**Biotechnology and Genetic Engineering**

Advancements in genetics are possible due to the advanced biotechnology tools that have been developed. The following webquest will use animations and online simulations to give you a better understanding of common genetic engineering technologies. Complete the first simulation of each technology. You may go through the others for further understanding.

**Bacterial Transformation & Recombinant DNA**

1. Go to: <https://www.classzone.com/books/hs/ca/sc/bio_07/virtual_labs/virtualLabs.html>

Complete all parts of the lab. Record your answers in the “lab notebook” when asked. Save your answers and print/email. The procedure is very easy to follow if you READ and follow the instructions.

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

**Polymerase Chain Reaction (PCR)**

1. Use the following link to work through the PCR simulation and answer the following questions.

<http://www.picse.net/CD2011/apps/dna-pcr.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.
3. <http://learn.genetics.utah.edu/content/labs/pcr/>

**Gel Electrophoresis**

1. Use the following link to work through the Gel Electrophoresis simulation and answer the following questions.

<http://www.picse.net/CD2011/apps/dna-electrophoresis.html>

1. Gel electrophoresis a technique used for ?

2. What is the purpose of the power supply?

3. The TBE buffer solution is used to help \_\_\_\_\_\_\_\_

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

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

7. Do you think you would find the largest or the smallest fragment of DNA closest to the well? Explain.

8. Explain what would happen if the power supply is left on longer than it should be.

1. Be the Scientist! Complete the following simulation to walk through the gel electrophoresis procedure.

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

1. Use the link below to complete the virtual lab (click on “Gel Electrophoresis) and find out who the guilty party is…The procedure is very easy to follow if you READ and follow the instructions.

<https://www.classzone.com/books/hs/ca/sc/bio_07/virtual_labs/virtualLabs.html>

**Cloning**

1. Explore the following website:

<http://learn.genetics.utah.edu/content/cloning>

* 1. *Read* “What is Cloning?”
  2. ***Complete Interactive Activity – Click and Clone***
  3. Explain 4 risks of cloning.
  4. Describe 3 ethical issues about therapeutic cloning.

1. <http://www.wiley.com/legacy/college/boyer/0470003790/animations/cloning/cloning.htm>