Bio12-Q2W7-Qs Bank-Biotechnology

Matching

Match each item with the correct statement below.

a. recombinant DNA
b. vector
c. restriction enzymes
d. plasmid
e. transgenic organisms
f. genetic engineering or recombinant DNA technology

____ 1. Bacterial proteins that have the ability to cut both strands of the DNA molecule at certain points
____ 2. Contain foreign DNA
____ 3. Is made by connecting segments of DNA from different sources
____ 4. General term for a carrier used to transfer a foreign DNA fragment into a host cell
____ 5. The procedure for cleaving DNA from an organism into small segments, and inserting the segments into another organism

Completion

Complete each statement.

6. Organisms that are homozygous dominant and those that are _____ for a trait controlled by Mendelian inheritance have the same phenotype.
7. A _____ determines whether an organism is heterozygous or homozygous dominant for a trait.
8. Usually the parent with the known genotype is _____ for the trait in question.
9. When two cultivars are crossed, their offspring will be _____.
10. A gene gun and a virus may both be classified as _____ because they are mechanisms by which foreign DNA may be transferred into a host cell.
11. For the diagnosis of a genetic disorder, many cells are required, but only a few need to be taken from the individual. These cells are grown in a _____ so that enough DNA can be obtained to run the necessary tests.
12. _____ are produced when DNA from another species is inserted into the genome of an organism, which then begins to produce the protein encoded on the recombinant DNA.
13. A(n) _____ shows the relative location of genes on a chromosome.
14. A(n) _____ is a small ring of DNA found in a bacterial cell.
15. The entire collection of genes within human cells is referred to as the _____.
16. _____ is an application of the Human Genome Project that involves the insertion of normal genes into cells with defective genes in an attempt to correct genetic disorders.
17. _____ are used to cleave DNA into fragments.
18. To determine if an individual with a dominant phenotype is homozygous or heterozygous, a _____ is used.

19. _____ is used to develop pure breeds.

20. Many crop plants such as wheat and corn have been developed as _____ in order to develop larger and stronger plants.

Modified True/False
Indicate whether the statement is true or false. If false, change the identified word or phrase to make the statement true.

____ 21. Santa Gertrudis cattle have the combined traits of good beef production and hot weather tolerance as a result of selection and inbreeding. _____

____ 22. Many flowering plants such as roses, African violets, and orchids have been produced by the process of test crossing. _____

____ 23. You have benefited from selective breeding by having more agricultural produce than would have been possible otherwise. _____

Multiple Choice
Identify the choice that best completes the statement or answers the question.

____ 24. An application of using DNA technology to help environmental scientists would be _____.
a. use PCR to analyze DNA at a crime scene
b. create a tobacco plant that glows in the dark
c. clone the gene for human growth hormone to treat pituitary dwarfism
d. make transgenic bacteria that can be used to clean up oil spills more quickly than do the natural bacteria

____ 25. Which of the following would be an example of gene therapy technology?
a. development of a nasal spray that contains copies of the normal gene that is defective in persons with cystic fibrosis
b. cutting DNA into fragments with restriction enzymes
c. modifying E. coli to produce indigo dye for coloring denim blue jeans
d. separation DNA fragments using gel electrophoresis

____ 26. Gel electrophoresis is a technique used to _____.
a. clone chromosomes of various species
b. cut DNA into fragments of various sizes
c. separate DNA fragments by charge and length
d. inject foreign DNA into animal and plant cells

____ 27. Recombinant DNA are currently used to produce _____.
a. clothing dye, cheese, and laundry products
b. human antibodies and vaccines
c. crops that test better and stay fresh longer
d. all of these

____ 28. A small amount of DNA obtained from a mummy or from frozen remains of a human may be cloned. In order to clone small amounts of DNA, _____ needs to be used to generate larger quantities of the DNA.
a. polymerase chain reaction techniques
b. gel electrophoresis
c. DNA fingerprinting
d. gene splicing

____ 29. Examine the pieces of DNA represented in Figure 13-1. Why are the nucleotide sequences on both strands referred to as palindromes?

