**CHAPTER 20 READING GUIDE**

***Concept 20.1: DNA cloning yields multiple copies of a gene or other DNA segment.***

1. How are the terms “biotechnology” and “genetic engineering” related? How are they different?
2. Draw a diagram to represent Recombinant DNA. Define/describe this molecule and how it is made.
3. Why are restriction enzymes important in genetic engineering?
4. There are several steps involved in gene cloning. During the final stage, scientists must differentiate between transformed and untransformed cells. What is meant by “transformation”?
5. How do scientists select the transformed cells?
6. Once scientists have selected transformed bacterial cells, they then have to find the gene of interest. To do this they can use a technique called nucleic acid hybridization. Explain what this process is and how it works.
7. What is a cDNA library? How is it made?
8. When DNA (or cells) is scarce, what technique can scientists use to amplify the amount of genetic material found (like at a crime scene)?

***Concept 20.2: DNA technology allows us to study the sequence, expression, and function of a gene***.

1. Gel electrophoresis is used to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ macromolecules, mainly DNA and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
	1. How does gel electrophoresis utilize the property that DNA is negatively charged?
	2. How does gel electrophoresis separate molecules by size?

**Use the DNA fingerprint below to answer questions 10-11.**

1. On the DNA fingerprint below, highlight or circle the shortest DNA fragment. How many base pairs long is it? \_\_\_
2. Which 2 suspects were most likely at the crime scene? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. In a DNA microarray assay, how do scientists identify which genes are being actively expressed?
4. How are RFLPs used in gel electrophoresis?

***Concept 20.3: Cloning organisms may lead to production of stem cells for research and other applications.***

1. During the process of animal cloning using nuclear transplantation, why is a sperm not necessary to create the zygote?
2. What is the major use of cloning in humans?
3. How are the terms embryonic stem cell and adult stem cell related?
	1. How are they different?
	2. Which type of stem cell is pluripotent? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ What does this mean?

***Concept 20.4: The practical applications of DNA technology affect our lives in many ways.***

**Identify each DNA tech application with its description or use.**

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: used to clean up heavy metals from mining sites or clean up toxic sludge from oil spills.
2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: used to treat cystic fibrosis and the genetic level
3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: utilizes DNA left behind at crime scenes
4. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: used to create GMOs to increase crop yield and improve nutrition
5. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: uses RFLPs to help identify cystic fibrosis or test for HIV
6. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_: uses gene splicing and cloning to make large quantities of protein like insulin