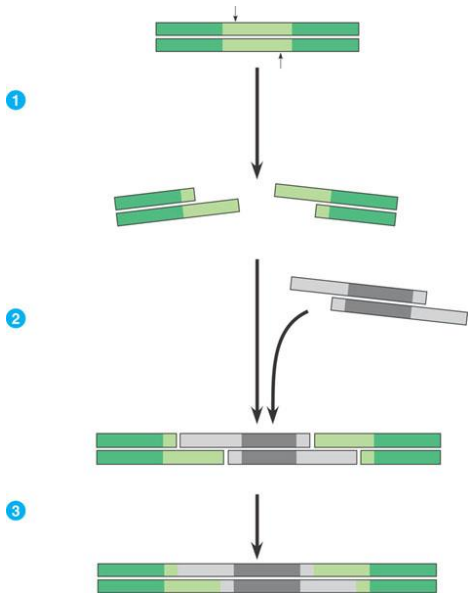
Name_____

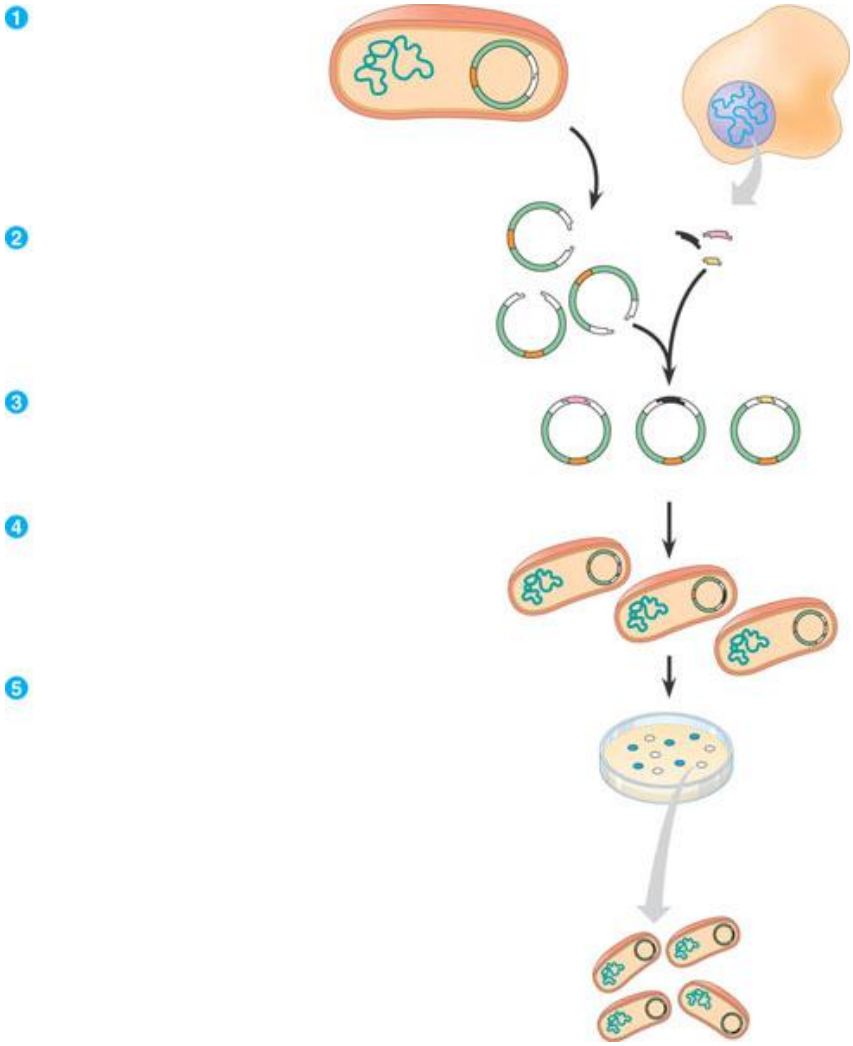
AP Biology
TEXT: *Biology*, **Campbell and Reece**
7th Edition

Chapter 20 – DNA Technology and Genomics
Guided Reading

1. Define the following terms:
    a. Recombinant DNA
    b. Genetic engineering
    c. Biotechnology
    d. Gene cloning
2. What are the two basic purposes of cloned genes? Describe ***at least*** three practical uses for cloned genes.
3. What is the other name for restriction enzymes and what do these enzymes do for bacteria in "nature"?
4. Define the following terms:
    a. Restriction site
    b. Restriction fragments
    c. Sticky end
5. Label the following diagram and briefly describe the process being illustrated.



