

20.1

- 1) Explain how advances in recombinant DNA technology have helped scientists study the eukaryotic genome.
- 2) Describe the natural function of restriction enzymes.
- 3) Explain how the creation of sticky ends by restriction enzymes is useful in producing a recombinant DNA molecule.
- 4) Outline the procedures for cloning a eukaryotic gene in a bacterial plasmid.
- 5) Describe the role of an expression vector.
- 6) Explain how eukaryotic genes are cloned to avoid the problems associated with introns.
- 7) Describe two advantages of using yeast cells instead of bacteria as hosts for cloning or expressing eukaryotic genes.
- 8) Describe three techniques to aggressively introduce recombinant DNA into eukaryotic cells.
- 9) Describe the process of nucleic acid hybridization.
- 10) Describe the polymerase chain reaction (PCR) and explain the advantages and limitations of this procedure.

20.2

- 11) Explain how gel electrophoresis is used to analyze nucleic acids and proteins and to distinguish between two alleles of a gene.
- 12) Describe the Southern blotting procedure and explain how it can be used to detect and analyze instances of restriction fragment length polymorphism (RFLP).
- 13) Explain how RFLP analysis facilitated the process of genomic mapping. (Figure 20.12)

20.3

- 14) What is a clone?
- 15) What are totipotent, pluripotent, embryonic, and induced pluripotent cells? How do they relate to each other?
- 16) What are differences with cloning plants versus cloning animals?
- 17) What are the problems with animal cloning?

20.4

18) Describe how DNA technology can have medical applications in such areas as the diagnosis of genetic disease, the development of gene therapy, vaccine production, and the development of pharmaceutical products.

19) Explain how DNA technology is used in the forensic sciences.

20) Describe how gene manipulation has practical applications for environmental and agricultural work.

21) Describe how plant genes can be manipulated using the Ti plasmid carried by *Agrobacterium* as a vector.

22) Explain how DNA technology can be used to improve the nutritional value of crops and to develop plants that can produce pharmaceutical products.

23) Describe the safety and ethical questions related to recombinant DNA studies and the biotechnology industry.

21.1

24) List the goals of the Human Genome Project.

25) Describe the alternate approach to whole-genome sequencing pursued by J. Craig Venter and the Celera Genomics company. Describe the advantages and disadvantages of public and private efforts.

21.3 and basics of 21.4

26) Describe the surprising results of the human genome project.