

**Solution Key: 7.013 Recitation 15 – Spring 2018**

. Classify the following as totipotent, pluripotent, bipotent, unipotent or differentiated:

- a) Cells that can differentiate into many cell types. *Pluripotent*
- b) A cell that is about to start cleavage. *Totipotent (it can form placenta also)*

2. A patient has a rare recessive genetic disorder due to the loss of a specific gene function. This disease causes a decrease in immune function. The patient receives a bone marrow transplant which is successful in alleviating the symptoms of the disease, such that patient can lead a normal life.

a) Why does the bone marrow transplant relieve the patient's symptoms?

*If the bone marrow transplant is successful, the bone marrow cells can proliferate to form the different blood cells that circulate in the patient's body and help them alleviate the signs and symptoms.*

b) Your patient marries a man who happens to be carrier for the same genetic disorder. What is the probability that their offspring will inherit the disease if the couple had a child a) before and b) after any bone marrow transplant?

*The patient is (aa) before the transplant and she marries a carrier (Aa). So the chance that the child will have the disease is (aA, aa, aA, aa) = 1/2. The probability will remain the same even after bone marrow transplant since the gametes of this patient will still have the "aa" genotype.*

3. Stem cells are found in all multi-cellular organisms. They can undergo mitotic cell division to form cell types that can differentiate into diverse specialized cells. Stem cells are believed to have immense therapeutic potential.

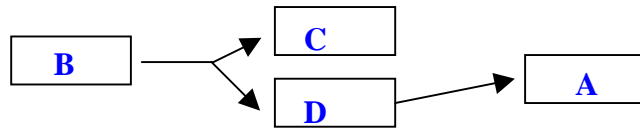
a) A stem cell is known to divide asymmetrically. When a stem cell divides asymmetrically, what are the two possible fates of its daughter cells?

*A stem cell undergoes asymmetric division to produce more daughter cells similar to the parental cell and also some other cell progenitor cells that differentiate to form specific cell type(s).*

b) A major goal of stem cell research is to repair diseased brain tissue using neural stem cell lines. Four human embryonic cell lines, originally prepared from the **SAME embryo**, were tested for their potency **in vitro**. Based on the data below, complete the table by ranking the potency of these cell lines.

Cell types	Cell types differentiated in vitro	Potency from 1-4 (1=most potent and 4= least potent).
A	motor	4
B	motor, sensory, lateral, hippocampal	1
C	sensory, lateral, hippocampal	2
D	motor, sensory	3

c) Draw a lineage tree for the cell types A-D using the information in the table above.



d) Does each of the above cell types have the same DNA (Yes/ No)? **Explain.**

*They have the same DNA sequence since they are originating from the same embryo.*

MIT OpenCourseWare  
<https://ocw.mit.edu/>

7.013 Introductory Biology  
Spring 2018

For information about citing these materials or our Terms of Use, visit: <https://ocw.mit.edu/terms>.