Genetic Engineering Notesheet C. Kohn, Waterford WI

Name: Hour Date:

Date Assignment is due: Why late? Score: + ✓ -  
 Day of Week Date If your project was late, describe why**Directions**: Use the accompanying PowerPoint (*available online*) to complete this sheet. This sheet will be due upon the completion of the PowerPoint in class. These assignments are graded on a +/✓/- scale.

1. What are two major limitations of artificial selection and traditional breeding that make genetic engineering necessary?
2. Genetic engineering is the process of
3. What is a genome?
4. The goal of genetic engineering is to   
     
   through   
     
   or
5. What are GMOs?
6. Bt Corn is a kind of corn that   
     
   It is able to do this because it
7. What are two reasons why a corn farmer might prefer Bt corn compared to corn that requires a chemical pesticide applications?
8. Summarize why it is possible to move a gene from a bacterial cell into the genome of corn and still have it function like it would in the bacterium. Be sure to address each of the following 1) A’s, T’s, G’s, and Cs’; 2) amino acids; 3) Universality of DNA.
9. What would a scientist use to cut out a gene from a genome?
10. How does a restriction enzyme work?
11. What is a restriction site?
12. T or F: there is only one kind of restriction enzyme. \_\_\_ Explain:
13. What is the difference between a blunt end and a sticky end?   
      
       
      
       
      
    Why does this matter for genetic engineering?
14. Draw a picture in the space below of how a gene could be inserted into a genome using sticky ends. Be sure to label the bases on the sticky end using A’s, G’s, C’s, and/or T’s.
15. What is recombinant DNA?
16. T or F: Producing recombinant DNA is the same thing as genetic engineering. \_\_\_\_\_\_
17. Why is DNA ligase needed for the production of recombinant DNA?
18. What is a genetic vector?
19. What are four common vectors?
20. What is a plasmid?
21. What are four important facts about viruses that you needed to understand?
22. How does a virus infect a cell?
23. How can scientists use a virus to get a gene into a different organism’s genome?
24. What are yeast?
25. How can a Yeast Artificial Chromosome be used as a vector?
26. What are two reasons why YACs might be more valuable as a vector than other kinds of vectors?
27. Summarize how the “shotgun technique” can be used to introduce DNA into a cell:
28. What is the purpose of a genetic marker during genetic engineering?
29. What is an antibiotic?
30. What is antibiotic resistance?
31. How can genes for antibiotic resistance be used as genetic markers?   
      
       
      
       
      
    If a scientist used antibiotic resistance genes as markers, how would they know if they successfully inserted a gene into a new genome?
32. What is an herbicide?
33. What are Roundup Ready Crops?
34. How could genes for herbicide resistance be used as genetic markers?   
      
       
      
       
      
    If a scientist used herbicide resistance genes as markers, how would they know if they successfully inserted a gene into a new genome?
35. How do visual markers work, and how could a scientist used GFP or luciferase to know that they successfully created recombinant DNA?

***In the space below, summarize how genetic engineering was used to produce insulin. Be sure to address…***

1. What is **insulin**, what it is used for, and how it was produced before genetic engineering?
2. How was the human gene for insulin inserted into the bacterial genome using plasmid **vectors**?
3. How did scientists know that they had created bacteria that produced human insulin using **markers**?
4. How did scientists control the expression of insulin using the operator and promoter of the *lac operon*?
5. What are transgenic organisms?
6. T or F: an organism with recombinant DNA is a transgenic organism. \_\_\_\_
7. What is *Agrobacterium*?
8. *Agrobacterium* is a plant pathogen. What is a pathogen?
9. Agrobacterium is responsible for , which are that grow on plants.
10. How does *Agrobacterium* create galls? Include the following: 1) Ti plasmid; 2) vector; 3) uncontrolled cell division; 4) T-DNA; 5) Virulence Region genes.
11. How can scientists use *Agrobacterium* to create transgenic plants? Be sure to include the following: 1) Ti plasmid, 2) restriction enzymes, 3) sticky ends, 4) T-DNA.
12. What is Golden Rice? Be sure to include the following in your description: 1) Beta Carotene; 2) Vitamin A Deficiency; 3) *Agrobacterium*; 4) Ti Plasmid.
13. In 10 words or less, summarize the concept of CRISPR-Cas9 (read through the slides before answering).
14. Summarize the 3 steps of the CRISPR-Cas9 immune system in the space below:   
      
    1   
      
       
      
    2   
      
       
      
    3
15. How was CRISPR discovered?
16. How can CRISPR-Cas9 be used for species like humans, cows, or plants?
17. What advantages does CRISPR have over other methods of genetic engineering?
18. How could CRISPR be used to create “smart drugs” and why might these be better than drugs like antibiotics?
19. What is HIV?
20. What is AIDS?
21. How could CRISPR be used to create a cure for HIV-AIDS?
22. How could CRISPR be used to insert new genes into a genome?
23. What are the risks of genetic engineering? What could go wrong? Summarize your thoughts below:
24. What are the risks of not doing this? What could go wrong if we banned this kind of science?
25. What are your thoughts on all of this? Is this something that we should be doing? Why or why not?
26. Imagine a world 20 years into the future. How do you think the world will change (*good or bad*) as a result of genetic engineering?

Unit Wrap-up C. Kohn, Agricultural Sciences - Waterford WI

This page is designed to help raise your grade while enabling you to develop skills you will need for after high   
school. You will need to complete every question and blank in order to receive full credit for your notes. Note: if you cannot come up with a strategy to remember a difficult concept on your own, see your instructor for help.

1. What is a topic or concept from this unit that you found to be more challenging? Write or describe below:  
     
      
     
   In the space below, create a mnemonic, rhyme, analogy, or other strategy to help you remember this particular concept:
2. What is a 2nd topic or concept from this unit that you found to be more challenging? Write or describe below:  
     
      
     
   In the space below, create a mnemonic, rhyme, analogy, or other strategy to help you remember this particular concept:
3. What is a 3rd topic or concept from this unit that you found to be more challenging? Write or describe below:  
     
      
     
   In the space below, create a mnemonic, rhyme, analogy, or other strategy to help you remember this particular concept:
4. In the space below, list any topics from this unit that you would struggle to explain verbally without using your notes. *Be honest with yourself – DO NOT write ‘none’!* This will help you better prepare for the quiz.
5. On a scale of 1 (totally confused) to 5 (completely comprehending), how do you rank yourself for this unit? \_\_\_\_
6. Should you be getting additional help from your instructor before you take this quiz?