

## Chap 13

### Short Answer

1. What does polymerase chain reaction enable scientists to do?
2. What is a transgenic organism?
3. Why do transgenic bacteria that have the gene for human insulin produce insulin in great abundance?

### Essay

4. Compare and contrast the techniques used in genetic engineering and in selective breeding to produce organisms with desired traits.
5. Suppose you are a scientist trying to help people who cannot produce an enzyme needed for proper digestion. How could you use genetic engineering techniques to make transformed bacteria that produce the enzyme?
6. In what general ways are transgenic organisms useful to people today?

## Chap 13

### Answer Section

#### SHORT ANSWER

1. ANS:  
Polymerase chain reaction enables scientists to make many copies of a gene.  
  
PTS: 1 NAT: C.2.a | E.2 STA: BL.5.a | BL.5.b | BL.5.c  
KEY: knowledge
2. ANS:  
A transgenic organism is an organism produced by genetic engineering that contains genes from another kind of organism.  
  
PTS: 1 NAT: C.4.e | F.6 STA: BL.5.c KEY: knowledge
3. ANS:  
Bacteria reproduce quickly. The more transgenic bacteria there are, the more insulin is produced.  
  
PTS: 1 NAT: C.4.e | F.6 STA: BL.5.c | BL.5.e  
KEY: synthesis

#### ESSAY

4. ANS:  
In genetic engineering, organisms with desired traits are produced by directly changing the DNA of the organisms. This is done by cutting out desirable genes from the DNA of certain organisms and inserting them into the DNA of other organisms. In selective breeding, organisms with desired traits are produced by selecting organisms for their traits and then mating, or crossing, them. Selective breeding does not directly change the DNA of living organisms.  
  
PTS: 1 NAT: C.2.a | E.2 STA: BL.5.c | BL.3.a  
KEY: analysis
5. ANS:  
Extract DNA from the cells of people who can make the digestion enzyme. Cut the DNA with restriction enzymes to cut out the gene that codes for the enzyme. Use gel electrophoresis to locate the gene. Then, use polymerase chain reaction to make copies of the gene. Choose a plasmid that has an antibiotic-resistance genetic marker, and cut the plasmid with the same restriction enzyme used to cut out the human gene. Insert the copies of the human gene into the plasmids. Allow bacterial cells to take in the plasmids. Select for transformed bacteria by growing them in a culture containing the antibiotic. These bacteria will make the digestion enzyme.  
  
PTS: 1 NAT: C.4.e | F.6 STA: BL.5.c | BL.5.d | BL.5.e  
KEY: synthesis

6. ANS:

Answers will vary. Transgenic bacteria make human proteins cheaply and in large amounts. Transgenic animals are used to study human genes and to improve animal foods. Transgenic plants help increase crop yields and may be healthier for people to eat.

PTS: 1 NAT: C.4.e | F.6 STA: BL.5.c | BL.5.e

KEY: application