

Chapter 4 Modern Genetics

Study Guide

1. Human Inheritance

a. Traits Controlled by Single Genes

b. **Multiple Alleles**

i. *If a gene has multiple alleles, why can a person only have two of the alleles for the gene?*

c. Traits Controlled by Many Genes

d. The Effect of Environment

i. *How can environmental factors affect a person's height?*

e. Male or Female?

f. **Sex-Linked Genes**

i. **Carrier**

g. **Pedigree**

i. *How is a pedigree like a "family tree"?*

2. Human Genetic Disorders

a. Cystic Fibrosis

i. *What are some symptoms of cystic fibrosis?*

b. Sickle-Cell Disease

c. Hemophilia

d. Huntington's Disease

e. Down Syndrome

f. Diagnosing Genetic Disorders

i. **Amniocentesis**

ii. **Karyotype**

g. Genetic Counseling

3. Advances in Genetics

a. **Selective Breeding**

i. **Inbreeding**

ii. **Hybridization**

b. **Cloning**

i. Cloning Plants

ii. Cloning Animals

iii. *How can a clone of a plant be produced?*

c. **Genetic Engineering**

i. Genetic Engineering in Bacteria

ii. Genetic Engineering in Other Organisms

iii. **Gene Therapy**

d. DNA Fingerprinting

i. *In what way is DNA like Fingerprints?*

e. The Human Genome Project

i. **Genome**

SECTION 4-1 REVIEW AND REINFORCE

Human Inheritance

◆ Understanding Main Ideas

Fill in the Punnett squares for dimples, a trait controlled by a dominant allele (A), and colorblindness, a trait controlled by a recessive sex-linked allele (B). Then answer the questions that follow.

5. Does either the mother or the father in A have dimples?

6. What percentage of children are likely to have dimples?

A: Dimples

	D	d
d	1.	2.
d	3.	4.

B: Colorblindness

	X ^c	Y
X ^C	7.	8.
X ^c	9.	10.

11. Is either the mother or father in B colorblind?

12. What percentage of female children are likely to be colorblind?

13. What percentage of male children are likely to be colorblind?

◆ Building Vocabulary

Fill in the blank to complete each statement.

14. Three or more forms of a gene that code for a single trait are called _____.

15. _____ are alleles passed from parent to child on a sex chromosome.

16. A(n) _____ is a person who has one recessive allele for a trait and one dominant allele for the same trait.

17. A(n) _____ is a chart that tracks which members of a family have a particular trait.

SECTION 4-2**REVIEW AND REINFORCE****Human Genetic Disorders****◆ Understanding Main Ideas**

Complete the table below. Then answer the questions that follow.

Human Genetic Disorders

Disorder	Type of Allele	Effects on Body
1.	2.	Abnormally thick mucus in lungs and intestines
Sickle-cell disease	3.	4.
5.	Recessive sex-linked	Blood clots poorly

Write your answers on a separate sheet of paper.

6. Name one treatment for cystic fibrosis.
7. How does sickle-cell trait differ from sickle-cell disease?
8. Why is hemophilia more common in males than in females?
9. Explain what causes Down syndrome.

◆ Building Vocabulary

If the statement is true, write true. If the statement is false, change the underlined word or words to make the statement true.

- _____ 10. A genetic disorder is an abnormal condition that a person inherits through genes or chromosomes.
- _____ 11. Genetic counseling is a procedure in which cells are examined to determine whether a baby will have some genetic disorders.
- _____ 12. A picture of all the chromosomes in a cell is called a genotype.

SECTION 4 - 3 REVIEW AND REINFORCE

Advances in Genetics

◆ Understanding Main Ideas

Answer the following questions on a separate sheet of paper.

1. What are two types of selective breeding, and how do they compare?
2. What is cloning?
3. How is bacteria used in genetic engineering?
4. How is gene therapy used to treat genetic disorders?
5. What is the Human Genome Project?

◆ Building Vocabulary

Match each term with its definition by writing the letter of the correct term on the line next to the definition.

