Explain: Chemistry of Onions explained

Activity 1: Article Analysis (Why Onions Make Us Cry) Vocab

Read the article and answer the following questions using CER.

1. Explain how enzymes contribute to the production of the eye-irritating compound released when onions are cut. (You may use observations from your lab.)

2. Why was determining the structure of LF synthase important to understanding why onions make us cry?

3. Why does chopping a raw onion make you cry, but cooking it does not? (You may use observations from your lab.)

Activity 2: Molecule Mapping

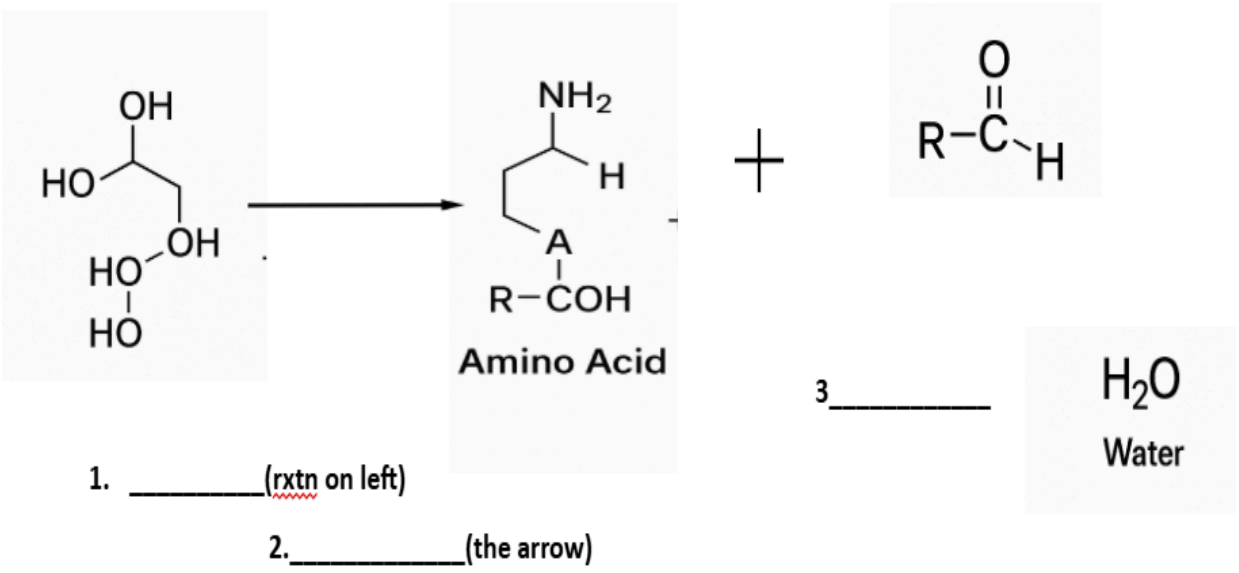
Instructions: Complete the tasks below to the chemical pathways involved in manipulating onions (cutting, steeping, boiling and frying)

1) **Annotate** the provided diagram below (showing the reaction between sugars and amino acids during the Maillard reaction). Use the word bank below to label at least 4 parts of the diagram. Then answer the question.

Word Bank: Maillard reaction | Sugar molecule | Amino acid | Browning | New flavor compound

2) What evidence in the diagram suggests a chemical reaction is taking place? (how do we generally know that a chemical reaction has taken place?)

3) Circle or highlight the point at which new molecules are formed.



Activity 3: Molecule Mapping II

Instructions: Provide scientific reasoning to explain the chemical equations below. Use the word bank to help as needed.

Word Bank: enzyme, alliinase, sulfur compound, syn-Propanethial-S-oxide, heat, decomposition, chemical change, gas, odor

Part A: Chopping an Onion (Enzyme-Driven Reaction)

1. S-1-propenyl-L-cysteine sulfoxide + **alliinase** → **syn-Propanethial-S-oxide** → You cry
   Explain:
   _____
   _____

Part B: Cooking an Onion (Thermal Decomposition)

2. Sulfur compounds + **heat** → new **odor molecules** + color/smell changes
   Explain:
   _____
   _____

3. How is thermal energy used to cause chemical change in the onion during cooking?

_____

_____

_____

_____

_____

Part C: Molecular Changes in Onions

4. Why do you think the reaction only starts after the onion is cut?

_____

_____

_____

_____

_____

5. What does this suggest about how the onion stores its chemical components?

Activity 4: Talk Like a Chemist

Fill in the sentence to describe what you learned. Then, share with a partner. Some words may be used more than once.

Word Bank: allinase, sulfur compounds, new substances, heat, new substances, onion, syn-Propanethial-S-oxide,

1. When the onion is cut, an enzyme called _____ reacts with _____ _____ to produce _____.
2. Cooking the onion causes a chemical change because _____ breaks down _____ _____ into _____ _____.
3. We can tell a chemical change happened because the _____ smell different, look different, and produce _____ _____.

Partner Share/Gallery walk:

Take notes of any differences or disagreements you encountered while sharing your responses. Also note HOW you resolved them, as well as your final consensus.