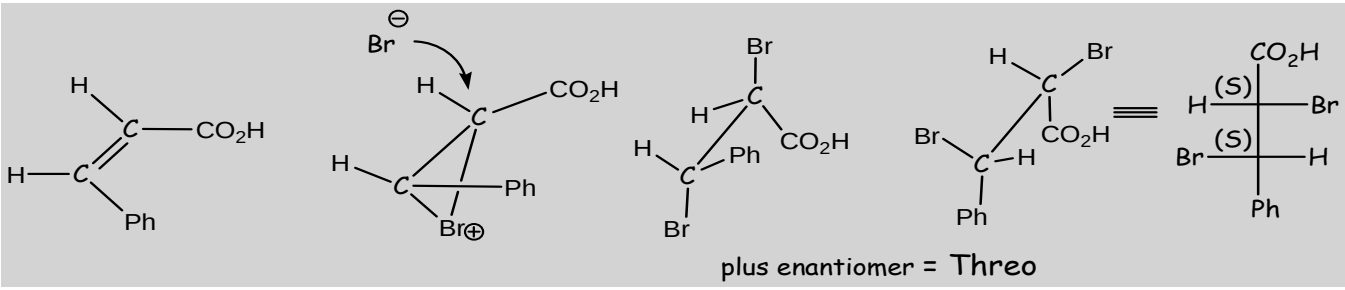
i) A and B are enantiomers
ii) erythro
iii) racemic
iv) inactive

4. **(4 pts)** Draw mechanism schemes similar to question #2 which illustrate bromonium ion formation on the top face of *trans*-cinnamic acid and bromide ion attacking each of the carbon atoms to give two dibromides (label them as C and D). Assign R,S configuration to all asymmetric centers. (i) What is the stereochemical relationship between dibromides **C and D**, enantiomers, diastereomers or meso? (ii) A 50/50 mixture of **C and D** is erythro or threo? (iii) A 50/50 mixture of **C and D** racemic or not? (iv) A 50/50 mixture of **C and D** is optically active or inactive?

