An Introduction to Forensic Biotechnology

Today's virtual biotechnology lab has the purpose of introducing you to the techniques used in studying an individual's DNA. This will involve three techniques: DNA Extraction, PCR, and Gel Electrophoresis.

DNA Extraction – Log on to http://learn.genetics.utah.edu/content/labs/extraction/

Complete the virtual lab and then answer the questions that follow:

1) Provide three reasons why society would want to extract an individual's DNA.

2) In order to get pure DNA, what are some obstacles that need to be dealt with during the extraction process?

3) Complete the table regarding the role of different reagents/processes in the DNA extraction procedure:

Procedure Component	How the reagent/process helps in DNA extraction
Lysis Solution	
Salt Solution & Centrifugation	
Isopropyl alcohol & Centrifugation	

4) How do you handle DNA if you want to do studies on it at a later date?

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PCR - Log on to http://learn.genetics.utah.edu/content/labs/pcr/

Before completing the virtual lab, scroll down and define for yourself what the following represent:

Polymerase Chain Reaction (PCR)	**Function in Procedure**
Primers	
DNA Polymerase (Taq Polymerase)	
Nucleotides	

Complete the virtual lab and answer the questions that follow:

1) Name three ways that PCR can be useful in society.
2) Why is the PCR technique necessary?
3) The thermocycler can oscillate between different temperatures. What is the purpose of the high temperature (95C)? What is the purpose of the lower temperature (50C)? At what temperature does the polymerase begin copying the DNA?
4) The animation shows the primers sticking to the existing DNA strands. How do the primers find the spots to bind to?
5) What is the special significance of the third cycle in the PCR procedure?
6) As cycles continue, what happens to the proportion of fragments with the target sequence versus those of the longer length (original) molecules?
7) Why is PCR like a photocopier?

Gel Electrophoresis – Log on to http://learn.genetics.utah.edu/content/labs/gel/

Imagine that you could use this technique to separate the longer DNA fragments from the target fragments obtained during the PCR procedure.

Complete the virtual lab and answer the questions that follow:

1) How is gel electrophoresis useful to geneticists?
2) What is the nature of the gel like?
3) Why is running a DNA standard important?
4) When DNA is loaded up in the gel wells, an electric current is transmitted through the gel. Why does DNA move through the gel when this current is applied? What charge does DNA have?
5) If a current has been applied for a certain amount of time, then predict which fragments will go further on the gel – your target sequence bands or the longer length original molecules?
6) What must be applied to the gel so that one can actually visualize the DNA bands?

When you have completed the virtual lab, it should bring you back to the original screen. Scroll down below and click on **"Can DNA Demand a Verdict"**. This will allow you to see how gel electrophoresis is used in forensics. Answer the questions that follow once you have read this section.

A) How is each technique you've learned about needed in forensic DNA fingerprinting?
B) How are the DNA fragments for gel electrophoresis generated? Why is this an important step in the use of DNA in forensics?
C) Give proof that DNA fingerprinting has been a great help to the legal system.