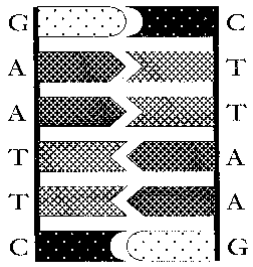


Figure 13-1

a. the sequences show chromosome mutation
b. the DNA is an example of a transgenic codon
c. the sequences are the same but run in opposite directions
d. each nucleotide is represented

____ 30. In 1974, Stanley Cohen and Herbert Boyer inserted a gene from an African clawed frog into a bacterium. The bacterium produced the protein coded for by the inserted frog gene. The bacterium containing functional frog DNA would be classified as a _____.

a. clone
b. DNA fingerprint
c. plasmid
d. transgenic organism

____ 31. In 1974, Stanley Cohen and Herbert Boyer inserted a gene from an African clawed frog into a bacterium. The bacterium produced the protein coded for by the inserted frog gene. This insertion of a small fragment of frog DNA into the DNA of another species can most accurately be called _____.

a. cloning
b. genetic engineering
c. electrophoresis
d. gene therapy

____ 32. Listed below are procedures involved in the production of a transgenic organism. From the choices provided, select the sequence that represents the proper order of events.

1. Recombinant DNA is transferred into a bacterial cell.
2. A specific gene is identified in a DNA sequence.
3. The DNA fragment is recombined into a vector.
4. The DNA fragment to be inserted is isolated.

a. 1, 2, 3, 4
b. 2, 3, 1, 4
c. 2, 4, 3, 1
d. 4, 1, 2, 3

____ 33. The process used to separate DNA segments of different lengths is _____.

a. PCR
b. gel electrophoresis
c. gene amplification
d. all of these

____ 34. The Human Genome Project has involved sequencing and mapping the human genome. The most important benefit of this information has been the diagnosis of genetic disorders. Once a genetic disorder is diagnosed, _____ can be used as a possible treatment.

a. cell cultures
b. gene therapy
c. DNA fingerprinting
d. PCR

____ 35. The Human Genome Project may make use of which of the following to diagnose genetic disorders before birth?

a. cell cultures
b. gel electrophoresis
c. PCR
d. all of the above

____ 36. A echnique that may be employed in the Human Genome Project is _____.

a. PCR
b. automated gene sequencers
c. gel electrophoresis
d. all of these

____ 37. The historical method used to assign genes to particular human chromosome was to _____.
a. use linkage maps
b. study linkage data from human pedigrees
c. conduct mating experiments
d. use biotechnology

____ 38. The effort to completely map and sequence the human genome will likely result in knowing the sequence of the approximately _____ genes on the 46 human chromosomes.
a. 46
b. 10 000
c. 35 000 to 40 000
d. 3 billion

____ 39. Which of the following are applications of genetic engineering?
a. transgenic bacteria in agriculture
b. transgenic plants and animals
c. transgenic bacteria in industry
d. all of these

____ 40. A virus isolated from monkeys contains a circular double strand of DNA. The virus, called Simian Virus 40, interests scientists because it causes cancer in laboratory animals. Using a restriction enzyme, the strand is separated into six unequal segments, as shown in Figure 13-2. A scientist hypothesizes that the segment of DNA causing cancer can contain no fewer than 600 base pairs. Using Figure 13-2, decide which segments of the virus have the highest chance of containing the segment of interest. Identify in DESCENDING order, from the HIGHEST chance to the LOWEST.

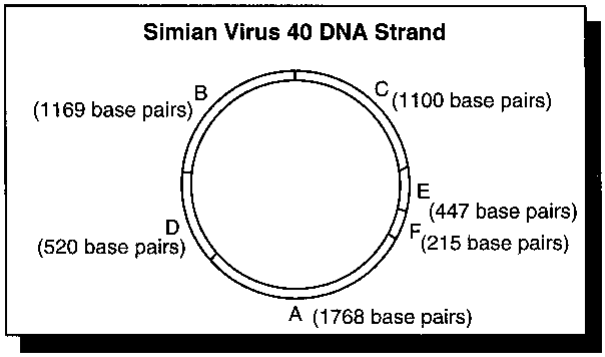


Figure 13-2

a. C, B, A
b. F, E, D
c. A, B, C
d. D, E, F

____ 41. In pea plants, inflated pods (R) are dominant to constricted pods (r). Which of the following crosses is a test cross between inflated pods and constricted pods?
a. RR x RR
b. RR x Rr
c. RR x rr
d. Rr x Rr

