

Name: _____ Period: _____ Date: _____

Open **peebedu.com** and navigate to **Cell Differentiation Simulator**. Work through the tutorial, which introduces the Molecule Palette, the Inspector and the two tabs. On the **Testing** tab you prime a stem cell with calcium and then choose its fate with a hormone.

Free Response Questions

Question 1 – Conceptual Analysis

Simulation Task: *On the Testing tab, click empty canvas to add a stem cell. Secrete Calcium to prime it, then secrete Squarin nearby and watch it differentiate. Click the cell and use the Inspector to see which gene is being expressed. Reset the cell and repeat with Triangulin, then with Starine.*

(A) (1 pt) **Describe** the relationship between the genes a cell expresses and the specialised cell type it becomes.

(B) (1 pt) **Explain** why the square, triangle and star cells can carry identical DNA and still develop into different cell types.

(C) (1 pt) **Predict** what will happen to the variety of cell types in the tissue if every stem cell receives only Squarin.

(D) (1 pt) **Justify** your prediction.

Question 2 — Analyze Model / Visual Representation

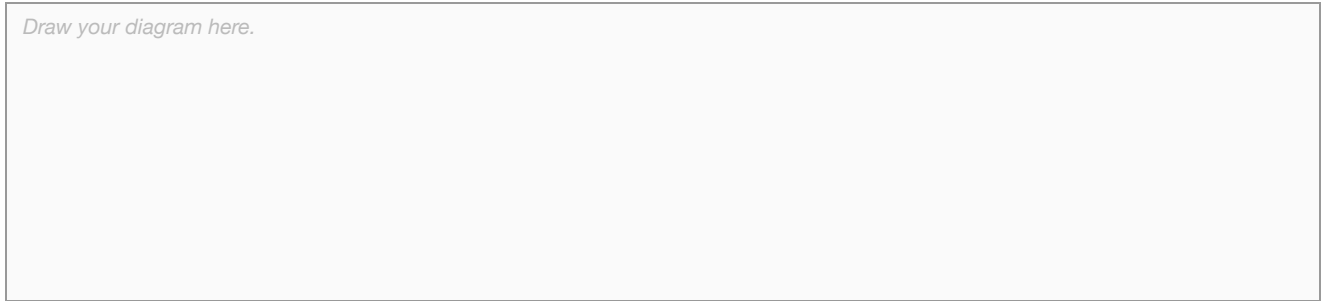
Simulation Task: Add a stem cell and click it to open the Inspector. Read the Chromatin State before adding anything. Secrete Calcium and follow HAT as it enters the nucleus and acetylates the histones. Read the Chromatin State again, and note what the cell is now able to do.

(A) (1 pt) **Describe** the change in Chromatin State the Inspector reports after the histones are acetylated.

(B) (1 pt) **Explain** how acetylating the histones allows a gene to be transcribed that could not be transcribed before.

(C) (1 pt) **Represent** the nucleus of a stem cell before and after calcium arrives by drawing two labeled diagrams that show the chromatin in each state and the regulatory region of a tissue-specific gene.

Draw your diagram here.



(D) (1 pt) **Explain** why roundol passes directly through the plasma membrane while the hormones must bind a receptor on the cell surface.

6.5.A.2