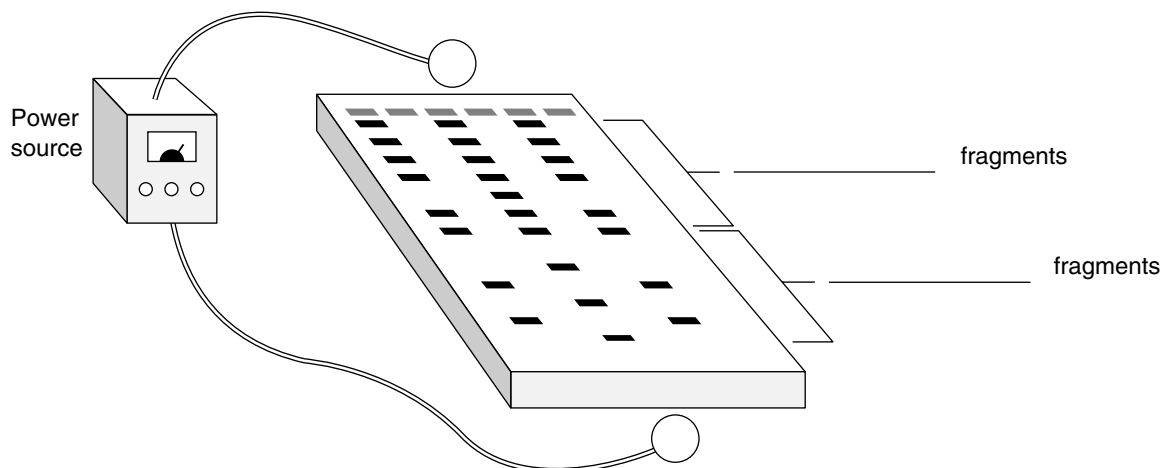


## Section 13–2 Manipulating DNA (pages 322–326)

*This section describes the various techniques used by molecular biologists to study and change DNA molecules.*

### The Tools of Molecular Biology (pages 322–323)

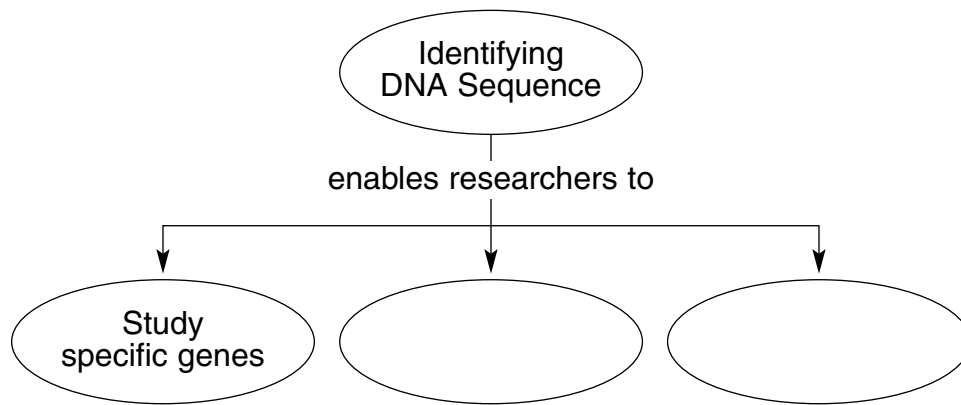
1. What is genetic engineering? \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
2. Is the following sentence true or false? Making changes to the DNA code is similar to changing the code of a computer program. \_\_\_\_\_
3. Scientists use their knowledge of the \_\_\_\_\_ of DNA and its \_\_\_\_\_ properties to study and change DNA molecules.
4. List four different techniques that molecular biologists use to study and change DNA molecules.
  - a. \_\_\_\_\_
  - b. \_\_\_\_\_
  - c. \_\_\_\_\_
  - d. \_\_\_\_\_
5. Explain how biologists get DNA out of a cell. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_
6. Biologists use \_\_\_\_\_ to cut DNA molecules at a specific sequence of nucleotides to make smaller fragments.
7. Circle the letter of the process by which DNA fragments are separated and analyzed.
  - a. gel electrophoresis
  - b. extraction
  - c. transformation
  - d. restriction
8. In the diagram below, label the positive and negative ends of the gel and identify the location of longer and shorter fragments.



9. Circle the letter of each sentence that is true about gel electrophoresis.
  - a. An electric voltage applied to the gel separates the DNA fragments.
  - b. DNA molecules are positively charged.
  - c. Gel electrophoresis is used to compare the genomes of different organisms.
  - d. Gel electrophoresis can be used to locate and identify one particular gene in an individual's genome.

**Using the DNA Sequence** (pages 323–326)

10. Complete the concept map to show how researchers use the DNA sequence of an organism.



11. List four “ingredients” added to a test tube to produce tagged DNA fragments that can be used to read a sequence of DNA.
  - a. \_\_\_\_\_
  - b. \_\_\_\_\_
  - c. \_\_\_\_\_
  - d. \_\_\_\_\_
12. What does the reaction in the test tube generate when complementary DNA is made for reading DNA? \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_
13. Is the following sentence true or false? The pattern of colored bands on a gel tells the exact sequence of bases in DNA. \_\_\_\_\_
14. Enzymes that splice DNA together can also be used to join \_\_\_\_\_ DNA sequences to natural DNA sequences.
15. How is recombinant DNA produced? \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Name \_\_\_\_\_ Class \_\_\_\_\_ Date \_\_\_\_\_

16. What is polymerase chain reaction (PCR)? \_\_\_\_\_

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17. What is the role of the primers in PCR? \_\_\_\_\_

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18. Circle the letter of the first step in the polymerase chain reaction.

- a. The copies become templates to make more copies.
- b. The DNA is cooled to allow the primers to bind to the single-stranded DNA.
- c. The DNA is heated to separate its two strands.
- d. DNA polymerase makes copies of the region between the primers.