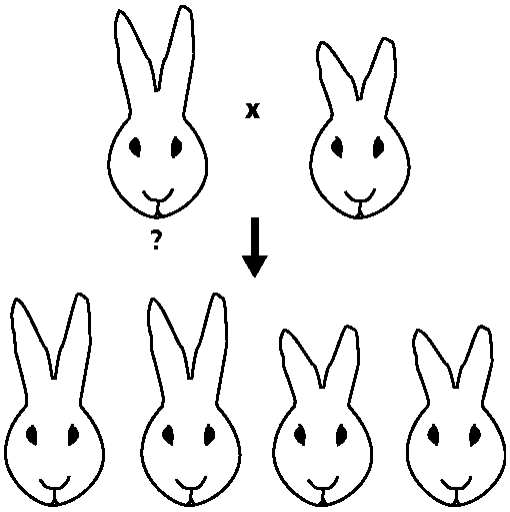


Figure 13-4

____ 42. What is the genotype of the unknown rabbit in Figure 13-4?

a. homozygous long ears
b. homozygous short ears
c. heterozygous
d. recessive

____ 43. What would be the result of the test cross in Figure 13-4 if the unknown were homozygous long ears?

a. 1/2 of the offspring would have long ears
b. all of the offspring would have long ears
c. all of the offspring would have short ears
d. 1/4 of the offspring would have short ears

