Lesson 15.1

1. C
2. a
3. a
4. To produce organisms with new traits, breeders can induce mutations (usually in bacteria) using radiation or chemicals, or they can create polyploid plants.
5. Polyploidy describes an organism with multiple sets of chromosomes. It can be useful to produce new species of plants that are larger and stronger than their diploid relatives.
6. Cross the pink and yellow roses until a thornless plant with sweet-smelling flowers is obtained. Then, cross that plant with the scentless purple flowers until a thornless plant with sweet-smelling purple flowers is obtained.
7. They are similar in that both involve selective breeding that takes advantage of naturally occurring genetic variation to produce wanted characteristics in the next generation. They are different in that hybridization crosses dissimilar individuals to bring together the best of both organisms, while inbreeding involves breeding together individuals of similar characteristics.

Lesson 15.2

1. A
2. B
3. C
4. C
5. A
6. The first step is to heat a piece of DNA, which separates its two strands. Then, as the DNA cools, primers bind to the single strands. Next, DNA polymerase starts copying the region between the primers. These copies can serve as templates to make still more copies.
7. A genetic marker is a gene that makes it possible to distinguish bacteria that carry a plasmid from those that do not. Genetic markers are inserted into plasmids so that scientists can identify cells that have been transformed.
8. A transgenic plant contains genes from other species, while a hybrid plant contains genes from only the parent plants.
9. One advantage of producing insulin or other proteins through genetic engineering is that huge cultures of bacteria can be cheaply grown, so large supplies of insulin can be made much more inexpensively than taking insulin from mammals. Also, recombinant DNA can be used to make human insulin, rather than having to rely on insulin made by other animals, which may be different and cause reactions in some people.
10. Because the genetic code is universal, it doesn’t matter which organism a particular DNA sequence came from.

Lesson 15.3

1. B
2. C
3. C
4. DNA microarrays allow scientists to compare the gene expression patterns of different cells. This kind of comparison can be used to distinguish cancer cells from normal cells.
5. DNA fingerprinting can be used to help solve crimes by matching DNA evidence from a crime scene with possible suspects. It can also be used to establish familial relationships, such as in cases disputed paternity, by finding alleles in a child that are not carried by the mother and then matching them to the father’s fingerprint.
6. The change would not be passed on because genetically altering bone marrow would not affect the DNA in gametes involved in reproduction.

Lesson 15.4

1. C
2. B
3. Sometimes patent holders demand high fees that block other scientists from exploring lines of research.
4. Expensive GM seeds may force small farmers out of business, especially in the developing world.
5. Transgenic microorganisms might be used to produce substances that can fight cancer. Transgenic animals might provide humans with sources of human proteins. Transgeneic plants might produce foods that contain all necessary vitamins.
6. Hypothetically, because the genetic code is universal, it may one day be possible to create an animal with a frog’s body and a bat’s wings. However, in reality, this would be very difficult (if not impossible), because there are so many genes needed to code for a single body structure. Also, scientists would need reasons to do their experiments, and there doesn’t appear to be a good reason to do this. So this is not really a reasonable statement.
7. Complementary strand: TACTCTAGATGCCTTAAGAGTTGAACTTAGC. On the original strand, *Bg/*II will cut after the fourth nucleotide and ECORI will cut after the thirteenth nucleotide. HindII will not cut the strand.
8. Demonstrate an understanding of both selective breeding and genetic engineering and the advantages and disadvantages of each.
9. The first step to find the human gene by using gel electrophoresis to separate DNA fragments, and then identifying the gene with radioactive probes. PCR may be used to make copies of the gene. The next step is to insert the human gene into a plasmid that has been cut with the same restriction enzyme to create sticky ends. The resulting recombinant DNA can be inserted into a bacterial cell by mixing recombinant plasmids with a culture of bacteria. Bacterial cells that take up the recombinant plasmid can be identified if the plasmid also has a genetic marker, such as a gene for antibiotic resistance.