- | | |
|--|--|
| <p>_____ 6. The process of selecting a few organisms with desired traits to serve as parents of the next generation</p> <p>_____ 7. Crossing two individuals that have identical or similar sets of alleles</p> <p>_____ 8. Crossing two genetically different individuals</p> <p>_____ 9. Organism that is genetically identical to the organism from which it was produced</p> <p>_____ 10. Process in which genes from one organism are inserted into the DNA of another organism</p> <p>_____ 11. Inserting working copies of a gene directly into the cells of a person with a genetic disorder</p> <p>_____ 12. All the DNA in one cell of an organism</p> | <p>a. inbreeding</p> <p>b. clone</p> <p>c. gene therapy</p> <p>d. selective breeding</p> <p>e. hybridization</p> <p>f. genetic engineering</p> <p>g. genome</p> |
|--|--|

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Name: _____

Class: Ch. 4 Review
Life Science

Choose the letter of the correct answer.

1. A carrier is a person who has
 - [A] one recessive and one dominant allele for a trait.
 - [B] more than two alleles for a trait.
 - [C] two recessive alleles for a trait.
 - [D] two dominant alleles for a trait.
2. What controls variations in skin color among humans?
 - [A] multiple alleles of a single gene
 - [B] two alleles of a single gene
 - [C] at least three genes
 - [D] a person's diet
3. What factors can affect a person's height?
 - [A] genes only
 - [B] both genes and environmental factors
 - [C] the sex chromosomes a person inherits
 - [D] environmental factors only
4. Sex-linked genes are genes on
 - [A] all 23 pairs of chromosomes.
 - [B] all the chromosomes of the mother.
 - [C] all the chromosomes of the father.
 - [D] the X and Y chromosomes.
5. Which of these traits is controlled by a gene with multiple alleles?
 - [A] blood type
 - [B] smile dimples
 - [C] straight hairline
 - [D] widow's peak
6. Genetic disorders are caused by
 - [A] pedigrees.
 - [B] sickle-shaped cells.
 - [C] dominant alleles.
 - [D] mutations.
7. Down syndrome most often occurs when
 - [A] a person inherits a recessive allele.
 - [B] sickle-shaped cells become stuck in blood vessels.
 - [C] blood fails to clot properly.
 - [D] chromosomes fail to separate properly during meiosis.

Choose the letter of the correct answer.

8. How do police use DNA fingerprinting to help solve crimes?
- [A] by comparing a suspect's DNA patterns with evidence from a crime scene
 - [B] by showing that a suspect's fingerprints are at a crime scene
 - [C] by matching phenotypes of suspects with DNA samples
 - [D] by proving that a suspect's blood type matches evidence in a crime

Fill in the word or phrase that best completes the statement(s).

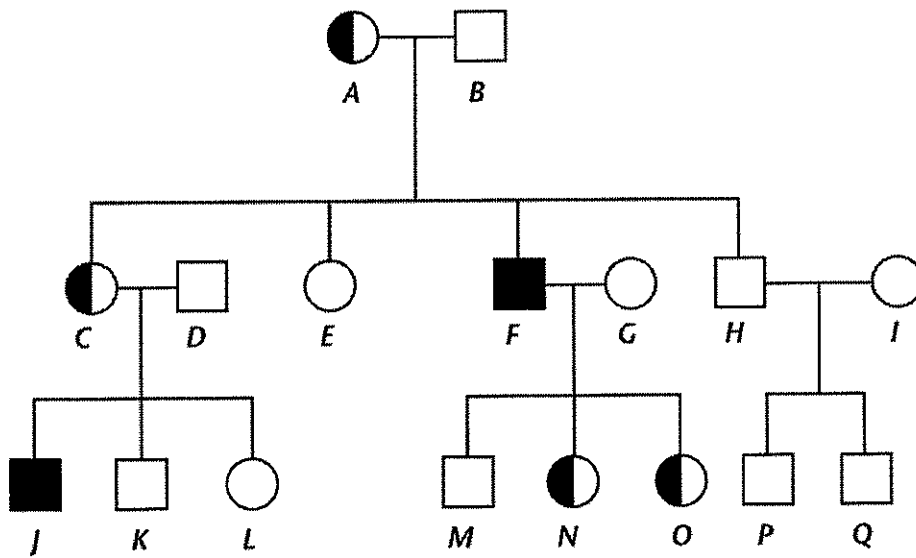
9. A doctor performs a procedure called _____ to get cells from the fluid that surrounds a developing baby.
10. People who have the genetic disorder called _____ disease suffer from a lack of oxygen in the blood.
11. _____ helps to solve crimes because no two people, except identical twins, have the same DNA.
12. A selective breeding technique called _____ is used to breed purebred dogs.
13. A recessive allele can be passed to offspring by a(n) _____ who does not show the trait.
14. Breeders use a technique called _____ to cross genetically different individuals.
15. Various combinations of _____ at each of several genes control human skin color.
16. Scientists in the Human Genome Project are working to identify the _____ sequence of every human gene.