____ 44. What must be on either end of any genetic material that is inserted into the cleaved DNA in Figure 13-5?

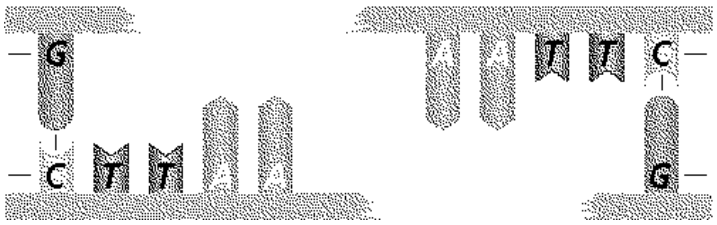


Figure 13-5

a. AATT
b. ATAT
c. CCGG
d. CGCG

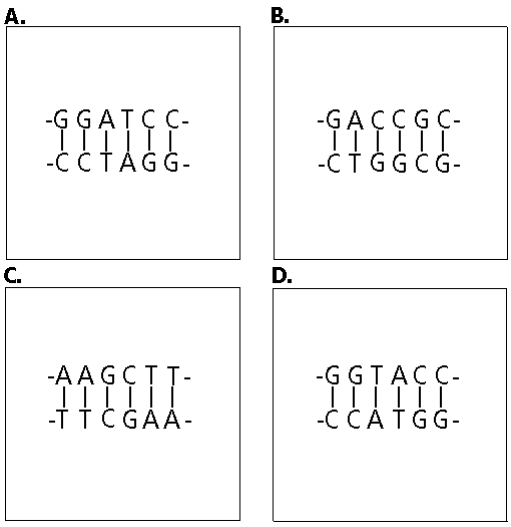


Figure 13-6

____ 45. Which segment in Figure 13-6 is not a palidrome?

a. A
b. B
c. C
d. D

____ 46. Which segment in Figure 13-6 will attach to genetic material with the sequence TCGA?

a. A
b. B
c. C
d. D

____ 47. If the segments in Figure 13-6 are mixed with several restriction enzymes, which will not be cleaved?

a. A
b. B
c. C
d. D

____ 48. According to Figure 13-7, which DNA sequence will be cleaved by EcoRI, which cuts AATT/TTAA?

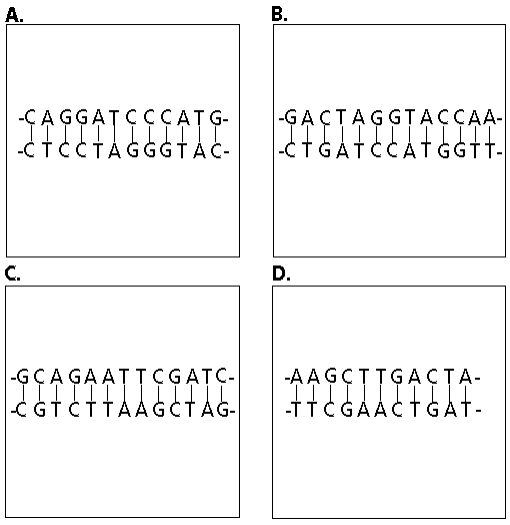


Figure 13-7

a. A
b. B
c. C
d. D

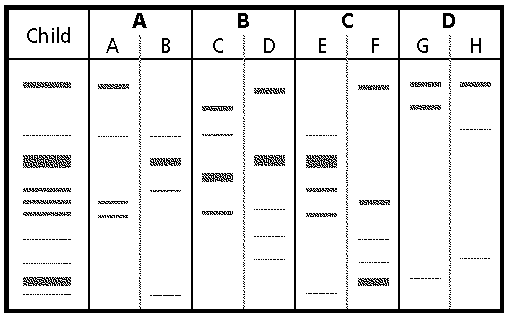


Figure 13-8

____ 49. According to Figure 13-8, which are the parents of the child?

a. A
b. B
c. C
d. D

____ 50. According to Figure 13-8, which parents might give a false positive if only the longer DNA fragments were analyzed?

a. A
b. B
c. C
d. D

Short Answer

51. Explain the term *recombinant DNA* in a complete sentence.

52. Explain the term *genetic engineering* in a complete sentence.

53. Discuss how DNA fingerprinting works in crime analysis.

54. Figure 13-3 is a drawing of a hypothetical gel. Included on the gel is the banding pattern of the mother and father of two children. Determine possible banding patterns for each child selecting the letters A to F from the chart.

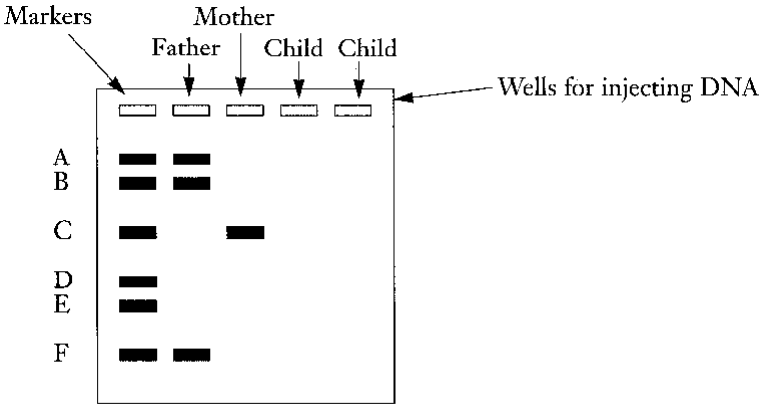


Figure 13-3

55. What impacts have pedigree analysis, inbreeding, and hybridization made on crop plants and farm animals?

56. A breeder wants to find out whether or not a certain golden retriever is a carrier of an undesirable recessive trait. What could the breeder do? Explain.

Problems

Agrobacterium tumefaciens is a bacterium that causes crown gall disease, a tumorous growth on the growing tip of certain plants. The bacterium is able to enter a plant through small cuts in the outer cell layer. When *Agrobacterium* enters a plant cell, a DNA sequence from the bacterium integrates into the plant's DNA. This new section of DNA causes the plant's cell to reproduce quickly to form a tumor and to synthesize a food molecule needed by the bacterium. A critical bit of information that scientists have learned about the process is that the tumor-causing information is carried on a large plasmid that is separate from the bacterium's main chromosome. During the infection process, the DNA on the plasmid that codes for food production and rapid reproduction leaves the plasmid, moves into the plant cell nucleus, and integrates with one of the plant cell's chromosomes. Thus, when the plant cell reproduces, it passes along the bacterium's genetic information, which has been incorporated into the plant genome.

57. Why is the above information about how *Agrobacterium* causes crown gall disease important to scientists hoping to produce transgenic plants?
58. What could be used to cut open an *Agrobacterium* plasmid and insert a gene that would increase the rate of conversion of atmospheric nitrogen into nitrates?
59. Illustrate and label what the plasmid might look like with the desired gene inserted.
60. What benefits to agriculture could stem from scientists being able to engineer plants genetically?

