

## **Learning Goals**

### **Foundational Skills: General Lab**

- Student can measure with accuracy and precision volumes of reagents using the appropriate micropipette (P1000, P200, P20, P10, and P2).
- Students know the basics of aseptic technique and can minimize contamination.
- Student can make, supplement with antibiotics, and aliquot media.
- Student can prepare common lab stocks or find where/how to prepare them.
- Student knows the value of experimental controls both positive and negative.
- Student can keep a lab notebook including: purpose for experiment, detailed experimental procedures, complete and accurate results, concluding remarks for future directions, and sections to be signed and witnessed.

### **Copy DNA: PCR (Polymerase Chain Reaction)**

- Student can design primers with the aid of software programs.
- Student can incorporate restriction enzyme sites or additional base pairs into primers.
- Student can set up a PCR reaction including dNTPs, buffer, template, primers, and polymerase.
- Student can determine the appropriate annealing temperature for a pair of primers.
- Student can program a PCR machine.
- Student knows how to troubleshoot and optimized PCR reactions.
- Student is aware of and can conceptually fuse two genes using PCR
- Student can describe advanced techniques such as PCR sewing, recursive PCR and Gibson Assembly.

### **Measure length of fragments: Gel Electrophoresis**

- Student can cast, load, run, and develop a gel for the purposes of gel electrophoresis.
- Student can estimate the size of DNA fragments using a DNA ladder.
- Student can isolate DNA from a gel following gel electrophoresis.
- Student knows how to troubleshoot and optimize gel electrophoresis experiments.

### **Cut DNA in pieces: DNA Restriction Digest and Ligation**

- Student can digest DNA using restriction enzymes.
- Student can use sticky ends to directionally insert a fragment of DNA into a plasmid.
- Student can dephosphorylate a cut plasmid to improve cloning efficiencies.
- Student can ligate DNA fragments into a plasmid.
- Student know how to troubleshoot restriction digests and ligations.

### **Change Life: Bacterial Transformation**

- Student can describe the process for generating competent E. coli cells.
- Student can generate competent cells from a log-phase culture of E. coli.
- Student can transform E. coli via the heat shock method of transformation including positive and negative controls.
- Student can evaluate clones using colony PCR.

- Student can culture individual colonies and generate glycerol stocks for long-term storage.
- Student knows how to troubleshoot bacterial transformation experiments.

#### **DNA Isolation and Quality Check**

- Student can isolate plasmid DNA using a spin column.
- Student knows how to optimize protocol for low-copy number plasmids.
- Student can identify restriction enzyme sites in a plasmid.
- Student can successfully perform a double restriction enzyme digest.

#### *Questions:*

- *Break up into “Required” and “need 3 of 5” type skills?*

#### *Change Log*

- *18 March Reto added plain text explanations to title.*