Bacteriophage Builder Student Worksheet Answers

<u>Do First</u>

1. Describe a time when you were sick. How did you feel? What were your symptoms?

   Variety of acceptable answers. Could be describing a cold, the flu, stomach virus, etc.

2. What do you think caused you to feel sick?

   Students will provide a variety of answers. Ultimately, you will tell them that sickness is caused by pathogens.

3. Draw what you think the cause of your sickness looked like:
   Variety of possibilities.

<u>Engineering Design Process</u>

Define the Problem:

We need to engineer viruses to infect as many bacteria as possible in order to eliminate harmful biofilms from water filters. (Variety of answers acceptable.)

Criteria for Success:

Must be able to attach to at least 10 bacteria cells;
Must be able to attach to at least 3 types of bacteria; etc.

Constraints:

We are limited by amount of time (15 min.)
We are limited by the size of the virus.

Brainstorm a design: *Variety of possibilities.*

Materials Needed
• _____
• _____
• _____
• _____

Reflection Questions

1. Did you make any changes to your design from when you first brainstormed? Why?
   Yes, we changed our design from when we first brainstormed. The first design was not able to pick up the paper bacteria, so we had to adjust the location of the toothpicks. After the adjustment, the tape surface markers were able to bind to the paper bacteria.

2. In what ways did our model *accurately* reflect how viruses infect their host cells?
   Our model accurately reflected how viruses infect host cells because the surface markers on the virus have to match/be complementary to the bacterial cell surface in order to be able to bind. Also, our model showed how the surface markers make viruses very specific to one type of host.

3. In what ways could our model be improved to show how viruses infect host cells?
   Our model could be improved by showing the insertion of DNA and the reproduction after the attachment step. Our model could be improved by accurately representing the size difference between viruses and bacteria.

4. In what ways did our model *accurately* reflect natural selection & the evolution of phages?
   Our model accurately reflected natural selection and the evolution of phages by showing how the ones with the most favorable traits are the ones that survive.

5. In what ways could our model be improved to more accurately show the evolution of phages?
   Our model could be improved to more accurately show the evolution of phages if traits were assigned at random rather than being chosen. Organisms (including phages) do not get to choose their DNA/mutations/traits. Additionally, the reproduction piece of natural selection is missing from our model. We could add a step where they now have more than one of the phages with the same surface markers.