CURE-Aligned Experiences for High School Students - Imondi
Supplemental Material 1

Supplemental Figure 1. Study questions that form the focus of independent study (pre-institute) and collaborative discourse with faculty and peers during program enactment in our research lab.

NeuroLab
Discovery science-based explorations in developmental neuroscience

Essay Questions

Original responses to these essay questions (i.e. *responses expressed in your own words and based on study guide resources*) are due no later than 6:00 p.m. PDT on July 16. Before you begin, please refer to the <READ ME FIRST> document for general instructions and study recommendations.

1. In the introduction to the video entitled *The Molecular Logic of Neural Circuits*, Tom Jessell describes neuroscience as being broader than many other disciplines. Explain why he made this claim. From your perspective, what are the implications for a student preparing to pursue a career as a neuroscientist?

2. In the TED Talk entitled *How to Look Inside the Brain*, Carl Schoonover makes a reference to the *greatest engineer of all*. With as much detail as possible, explain his rationale for making this reference and why it is significant to *you*.

3. In the same TED Talk, what specific types of visualization tools/methods did the speaker introduce? Which visualization tool(s) enables a researcher to exert control over the type of neuron that is visualized? Make use of other study guide materials to explain how this control is achieved. Can you identify in the study guide resources *another* visualization tool/method that was not covered in the video?

4. Propose an explanation for why a researcher may wish to visualize some types of neurons but not others during embryonic development.

5. Explain how the work conducted by Mark Tessier-Lavigne validated the Neurotropic Theory of Santiago Ramón y Cajal? What information was missing before this more contemporary work was conducted?

6. You recently discovered a previously unknown class of spinal cord neurons in the mouse embryo. Based on your readings, what specific types of information might you use to describe these embryonic neurons and distinguish them from other types of neurons? What methods would you use to collect this type of information? Be as specific as possible based on your current understanding of the readings.

7. What is meant by the term *identity* when referring to early embryonic cells? What distinguishes embryonic brain regions that will ultimately become the forebrain, midbrain, hindbrain, and spinal cord in the mature organism?

8. How does the position of an embryonic cell influence the identity that it assumes? Support your explanation with a figure.

9. What kinds of target DNA sequences are recognized by transcription factors? Are these target sequences coding or non-coding?

10. Why is it important for scientists to know the DNA sequences recognized by transcription factors? What computational approach can be used to identify these sequences? What is the underlying rationale for this approach? How can these sequences be used to visualize neurons in isolation from other neurons?

11. Explain how studies of a simple fruit fly (*Drosophila melanogaster*) can help shape our understanding of how neurons form connections in the vertebrate spinal cord. Be as specific as possible in your response.