**Selecting and Sequencing Student Ideas in Science to**

**Promote Discussion**

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| **Anticipated Student Idea, Explanation, Model** | **Rationale for Selection** | **S**  **e**  **q**  **u**  **e**  **n**  **c**  **e** | **Science Concepts to highlight when students share** | **Teacher Questions to ask to make student ideas transparent to all or to connect learning (whole group)** | **Teaching routines to use during discussion** | **About students or group who used this** |
| Enzymes have a range of temperatures and pHs at which they are effective. | Correct Conceptual Idea | 1 | Catalase is an enzyme that functions in mammals to break down hydrogen peroxide. | What temperature would you expect a mammalian enzyme to work best at? How did you test that?  What pH is hydrogen peroxide?  What pH is human blood?  What pH would you expect to be best for human enzymes? | Prod. Talk:  Interpret and compare |  |
| Enzymes can be denatured by extreme heat or pH. | Correct  Conceptual  Idea | 2 | Enzymes can be changed irreversibly by temperature or pH and no longer function even returned to original temperature and pH. | Did the enzyme stop breaking down the enzyme at any point? How does your experimental design test for the extremes of heat/pH and how they impact catalase?  Why is it dangerous for humans to have high fevers? | Prod. Talk:  Interpret and compare |  |
| Enzymes are used up in a chemical reaction. | Misconception | 3 | Enzymes can be used multiple times by a cell because they provide a site for the reaction to occur but are not an actual part of the reaction. | How did you determine if the enzyme was consumed or not consumed by the reaction?  How can you prove that the enzyme either did or did not change after the reaction? | Prod Talk:  Interpret and compare |  |
| Enzymes are chemicals that are a part of the reaction. | Partially true conception | 4 | Enzymes reduce the activation energy of cellular reactions so that they occur more rapidly but are not actually a reactant or product of the reaction. | Is there a way to see if this reaction would happen without the enzyme? Why might hydrogen peroxide be stored in a brown bottle?  Is there a shelf life for hydrogen peroxide? | Prod. Talk:  Interpret and compare |  |
| **Connecting (**Questions that will make the core science idea visible and understandable to the entire class):  Why do humans maintain a specific body temperature/pH for optimal health? What are ramifications of having an extremely high temperature when you are ill? How does this concept tie in with homeostasis? How do you think ectothermic/cold-blooded organisms function during colder weather?  Looking back at your notebook, which stars would you consider removing? Why? How would you answer your focus question now? What, if anything, could you add to your answer?? | | | | | | |

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