6. Using the diagram below, label the steps to cloning a human gene in a bacterial plasmid.



7. Explain in your own words two ways that we know that cell clones carry the recombinant plasmids?

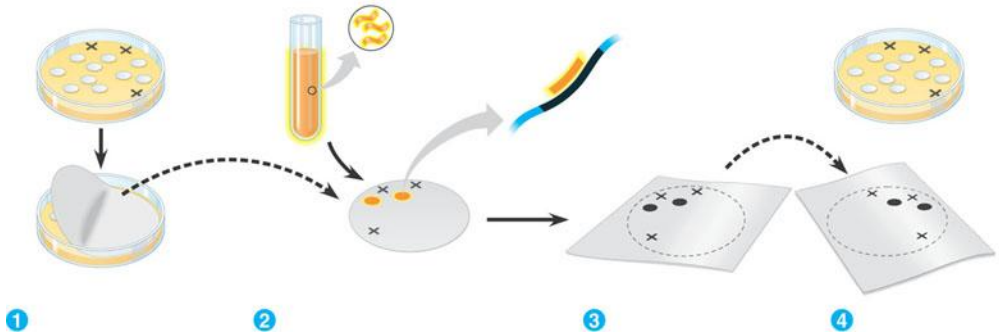
8. What is the purpose of nucleic acid hybridization? Why is the word “hybrid” used to describe this process?

9. What is a complementary, short, single-stranded nucleic acid that can be either DNA or RNA?

10. Why do scientists use a radioactive isotope tag for the probes?

11. How is DNA denaturation different than protein denaturation?

12. Label the following steps of nucleic acid probe hybridization.



13. Define genomic library.

14. How are bacteriophages used for making genomic libraries and what are some of the advantages of this?

15. What are the steps in making complementary DNA (cDNA)?

16. Compare and contrast the advantages of cDNA libraries and genomic libraries.

17. What is an expression vector and what problem does it solve?

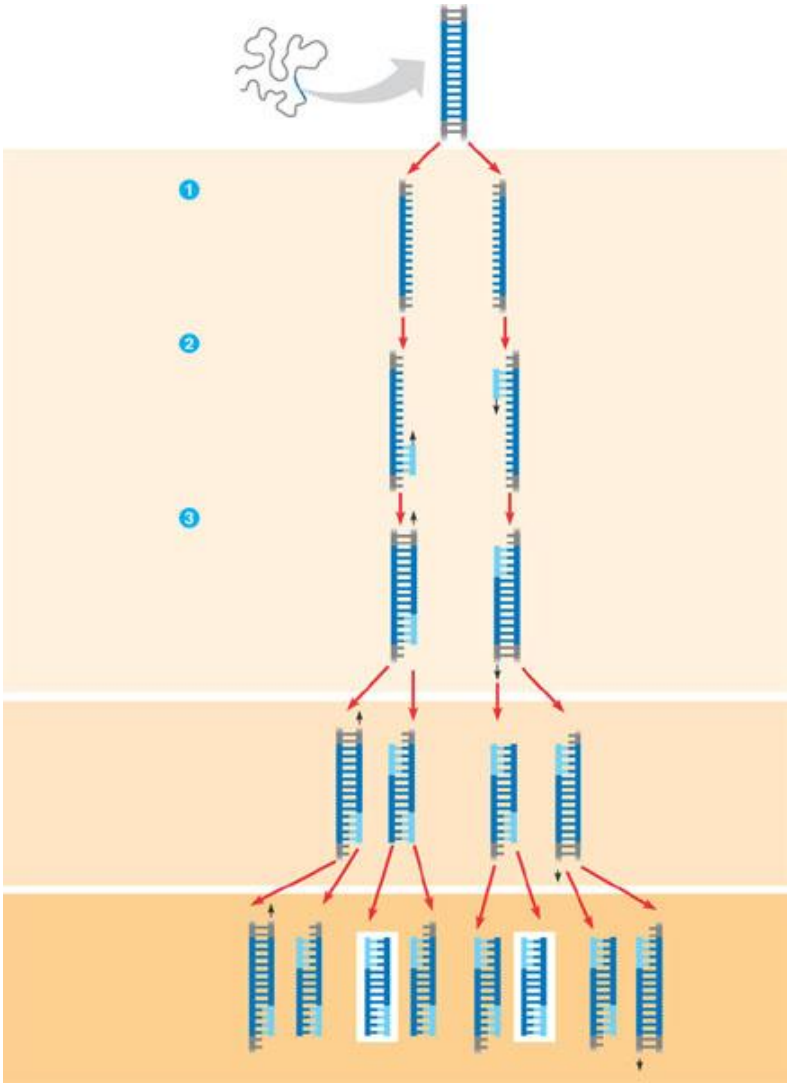
18. Why do molecular biologists use yeast as opposed to bacteria for expressing genes of interest?

