

Name: _____ Period: _____ Date: _____

Open **peebedu.com** and navigate to **Virtual PCR**. Read the introduction popup, which describes PCR as a technique that makes millions of copies of specific DNA sequences. Select **Standard Mode** to begin exploring the laboratory bench.

Free Response Questions

Question 1 — Conceptual Analysis

Simulation Task: *In the Virtual PCR simulation, select the **Sickle Cell** case study. Load the **Control AA**, **Control AS**, and **Control SS** DNA templates into separate test tubes. Add Master Mix and primers to each tube, centrifuge, and run the PCR thermocycler. Observe how the same primers amplify DNA from individuals with different HBB genotypes.*

(A) (1 pt) **Describe** what happens to the DNA in the reaction tube during each of the three steps of one PCR cycle.

(B) (1 pt) **Explain** why PCR produces copies of only a specific region of the genome rather than copying all of the DNA in the sample.

(C) (1 pt) **Predict** the effect on the amount of amplified DNA produced after 30 cycles if the primers cannot form stable base pairs with the template.

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

Question 2 — Analyze Model / Visual Representation

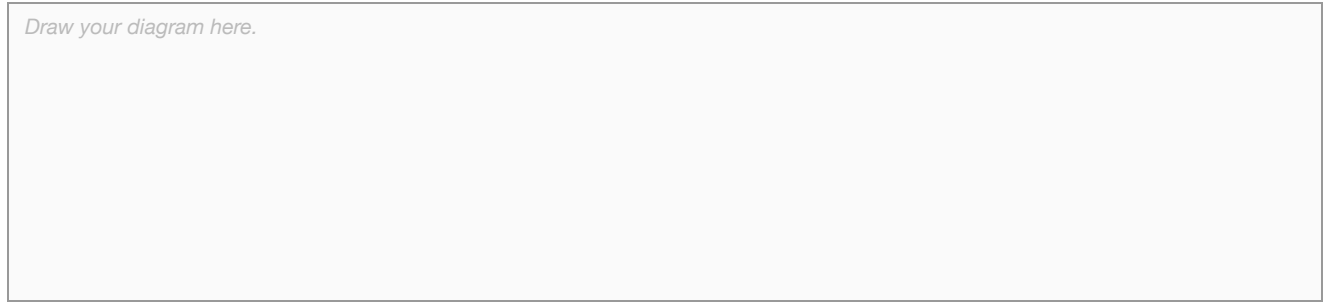
Simulation Task: In the Virtual PCR simulation, select the **CSI Analysis** case study. Load the **Crime Scene** DNA sample and at least two **Suspect** samples into separate test tubes. Add Master Mix and primers to each, centrifuge, and run PCR. After the thermocycler completes, click **Load VLDS** to separate the amplified DNA by gel electrophoresis, then compare the band patterns across samples.

(A) (1 pt) **Describe** what the gel electrophoresis band patterns show when the crime scene sample and one of the suspect samples came from the same person.

(B) (1 pt) **Explain** why the amplified DNA fragments from one individual's sample produce a different pattern than fragments from another individual's sample when both are processed with the same primers.

(C) (1 pt) **Represent** In the drawing box below, draw a labeled diagram showing the three steps of one PCR cycle. Your diagram should include: (1) double-stranded DNA being denatured into single strands, (2) primers annealing to the complementary sequences on each strand, and (3) DNA polymerase extending new strands from the primers. Label the 5' and 3' ends, the primers, the template strands, and the newly synthesized strands.

Draw your diagram here.



(D) (1 pt) **Explain** how sexual reproduction produces individuals whose DNA sequences differ from those of both of their parents.

6.8.A.1.iv