# Virtual PCR



**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** the three temperature-dependent steps that occur in each cycle of PCR and the purpose of each step in amplifying a specific DNA fragment.

**(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 amount of target DNA present after 30 thermocycler cycles if the reaction temperature during the second step were too high for the short DNA sequences to 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 compare the amplified DNA fragment patterns across samples.*

**(A)** (1 pt) **Describe** how PCR enables the analysis of DNA from a biological sample that initially contains too little DNA to be detected by other methods.

**(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) **Connect** how a change in environmental conditions could make a previously neutral DNA sequence variant advantageous to the organisms that carry it.

6.8.A.1 (ii)