19. Explain the use of yeast artificial chromosomes (YAC's) in gene cloning.

20. What is electroporation?

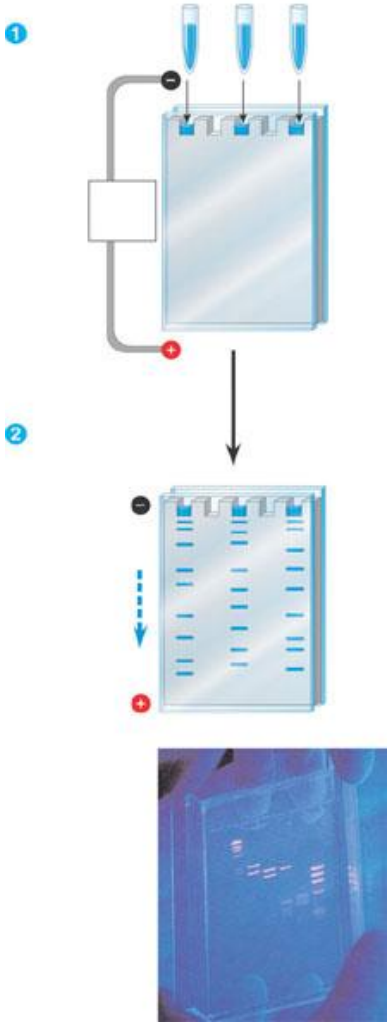
21. Why is PCR, polymerase chain reaction, important in many aspects of biotechnology? Before addressing this question check out the new PCR Song Music Video at: **http://bio-rad.cnpg.com/lsca/videos/ScientistsForBetterPCR/**.

22. Label the diagram of PCR below.

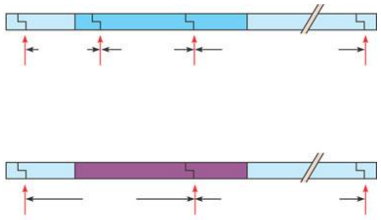


23. What is the purpose and general process of gel electrophoresis?

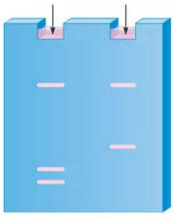
24. Label the diagram below. Focus on the charge, molecule size and results.



25. Label the diagram below. Focus on identifying the fragments.



(a)

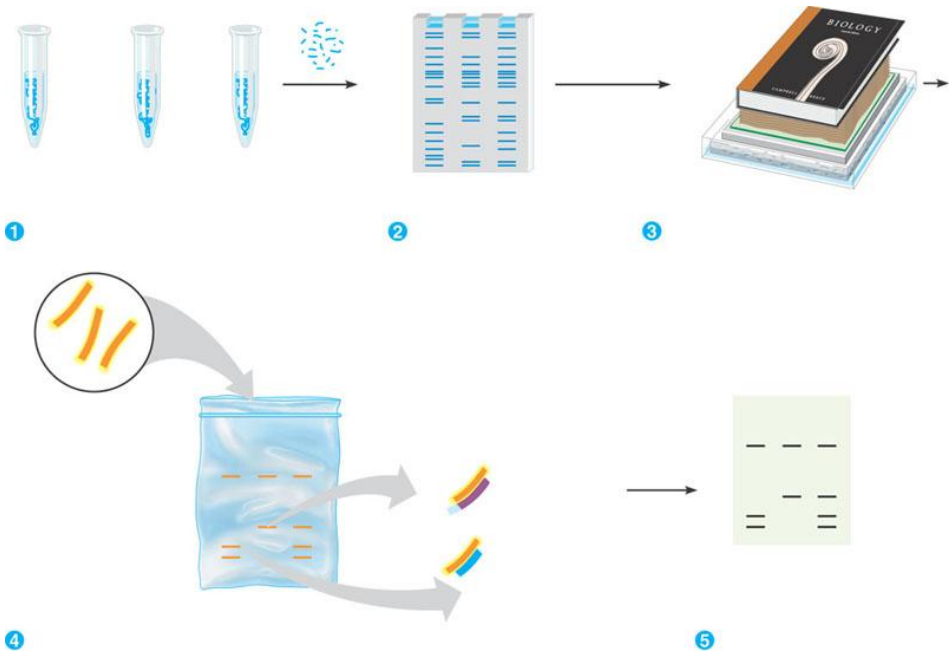


(b)

26. Define and explain the significance of RFLP's, restriction length polymorphisms.

27. What was the purpose of the Human Genome Project?

28. Label the diagram outlining the Southern Blotting of DNA Fragments



29. Why is genetic mapping considered a "relative mapping" as opposed to physical mapping?

30. What is the goal of DNA sequencing?

31. What is the basic concept of the whole-genome shotgun approach to sequencing?

32. Define genomics.

33. Is there a direct correlation between size of the genome and the complexity of the organism?

34. What is in vitro mutagenesis and what does it help the scientist understand?

35. What is proteomics?

36. Define **single nucleotide polymorphisms.**

37. What are some of the examples of the medical applications of biotechnology?

38. What are the basic steps in human gene therapy with a retroviral vector?

39. Have there been problems with this procedure?

40. What is a DNA fingerprint?

41. What is a transgenic animal?

42. How are plasmids used in agriculture? How is genetic engineering used in plants?

43. What are genetically modified foods and do you think that you have eaten any?

The PCR Song **Brought to you by the fine scientists at…**

There was a time when to amplify DNA,
You had to grow tons and tons of tiny cells.

Then along came a guy named Dr. Kary Mullis,
Said you can amplify in vitro just as well.

Just mix your template with a buffer and some primers,
Nucleotides and polymerases, too.

Denaturing, annealing, and extending.
Well it's amazing what heating and cooling and heating will do.

PCR, when you need to detect mutations.
PCR, when you need to recombine.
PCR, when you need to find out who the daddy is.
PCR, when you need to solve a crime.

(repeat chorus)