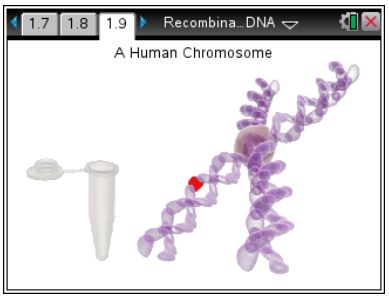
Recombinant DNA
Student Activity

Name _____
Class _____

Open the TI-Nspire document *Recombinant_DNA.tns.*



Molecular biologists often use recombinant DNA to study the function of one gene in isolation by making many copies of it. This is called cloning, or **molecular cloning**. Often, to study one gene, scientists will recombine that gene with other DNA to package the gene for study in a **model organism**. A model organism is one that reproduces quickly and can be studied easily. Bacteria are a common model organism.

Part 1: Cloning

Press ctrl ▶ and ctrl ◀ to navigate through the lesson.

Move to pages 1.2 – 1.4. Answer questions 1 – 2 here and/or in the .tns file.

Q1. Why might a scientist want to isolate a gene by cloning it to study it?

Q2. What other model organisms are you familiar with?

Move to pages 1.5 – 1.6.

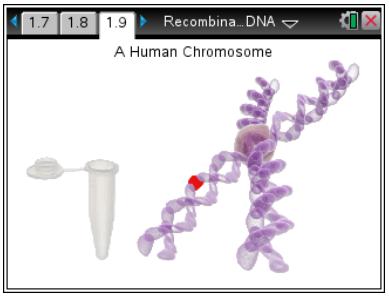
1. Read the information on pages 1.5 and 1.6 about the use of restriction enzymes in molecular cloning.

Move to page 1.7. Answer question 3 here and/or in the .tns file.

Q3. Which DNA sequence is a palindrome?

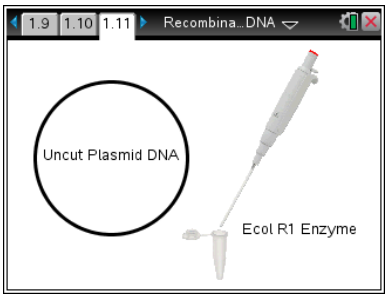
A. ATAAAT
B. GGATAGG
C. AAGCTT
D. CAAGTG

Move to pages 1.8 – 1.9.



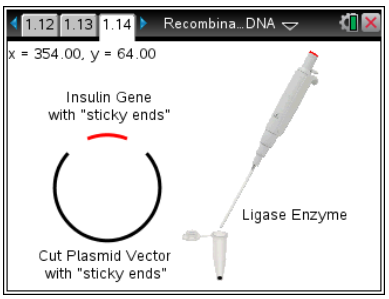
2. In this lesson, you will perform a simulation of molecular cloning in which the human insulin gene will be inserted and studied in bacteria. Read and follow the directions on page 1.9 to isolate the human insulin gene. Click ☒ to close the directions and view the simulation. If needed at any time during the simulation, you can press menu to view the directions again.

Move to pages 1.10 – 1.11.



3. Read the information on page 1.10 referring to the next step after isolating the insulin gene. Follow the instructions on page 1.11 to prepare the plasmid.

Move to pages 1.12 – 1.14.



4. Now you have two pieces of DNA with identical sticky ends that need to be connected. Read the information on pages 1.12 and 1.13 about the next step. Follow the instructions on page 1.14 to use the ligase enzyme.

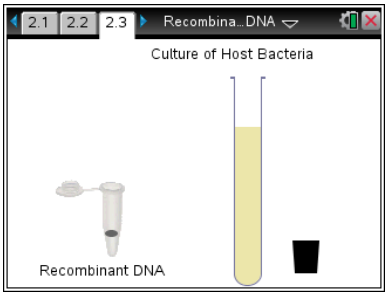
Move to pages 1.15 – 1.16. Answer questions 4 – 5 here and/or in the .tns file.

Q4. How do sticky ends of DNA help in cloning?

Q5. Ligase is found in normal cells. What do you think it does normally?

Part 2: Transforming and Culturing

Move to pages 2.1 – 2.3.



5. Read the information on pages 2.1 and 2.2 about how the isolated insulin gene can now be expressed in bacteria. Follow the instructions on page 2.3 to transform recombinant DNA into bacteria.

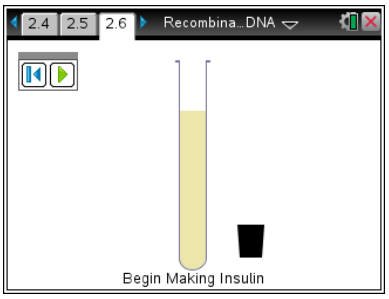
Move to page 2.4. Answer question 6 here and/or in the .tns file.

Q6. Which of the following result from transformation? Select all that apply.

A. Gene is removed from the plasmid.
B. DNA is taken up by the host.
C. Gene can be expressed by the host.
D. Gene is inserted into the plasmid.

Move to pages 2.5 – 2.6.

6. Read the information on page 2.5 about why bacteria are used to study a gene such as insulin. Follow the instructions on page 2.6 to grow insulin expressing bacteria.



Move to pages 2.7 – 2.10. Answer questions 7 – 10 here and/or in the .tns file.

Q7. As the bacteria population grows, what happens to the total amount of insulin?

Q8. Why do you think scientists use bacteria as a model organism?

Q9. Making recombinant DNA and transforming bacteria are both very inefficient. Which steps might slow down the process?

Q10. If a scientist wanted to make recombinant DNA using a different gene, which steps should be used? Select all that apply.

A. Isolate gene of interest
B. Ligate
C. Cut plasmid
D. Transform plasmid