Bio12-Q2W7-Qs Bank-Biotechnology
Answer Section

MATCHING

1. ANS: C PTS: 1
2. ANS: E PTS: 1
3. ANS: A PTS: 1
4. ANS: B PTS: 1
5. ANS: F PTS: 1

COMPLETION

6. ANS: heterozygous

   PTS: 1
7. ANS: testcross

   PTS: 1
8. ANS: homozygous recessive

   PTS: 1
9. ANS: hybrids

   PTS: 1
10. ANS: vectors

    PTS: 1 DIF: B OBJ: 13-3 NAT: F4 | F5 | F6
11. ANS: cell culture

    PTS: 1 DIF: B OBJ: 13-3 NAT: F4 | F5 | F6
12. ANS: Transgenic organisms

    PTS: 1 DIF: B OBJ: 13-3 NAT: F4 | F5 | F6
13. ANS: linkage map

    PTS: 1 DIF: B OBJ: 13-5 NAT: F4 | F5 | F6
14. ANS: plasmid

    PTS: 1 DIF: B OBJ: 13-3 NAT: F4 | F5 | F6
15. ANS: human genome

    PTS: 1 DIF: B OBJ: 13-5 NAT: F4 | F5 | F6
16. ANS: Gene therapy

    PTS: 1 DIF: B OBJ: 13-6 NAT: F5 | F6 | G1
17. ANS: Restriction enzymes

PTS: 1 DIF: B OBJ: 13-3 NAT: F4 | F5 | F6

18. ANS: test cross

PTS: 1 DIF: A OBJ: 13-1 NAT: C2 | F1 | G1

19. ANS: inbreeding

PTS: 1 DIF: A OBJ: 13-2 NAT: F1 | G1 | G2

20. ANS: Hybrids

PTS: 1 DIF: A OBJ: 13-2 NAT: F1 | G1 | G2

MODIFIED TRUE/FALSE

21. ANS: F, hybridization

PTS: 1 DIF: B OBJ: 13-2 NAT: F1 | G1 | G2

22. ANS: F
selective breeding
Inbreeding
hybridization

PTS: 1 DIF: B OBJ: 13-2 NAT: F1 | G1 | G2

23. ANS: T PTS: 1 DIF: B
OBJ: 13-2 NAT: F1 | G1 | G2

MULTIPLE CHOICE

24. ANS: D PTS: 1 DIF: A OBJ: 13-4
NAT: F1 | F5 | F6

25. ANS: A PTS: 1 DIF: A OBJ: 13-4
NAT: F1 | F5 | F6

26. ANS: C PTS: 1 DIF: B OBJ: 13-3
NAT: F4 | F5 | F6

27. ANS: A PTS: 1 DIF: A OBJ: 13-4
NAT: F1 | F5 | F6

28. ANS: A PTS: 1 DIF: A OBJ: 13-4
NAT: F1 | F5 | F6

29. ANS: C PTS: 1 DIF: A OBJ: 13-4
NAT: F1 | F5 | F6

30. ANS: D PTS: 1 DIF: B OBJ: 13-3
NAT: F4 | F5 | F6

31. ANS: B PTS: 1 DIF: B OBJ: 13-3
NAT: F4 | F5 | F6

32. ANS: C PTS: 1 DIF: A OBJ: 13-3
NAT: F4 | F5 | F6

33. ANS: B PTS: 1 DIF: B OBJ: 13-3
NAT: F4 | F5 | F6

34. ANS: B PTS: 1 DIF: A OBJ: 13-6
NAT: F5 | F6 | G1
35. ANS: D PTS: 1 DIF: A OBJ: 13-6
NAT: F5 | F6 | G1
36. ANS: D PTS: 1 DIF: B OBJ: 13-5
NAT: F4 | F5 | F6
37. ANS: B PTS: 1 DIF: B OBJ: 13-5
NAT: F4 | F5 | F6
38. ANS: C PTS: 1 DIF: B OBJ: 13-5
NAT: F4 | F5 | F6
39. ANS: D PTS: 1 DIF: B OBJ: 13-4
NAT: F1 | F5 | F6
40. ANS: C PTS: 1 DIF: A OBJ: 13-4
NAT: F1 | F5 | F6
41. ANS: C PTS: 1 DIF: B OBJ: 13-1
NAT: C2 | F1 | G1
42. ANS: C PTS: 1 DIF: B OBJ: 13-1
NAT: C2 | F1 | G1
43. ANS: B PTS: 1 DIF: A OBJ: 13-1
NAT: C2 | F1 | G1
44. ANS: A PTS: 1 DIF: A OBJ: 13-2
NAT: F1 | G1 | G2
45. ANS: B PTS: 1 DIF: B OBJ: 13-3
NAT: F4 | F5 | F6
46. ANS: C PTS: 1 DIF: A OBJ: 13-3
NAT: F4 | F5 | F6
47. ANS: B PTS: 1 DIF: A OBJ: 13-3
NAT: F4 | F5 | F6
48. ANS: C PTS: 1 DIF: B OBJ: 13-3
NAT: F4 | F5 | F6
49. ANS: C PTS: 1 DIF: A OBJ: 13-5
NAT: F4 | F5 | F6
50. ANS: A PTS: 1 DIF: A OBJ: 13-5
NAT: F4 | F5 | F6

SHORT ANSWER

