

PEEBEDU Virtual Gel Electrophoresis

Unit 6: Gene Expression and Regulation

Name: _____ Period: _____ Date: _____

Open **peebedu.com** and navigate to **Virtual Gel Electrophoresis**. Read the introduction popup, which explains that gel electrophoresis separates DNA fragments by size using an electric field. Select the **Sickle Cell** scenario to begin, then explore other scenarios as directed.

Free Response Questions

Question 1 — Conceptual Analysis

Simulation Task: Select the **Sickle Cell** scenario from the mission menu. Load all samples into the lanes and run the gel at the default voltage (100V). Observe the band patterns that appear in each lane and note which lanes show different banding patterns from one another.

(A) (1 pt) **Describe** the properties of DNA fragments that determine how far each fragment migrates through a gel during electrophoresis.

(B) (1 pt) **Explain** why the DNA in every lane moves away from the negative electrode and toward the positive electrode once the gel is running.

(C) (1 pt) **Predict** how far the DNA fragments in a lane would travel if the same gel were run at 50V instead of at the default 100V.

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

Question 2 — Analyze Model / Visual Representation

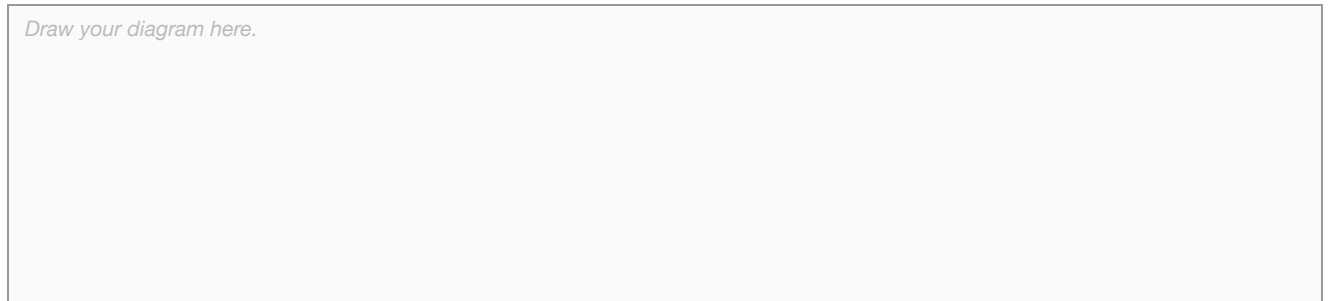
Simulation Task: Select the **Cystic Fibrosis** scenario from the mission menu. Load all samples and run the gel. Then switch to the **Custom Scenario**, load a DNA Ladder in Lane 1 and any other sample in Lane 2, and run the gel. Compare the positions of the bands in Lane 2 with the positions of the ladder bands in Lane 1.

(A) (1 pt) **Describe** how the banding patterns in two lanes can be used to determine whether two DNA samples came from the same source.

(B) (1 pt) **Explain** why a DNA ladder of known fragment sizes must be run alongside the samples in order to interpret the sizes of the bands in the other lanes.

(C) (1 pt) **Represent** In the box below, draw a labeled diagram of a gel electrophoresis result that shows the following: a DNA ladder (molecular weight marker) in Lane 1, a normal individual in Lane 2, a carrier (heterozygous) in Lane 3, and an affected individual in Lane 4. Label the wells, the direction of DNA migration, the positive and negative electrodes, and indicate relative fragment sizes.

Draw your diagram here.



(D) (1 pt) **Explain** how the inheritance of one copy of a gene from each parent accounts for a carrier's lane showing both of the bands that appear separately in the lanes of an unaffected individual and an affected individual.

6.8.A.1.iv