

TITLE OF LESSON

Biology Unit 1 Lesson 34 – Recombinant DNA Technology

*Restriction Enzymes, Gel Electrophoresis and Hybridization: How does man control what's on the inside and outside of a cell?*

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TIME ESTIMATE FOR THIS LESSON

One class period

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ALIGNMENT WITH STANDARDS

California – Biol CB 1; G5c-d

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MATERIALS

**Restriction Enzyme Worksheet** – Student Page

**Teacher's Notes Lesson 34** – Teacher Page

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LESSON OBJECTIVES

- To learn about recombinant DNA technology
  - To understand how these techniques are manipulations of normal processes or enzymes found in normal cells
  - To understand how restriction enzymes work and are useful in this technology
  - To understand how to analyze DNA samples by cutting and gel electrophoresis
  - To understand how DNA hybridizes
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EXPLANATION OF LESSON

The lesson is designed so that the students understand the basic principles behind recombinant DNA technology. The most important discovery was that of restriction enzymes, which allows scientists to cut DNA in a very specific area. They will also begin to learn about what can be done once DNA has been isolated. The students will learn how good scientists learn about the normal functions within a cell in order to increase their knowledge, as well as learn how one can manipulate these functions to learn something else about a system (basic research), or to do work (recombinant DNA technology). In recombinant DNA technology it is easy to see how powerful this information can be. It has brought us to cloning and gene therapy.

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FOCUS AND MOTIVATE STUDENTS – WARM-UP ACTIVITY

- 1) Homework Check – Hand back all graded assignments and ask students to place them in the appropriate sections of their binders. Remind them that they will be turning in their binders at the end of the period today. So they should be organizing their binders now and making sure they have all assignments in the correct section, according to date. Collect their reading assignment from last night.
  - 2) **Agenda** – Have students copy the agenda you posted.
  - 3) **Group Definition** – Ask the students to work in their assigned groups. They have two minutes to come up with their definition of cloning and what it does. Then they will present their ideas to the class.
  - 4) **Vocabulary** – Afterwards, tell them that cloning is a part of recombinant DNA technologies. Write the word recombinant on the board. Ask them to write down what they think it means. How can they use their knowledge of root words, prefixes and suffixes to help them? Then have a student look up *recombinant* in the dictionary to see how close they were to the definition. Help them realize that recombinant DNA technology is about recombining different pieces of DNA. Give them some other examples of recombinant DNA technology, such as forming clones to isolate genes for DNA sequencing, genetic engineering, and gene therapy.
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ACTIVITIES – INDIVIDUAL AND GROUP



1. Lecture – Present the *Recombinant DNA Technology and Restriction Enzymes* material in **Teacher's Notes Lesson 34**. Have the student note taker take notes at the overhead during this session, while the others take notes at their desks. Remind them to underline any new vocabulary words they encounter. Make sure to leave a bit of time at the end of the lesson to [Applaud/Critique](#) the note taker.
2. Pair Work – When you have finished lecturing on the first two sections, pass out the **Restriction Enzyme Worksheet**. The students should work in assigned pairs. Have the students follow the directions in the worksheet. They must look at the DNA sequence and then the list of restriction enzymes to find which one can cut the sequence.

*Answers For Teachers: Enzymes that cut this sequence: AvaI, XhoI, EcoRI, and DraI*

3. Lecture 2 – After the students have completed the worksheet, continue with the rest of the material in **Teacher's Notes Lesson 34**, making sure that students are taking notes while you are lecturing.
  4. [Applaud/Critique](#) your note taker.
  5. Homework Review – Collect all binders. Review the homework assignments.
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#### HOMEWORK

- 1) Starr's textbook *Biology Concepts and Applications*, chapter 15, pp. 222 – 224 & 229 or other text with information about restriction enzymes, probes, and hybridization. The students should write down the key points found in the text.
  - 2) Make flash cards of all the topics studied between lesson 20 and lesson 30.
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#### GROUP ROLES

Recorder – The recorder will take notes and write up the restriction enzyme data. All students are recorders.  
Manager – The manager will hand out the sheets containing the list of restriction enzymes.  
Illustrator – The illustrator will draw images representing the way in which restriction enzymes function.

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#### DOCUMENTATION FOR PORTFOLIO

Lab Report #1  
Method – Photoshop Image  
Lab Report #2  
Evaluation Essay #1  
Method 2 – Photoshop Image