**Biotechnology Tools: Polymerase Chain Reaction and Gel Electrophoresis**

Advancements in genetics are possible due to the advanced biotechnology tools that have been developed. The following assignment will introduce you to two key procedures.

**Polymerase Chain Reaction (PCR)**

Use one of the following links to work through a PCR simulation and answer the questions.

1. <http://learn.genetics.utah.edu/content/labs/pcr/>

1. <http://www.picse.net/CD2011/apps/dna-pcr.html>
2. <http://www.sumanasinc.com/webcontent/animations/content/pcr.html>

Also:

Watch the following animation and complete the quiz questions at the end to check for your understanding:

<http://highered.mheducation.com/sites/0072556781/student_view0/chapter14/animation_quiz_6.html>

1. What is a PCR machine called and what does it do?
2. Polymerase chain reaction (PCR) consists of multiple cycles of:

**A** Cooling (annealing a primer to template) heating (denaturation) extension of the new chain

**B** Heating (denaturation) cooling (annealing a primer to template), extension of the new chain

**C** Extension of the new chain, heating (denaturation) cooling (annealing of primer to template)

**D** Extension of the new chain, heating (denaturation), cooling (annealing of primer to template), denaturation

1. What is the primer that is required to initiate the synthesis of a new DNA strand in PCR

**A** Taq polymerase

**B** protein

**C** ligase

**D** DNA

**E** RNA

1. A trace of DNA has been obtained from a mutant crop that grows rapidly. Before it can be used for analysis the quantity must be increased by using a polymerase chain reaction. Briefly explain how PCR works. Your answer should make reference to the following stages; cooling, heating, primers and Taq polymerase. As well, ensure you reference specific temperatures in your explanation.
2. Compare the normal process of DNA replication within a cell to the artificial replication of DNA molecules in a PCR machine. Describe what is different between these two processes.

**DNA GEL ELECTROPHORESIS**

Use one or more of the following links to work through the electrophoresis simulation and answer the questions.

1. <https://www.dnalc.org/resources/animations/gelelectrophoresis.html>
2. <http://learn.genetics.utah.edu/content/labs/gel/>
3. <http://www.sumanasinc.com/webcontent/animations/content/gelelectrophoresis.html>
4. <http://www.picse.net/CD2011/apps/dna-electrophoresis.html>

Also:

Watch the following animation and complete the quiz questions at the end to check for your understanding:

<https://highered.mheducation.com/sites/9834092339/student_view0/chapter20/electrophoresis.html>

**Questions**

1. What is Gel electrophores used for ?

2. Explain the purpose of the TBE buffer

3. Compare the movement of shorter strands of DNA to longer strands.

4. Notice the placement of the negative and positive electrode. Explain the significance of this.

5. Explain how a DNA fingerprint can be used to determine paternity or a suspects guilt or innocence.

**Bacterial Transformation & Recombinant DNA**

Use the following websites to explore the process of creating recombinant DNA

1. <http://www.bioteach.ubc.ca/TeachingResources/Applications/GMOpkgJKloseGLampard2.swf>
2. <http://www.mhhe.com/biosci/genbio/virtual_labs/BL_22/BL_22.html>

* You should be able to explain the role of: restriction enzymes, sticky ends, plasmids and vectors.
* How can this process be used to have bacteria create human insulin?

Also:

Watch the following video’s and complete the quiz questions at the end to check your understanding.

<http://highered.mheducation.com/sites/0072556781/student_view0/chapter14/animation_quiz_2.html>

<http://highered.mheducation.com/sites/0072556781/student_view0/chapter14/animation_quiz_2.html>