Name: ____Date: ________________Period: ____

Honors Biology Biotechnology Unit

Homework/Lab questions

Tab A Intro Questions

About the Amgen Biotech Experience: Program Intro (A-5 – A15)

1. What is **gene cloning**?
2. What are some diseases that can be treated with gene cloning?
3. What was the first commercially successful product made through this process?
4. What gene will we insert into the bacteria *e-coli* and what will it allow *e-coli* to do?
5. Explain the cause of Type 1 diabetes compared to Type 2 and the differences in how they are treated.
6. Where did diabetics get insulin from originally? Now where do they get it from?
7. In your words, what are we going to do in the whole lab series over the next few weeks?
8. What are 2 possible reasons sea anemones glow?

Chapter 1: Some Tools of the Trade (A-17—A31)

Lab 1.1: How to Use a Micropipette

1. When do you push plunger on micropipette to the second stop?
2. On a p-20 micropipette, draw what the windows look like if you are measuring 2μL? 10μL?

The Genetic Engineering Process

3. What is a **plasmid**?

Lab 1.2: Gel Electrophoresis

4. What are 3 factors that determine how quickly molecules will move through the gel during electrophoresis?
5. Name three uses of DNA fingerprinting by electrophoresis

Tab B: Chapter 2 How Do You begin to Clone a Gene

Plasmids and Restriction Enzymes (B-3—B-8)

1-4. Answer the 4 **What do you already know?** Questions (B-3)

5. What are the two forms of DNA found in bacteria? How many plasmids can be in a bacterial cell?
6. Explain the 4 characteristics of plasmids that make them ideal vectors for genetic engineering
7. What 2 antibiotics will some of our plasmids have resistance to? **and** how exactly do they create this resistance?
8. What will the antibiotic resistance gene allow us to see?
9. What do **restriction enzymes** do? What was their original purpose?

10-11. Answer 2 **Consider** questions (B-7)

12. What is happening with the increase use of antibiotics?

Lab 2: Preparing to clone the RFP Gene: Digesting the pKAN-R and pARA (B-12—B-16)

1. What is the overall purpose (in your words) of Laboratory 2?
2. Which plasmid that we are using has more base pairs (bp's)?
3. What are the two restriction enzymes we will be using to cut our plasmids?
4. Why is it beneficial to use two different restriction enzymes?

5.-7.Answer Questions 1-3 **Before the Lab Questions (B-13)**

8. Why do we create a K- and A- tube?
9. Why do we place tubes in a 37 ° C water bath?
10. How many different DNA fragments will be created by the restriction enzymes? (**DRAW** the fragments that will be made with their correct components)

Tab B: Chapter 3 Building a Recombinant Plasmid (B-23—B-32)

1. What is **DNA ligase**? What is its job?

2-5. Answer the 4 **What do you already know?** Questions (B-23)

6. Which bond does DNA ligase catalyze on the DNA strand?
7. Why is DNA ligase only used on 1 of the 2 strands during replication?

Laboratory 3: Building the pARA-R Plasmid

1. What is the main purpose (in your words) of Lab 3
2. Answer **Before the Lab** question **#1** (B-28)
3. Why do we start by placing tubes in 70° C degree water bath?

4-8.Answer **Chapter 3 questions** (B-30)

5. **Draw the plasmid** we are hoping to create in this Lab

Tab B: Chapter 4 Making Sure You've Created a Recombinant Plasmid

1-4. Answer the 4 **What do you already know questions** (B-35)

5. Which electrode will the DNA fragments move towards and why?
6. Describe the three types of plasmid configurations and tell which one moves the fastest and slowest
7. What was the first type of genetic engineering and how was it done?

Laboratory 4: Verification of Restriction and Ligation Using Gel Electrophoresis

1. What is the overall purpose of Lab 4?

2-4. Answer **Before the Lab** questions **#1-3** (B-41-42)

Tab B: Chapter 5 Getting Recombinant Plasmids in Bacteria

1. What is our next step in creating the red fluorescent protein? What's this process called?
2. Answer **What Do You Already Know** questions (B-51)
3. What prevents bacteria from taking up DNA from the environment easily?
4. How can scientists increase the chance that bacteria will take in new DNA from the environment? What do we call these bacteria after they have been treated?
5. How are we going to identify the bacteria that took up our recombinant plasmid?
6. Compare transcription/translation in Eukaryotes and prokaryotes (Did you know? box B-55)

Laboratory 5: Transforming Bacteria with the Ligation Products

1-3. Answer **Before the Lab** questions **#1-3** (B-57) including: Completing **Bacterial Growth Predictions** handout

Tab E: Chapter 6 Getting What We Need

1. Describe the structure of a protein. What is the location of the hydrophobic amino acids?
2. What is the role of the resin in column chromatography?
3. What allows the hydrophobic amino acids to be exposed?
4. Describe the function on each of the three different buffers we will use in column chromatography
5. What allows the red fluorescent proteins to eventually be released from the resin beads?

Laboratory 6: Purifying the Flourescent Protein

1. What is the purpose of Lab 6 part A? What is the purpose of Lab 6 part B?