51. ANS:
Recombinant DNA results from cutting and recombining DNA fragments from different organisms.

PTS: 1 DIF: A OBJ: 13-3 NAT: F4 | F5 | F6
52. ANS:
Genetic engineering is the method of cutting DNA from one organism and inserting the DNA fragment into a host organism of the same or a different species.

PTS: 1 DIF: A OBJ: 13-3 NAT: F4 | F5 | F6
53. ANS:

Law enforcement workers use unique DNA fingerprint patterns to determine whether suspects have been at a crime scene. DNA samples can be obtained from hair, blood, skin, or semen. Because no two individuals have the same DNA sequence, samples from the suspects can be matched with samples taken at the crime scene.

PTS: 1 DIF: A OBJ: 13-6 NAT: F5 | F6 | G1

54. ANS:
Any combination of one band from the mother and one band from the father will be correct. Note: The 2 child lanes should not match unless it is indicated that the children are identical twins.

PTS: 1 DIF: A OBJ: 13-6 NAT: F5 | F6 | G1

55. ANS:
Inbreeding is mating between closely related offspring and ensures that offspring are homozygous for most traits. Using pedigree analysis, the inheritance pattern of useful traits can be selected and maintained in farm animals such as sheep and cattle. Hybridization is the production of offspring from two varieties or closely related species. The impact of hybridization on corn, wheat, and similar crops has often been the production of larger and stronger plants than either of the parents.

PTS: 1 DIF: A OBJ: 13-2 NAT: F1 | G1 | G2

56. ANS:
The breeder could perform a test cross by mating the questionable retriever with another retriever that has the recessive phenotype (is homozygous recessive). If any offspring show the recessive trait, the breeder knows the first dog is a carrier of the trait and should not be used for breeding.

PTS: 1 DIF: A OBJ: 13-2 NAT: F1 | G1 | G2

PROBLEM

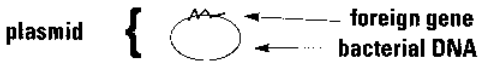
57. ANS:
Answers may vary. This knowledge is important because plant cells are surrounded by a thick cell wall that makes the introduction of foreign DNA difficult. *Agrobacterium* offers a way of successfully placing foreign DNA in a plant cell.

PTS: 1 DIF: A OBJ: 13-3 NAT: F4 | F5 | F6

58. ANS:
Restriction enzymes could be used to cut open a plasmid so that the desired gene could be inserted.

PTS: 1 DIF: A OBJ: 13-3 NAT: F4 | F5 | F6

59. ANS:
Illustrations may vary.
See Solution 13-1.



Solution 13-1

PTS: 1 DIF: A OBJ: 13-3 NAT: F4 | F5 | F6

60. ANS:
Answers may vary. They might be able to engineer plants that require less fertilizer, produce more protein, are resistant to disease, grow in less favorable environments, and are a more nutritious food source.

PTS: 1 DIF: A OBJ: 13-4 NAT: F1 | F5 | F6