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Outline for Completing the University of Utah Stem Cell Tutorial (30 pts.)

Go to <http://learn.genetics.utah.edu/units/stemcells> or click on the blog link. Start with the first page and work your way through the tutorial.

Answer each question using complete sentences. You will be responsible for this material on the exam.

**Part 1: The Nature of Stem Cells**

Compare and contrast a differentiated cell and a stem cell.

What types of cells can come from a fertilized egg?

Draw a blastula below. Make sure to indicate cells that will eventually become the placenta

as well as the inner cell mass (icm).

What types of cells can stem cells become?

What happens to the cells of the icm after about two weeks?

What structures come from these layers?

a. ectoderm

b. mesoderm

c. endoderm

What is the function of adult stem cells?

Compare and contrast somatic stem cells and embryonic stem cells.

Why do you think that somatic stem cells are found in so many different tissues?

**Now go back to the stem cell root page (tab at the top). Click on “Go, Go Stem Cells”.**

What is the relationship between niche cells and stem cells?

Blood Stem Cell Niche

Circulate the red blood cells; why do you think red blood cells need to be constantly replaced?

What do the signals released by the niche cells do to the stem cell and the cell that it produces? What is the process by which this new cell is produced?

What are the steps that the stem cell must go through to become a red blood cell?

What other types of cells can come from the bone marrow stem cells? What do you think determines which type of cell these cells differentiate into?

Other Stem Cell Niches:

Watch the other 4 tutorials about stem cell differentiation. What types of cells can come from the following stem cell niches?

a. Brain

b. Hair Follicle

c. Intestinal Cell

d. Bone Cell

**Now go back to the stem cell root page (tab at the top). Click on “Stem Cells In Use”**

One of the places where stem cells are currently and routinely used in medicine is to cure leukemia, a cancer of the white blood cells.

Describe how the following therapies 1) are stem cell therapies and 2) advantages and disadvantages of each.

Bone Marrow Transplant:

Peripheral Blood Stem Cells:

Umbilical Cord Blood Stem Cells:

Which therapy above seems best and why?

**Now go back to the stem cell root page (tab at the top). Click on “The Story of IPS Cells”**

How is the DNA of a stem cell physically different than that of a differentiated cell?

How many genes need to be “turned on” to turn a differentiated cell into a stem cell? Looking at the diagram, what do those genes do?

**Now go back to the stem cell root page (tab at the top). Click on “Unlocking Stem Cell Potential”.**

Where can stem cells be found in the human body?

Why do scientists think that some drugs may be able to stimulate stem cells?

Why do scientists like to study embryonic stem cells and induced pluripotent stem cells (iPSCs)? What types of structures do scientists think they can develop with these cells?

How have stem cell transplants helped with spinal cord injuries (in rodents)?

How do scientists want to use stem cells to target genetic diseases?

Has the above process worked?

**Now go back to the stem cell root page (tab at the top). Click on “The Stem Cell Debate” and answer the following.**

First, to read the tutorial use a dictionary to define these terms:

Multipotent:

Pluripotent:

Totipotent

Before iPSCs what was the only source of pluripotent stem cells?

What are some ethical considerations with embryonic (icm) stem cells?

Do hESCs still have a use in research? Why or why not?