



Unit 2: Appendix A – Teacher Answer Sheet

Howard Hughes Medical Institute video: Adult Stem Cells and Regeneration

<http://www.hhmi.org/biointeractive/stemcells/lectures.html>

Questions with answers (including [time-point] that each answer appears in video):
Lecture 2

1. How is stem cell division different from that of a mature differentiated cell?
[11:20]
Answer: Stem cells reproduce asymmetrically, as in they produce one differentiated cell and one undifferentiated cell from one mother cell, while mature differentiated cells undergo mitosis to produce two differentiated clone daughter cells.
2. Why are there proportionately fewer stem cells in adult tissues than in embryos?
[11:40-12:20]
Answer: In the embryo there aren't many differentiated cells undergoing mitosis, so the ratio of stem cells to differentiated cells is high. In adult tissues the ratio approaches 1:1 (stem cells: differentiated cells). Here, differentiated cells undergo mitosis and symmetric duplication (to expand their population), while stem cells can only undergo asymmetric duplication (maintaining their population number). Thus, the ratio of stem cells to differentiated cells is much lower in adult tissues than in the embryo.
3. Which cells in Planaria (flat worm) are capable of regenerating an entirely new planaria? [13:40]
Answer: The neoblast cells in planaria are capable of regenerating the entire organism. They are totipotent.
4. What is a blastema? [20:00]
Answer: A mass of differentiating cells, being signaled by stem cells to regenerate a part of the body which was damaged.
5. What types of cells do the muscle stem cells become when a salamander's leg is amputated? [21:10]
Answer: Muscle stem cells normally become muscle, but in the blastema they become cartilage and even skin.



6. Can newts regenerate organs with stem cells? What can they regenerate?
[26:30] (during Q&A)

Answer: Yes: they can regenerate the tail, part of the heart, and the lower jaw