

Names: \_\_\_\_\_

<b><i>Protein-Protein Interactions II</i></b> <i>Enzyme effects on collagen (gelatin)</i>
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**Reading:** <http://chemconnections.org/general/chem106/Tech%20Prep/Protein%20Activity%20II.1-2016.html>

***Experimental Procedure:***

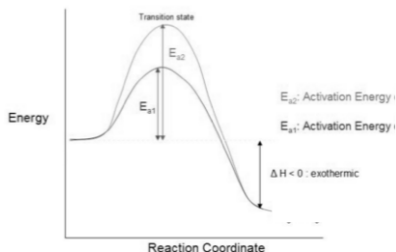
Prepare a 10% solution of Knox unflavored gelatin, divide it into six equal portions in small plastic cups. Cool the cups in a freezer or an ice bath until the solution gels.

Pour a generous amount of: meat tenderizer, which has the enzyme papain, over the gelatin in cup A, pour a similar amount of monosodium glutamate (MSG) the sodium salt of glutamic acid, an amino acid, in cup B, add a few pieces of fresh pineapple to cup C, a few pieces of canned pineapple in cup D, a few pieces of fresh pineapple that has been microwaved for 3 minutes in cup E. Let the cups stand 30-40 minutes, record your observations on the enclosed report form. Store the cups with your name on them until the next class meeting, record any changes in your observations and answer the related questions. Turn in one report form for each group with all names on the form.

		<b>Observation(s)</b>	
A.	Tenderizer (papain)		
B.	MSG		
C.	Pineapple (fresh)		
D.	Pineapple (canned)		
E.	Pineapple (microwaved)		

***Post Lab Questions***

- Based on your observations, explain the differences in enzymatic activity between (C.) fresh, (D.) canned, and (E.) microwaved pineapple on the denaturing of proteins.
- When making pineapple Jell-O, would you use fresh, microwaved, or canned pineapple? Why?



3. Refer to the Energy Diagram above. If  $E_{a1}$  represents protein being hydrolyzed with bromelain as a catalyst and  $E_{a2}$  is protein reacting with papain as a catalyst, which reaction is faster bromelain or papain? Briefly explain your answer.
4. Compare your experimental observations for reaction (A) and reaction (C). Do your results agree with the data presented in question #3? Briefly explain.
5. Consider the Energy Diagram and the total intra- and intermolecular bonds in uncooked, untreated protein. What happens in the enzymatic treatment of proteins in food? Does the nutritional value in eating the protein increase, decrease, or stay the same after treating with protease enzymes before ingesting the food? Briefly explain in terms of the total bonds in all four structural protein levels before and after enzyme treatment.
6. Do you think that a steak treated with meat tenderizer and then grilled would be more or less tender than the same steak marinated with canned pineapple juice? (Both steaks were cooked the same way and treated for the same length of time.) Explain your answer.
7. Would papain catalytically degrade the protein in chickpeas (garbanzo beans), dahl, and other grams which are common in vegan diets throughout the world. If so, would this make nutritional sense to advocate in establishing a worldwide food policy? Briefly explain.