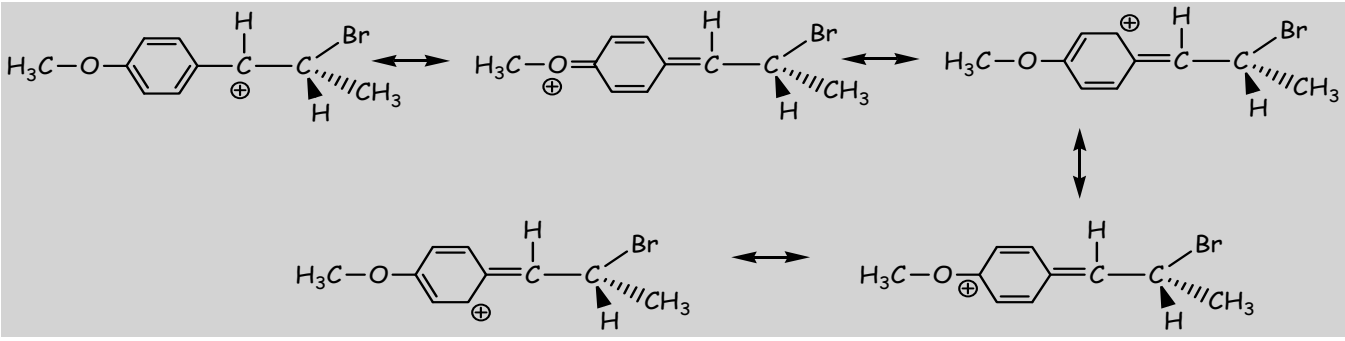


i) C and D are enantiomers ii) erythro
iii) racemic iv) inactive

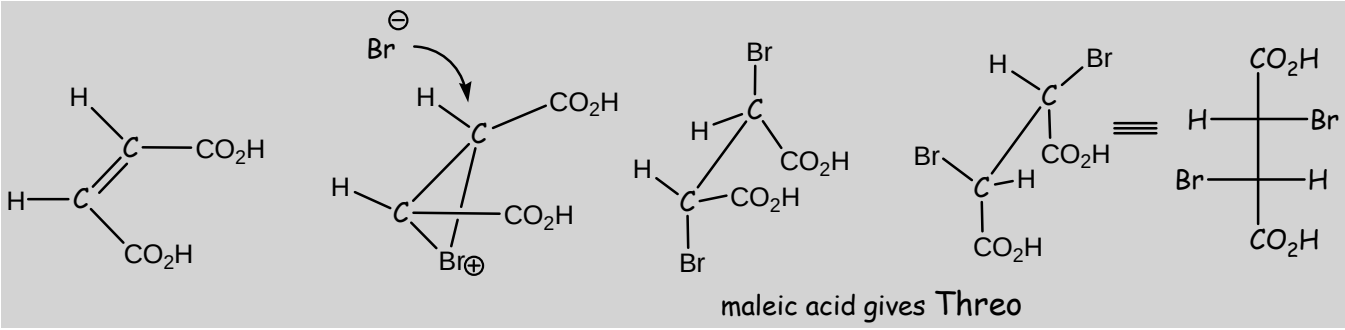
5. **(4 pts)** What product would you expect to obtain (erythro, threo or both) by the addition of bromine to *cis*-cinnamic acid, assuming it reacts by the same mechanism as *trans*-cinnamic acid? Include a mechanism scheme similar to that shown in question #2.



6. **(4 pts)** Draw resonance structures showing how the aryl group of *trans*-anethole stabilizes the intermediate carbocation shown in your lab text in "Understanding the Experiment".



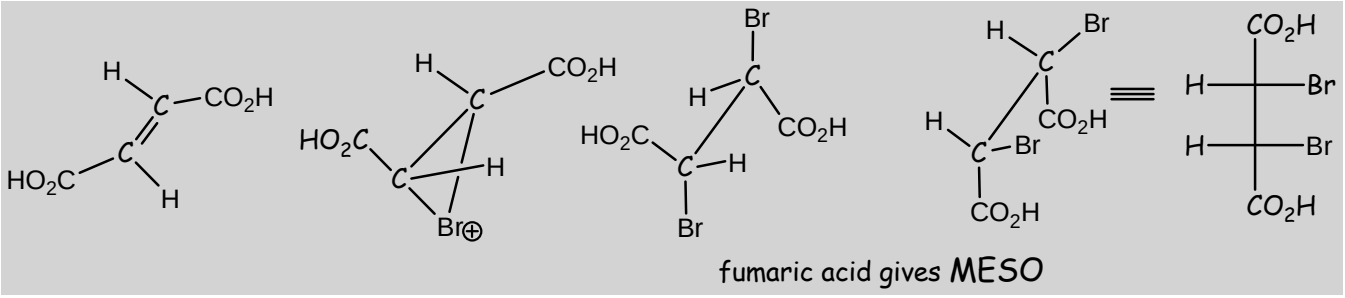
7. **(4 pts)** Assuming it reacts by the same mechanism as *trans*-cinnamic acid, draw a mechanism scheme similar to question #2 which illustrates the addition of bromine to maleic acid. (a) Would you expect the product to be optically active? Explain your reasoning. (b) Could this product be resolved into optically active constituents? Explain your answer.



(a) optically inactive since it is racemic

(b) could be resolved into optically active components, i.e., enantiomers

8. **(4 pts)** Assuming it reacts by the same mechanism as *trans*-cinnamic acid, draw a mechanism scheme similar to question #2 which illustrates the addition of bromine to fumaric acid. (a) Would you expect the product to be optically active? Explain your reasoning. (b) Could this product be resolved into optically active constituents? Explain your answer.



(a) optically inactive since it is **meso**

(b) could not be resolved into optically active components