If the statement is true, write true. If it is false, change the underlined word or words to make the statement true.

17. Except for identical twins, all people have the same DNA.
18. A genetic disorder in which an abnormal form of hemoglobin is produced is hemophilia.
19. Sex-linked traits that are controlled by recessive alleles are more likely to show up in males.

Use the diagram to answer the question(s).

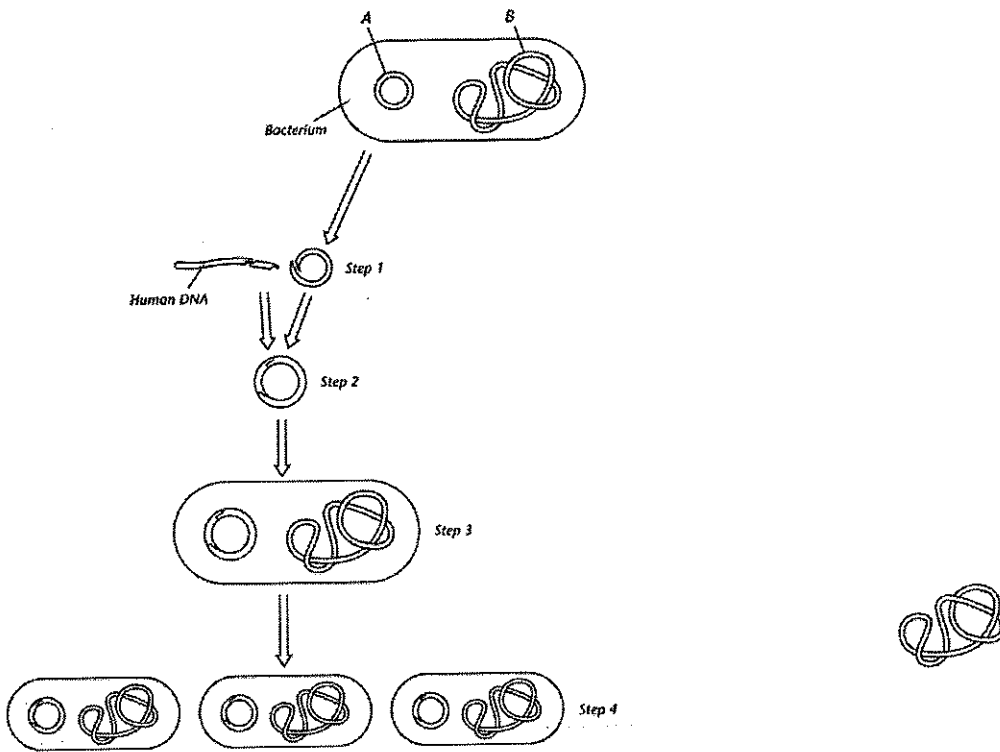
Pedigree



22. Which individuals are carriers of the trait that is traced by the pedigree?
23. Could the trait that is traced by this pedigree be sex-linked? Explain why or why not.
20. What do the circles in the pedigree represent? What do the squares represent?
21. Which individuals have the trait that is traced by the pedigree?

Use the diagram to answer the question(s).

Genetic Engineering



24. Explain what is happening in Step 2.
25. Explain what is happening in Step 4.
26. Why are bacteria often used in genetic engineering?

Write an answer to the following question(s).

27. Explain how the information from the Human Genome Project can be used to improve people's lives.
28. Explain what causes cystic fibrosis and describe two symptoms.
29. Contrast hybridization and inbreeding.
30. A plant breeder develops a new type of plant with beautiful flowers. Define cloning and describe what the offspring of this plant would look like if they were cloned.