

Chapter 3 **Genetics: The Science of Heredity**

## Study Guide

## 1. Mendel's Work

- a. Mendel's Peas
- b. Mendel's Experiments
  - i. **Purebred**
  - ii. *What is a purebred?*
- c. Other **Traits**
- d. Dominant and Recessive Alleles
  - i. **Genes**
  - ii. **Alleles**
  - iii. **Dominant Allele**
  - iv. **Recessive Allele**
- e. Understanding Mendel's Crosses
  - i. **Hybrids**
  - ii. *If a pea plant has a tall stem, what possible combinations of alleles could it have?*
- f. Other Symbols in Genetics
- g. Mendel's Contribution

2. **Probability** and Genetics

- a. Principles of Probability
  - i. *Why is there a 1 in 2 probability that a tossed coin will land heads up?*
- b. Mendel and Probability
- c. **Punnett Squares**
  - i. Using a Punnett Square
  - ii. Predicting Probabilities
    1. *If two guinea pigs with the alleles Bb are crossed, what is the probability that an offspring will have white fur?*
- d. **Phenotypes** and **Genotypes**
  - i. **Homozygous**
  - ii. **Heterozygous**
  - iii. *If a pea plant's genotype is Tt, what is its phenotype?*
- e. **Codominance**

### 3. The Cell and Inheritance

#### a. Sperm

#### b. Egg

#### c. Chromosomes and Inheritance

- i. *How does the number of chromosomes in a grasshopper's sex cells compare to the number in its body cells?*

#### d. Meiosis

- i. *What types of cells form by meiosis?*

#### e. Meiosis and Punnett Squares

#### f. Chromosomes

### 4. The DNA Connection

#### a. The Genetic Code

- i. *What is the main function of genes?*

#### b. How Cells Make Proteins

##### i. The Role of RNA

##### 1. Messenger RNA

##### 2. Transfer RNA

##### ii. Translating the Code

1. *What is the function of transfer RNA?*

#### c. Mutations

##### i. Types of Mutations

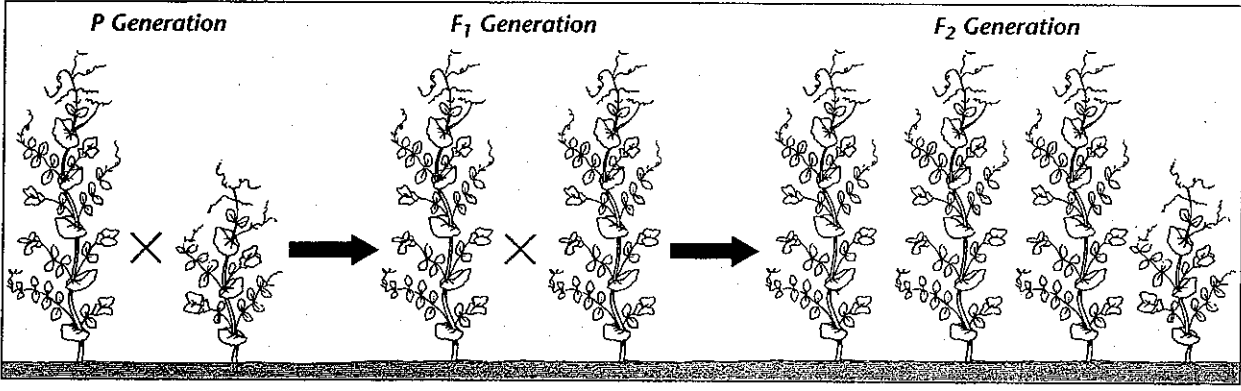
##### ii. The Effects of Mutations

**SECTION 3-1 REVIEW AND REINFORCE**

**Mendel's Work**

**◆ Understanding Main Ideas**

Study the figure. Then answer the following questions on a separate sheet of paper.



1. What trait in pea plants is being studied in the cross above?
2. What are the two alleles of this trait?
3. Which allele is the dominant allele? Explain how you know.
4. Which allele is the recessive allele? Explain.
5. What alleles do the F<sub>1</sub> offspring have? Explain which allele was inherited from which parent.

**◆ Building Vocabulary**

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

- |                           |   |
|---------------------------|---|
| _____ 6. genetics         | a. the passing of traits from parents to offspring                      |
| _____ 7. alleles          | b. an organism with two different alleles for a trait                   |
| _____ 8. traits           | c. factors that control traits  |
| _____ 9. recessive allele | d. physical characteristics of organisms                                |
| _____ 10. genes           | e. an allele whose trait always shows up in the organism                |
| _____ 11. hybrid          | f. the different forms of a gene  |
| _____ 12. heredity        | g. the scientific study of heredity                                     |
| _____ 13. dominant allele | h. an allele whose trait is masked in the presence of a dominant allele |

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**SECTION 3-2 REVIEW AND REINFORCE**

**Probability and Genetics**

**◆ Understanding Main Ideas**

Complete the two Punnett squares below, and then answer the questions on a separate sheet of paper.

1. Punnett Square A:

	B	b
B		
b		

2. Punnett Square B:

	Bb	bb
	Bb	bb

- In the cross between two black guinea pigs shown in Punnett Square A, what is the probability that an offspring will be black? White?
- Is it possible that the cross between two black guinea pigs in Punnett Square A would not produce a white guinea pig? Explain.
- What color are the guinea pig parents in the cross shown in Punnett Square B?
- Which guinea pig parent(s) in Punnett Square B is homozygous? Which is heterozygous? Explain how you know.
- Calculate the probability that an offspring will be black in the cross in Punnett Square B. What is the probability that an offspring will be white?

**◆ Building Vocabulary**

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

- |                         |   |
|-------------------------|---|
| _____ 8. heterozygous   | a. a chart that shows all the possible combinations of alleles that can result from a genetic cross |
| _____ 9. Punnett square | b. the likelihood that a particular event will occur  |
| _____ 10. genotype      | c. an organism that has two identical alleles for a trait   |
| _____ 11. codominance   | d. an organism's physical appearance  |
| _____ 12. probability   | e. an organism's genetic makeup, or allele combinations   |
| _____ 13. homozygous    | f. an organism that has two different alleles for a trait   |
| _____ 14. phenotype     | g. inheritance pattern in which the alleles are neither dominant nor recessive                      |

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**SECTION 3-3 REVIEW AND REINFORCE**

**The Cell and Inheritance**

**◆ Understanding Main Ideas**

Complete the table below by filling in the spaces with the correct stage of meiosis—Beginning, Meiosis I, Meiosis II, End.

Event	Stage in Meiosis
The double-stranded chromosomes move to the center of the cell and separate.	1.
The chromosome pairs separate.	2.
Four sex cells form with half the number of chromosome as the parental cells.	3.
The chromosomes are copied.	4.
The centromeres divide and separate.	5.

Answer the following questions in the spaces provided.

- 6. What is the chromosome theory of inheritance?  
 \_\_\_\_\_  
 \_\_\_\_\_
- 7. Why is it important that sex cells have half the number of chromosomes as body cells?  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**◆ Building Vocabulary**

Fill in the blanks to complete the statements.

- 8. Female sex cells are called \_\_\_\_\_; male sex cells are called \_\_\_\_\_.
- 9. The process by which the number of chromosomes is reduced by half to form sex cells is called \_\_\_\_\_.

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**SECTION 3-4****REVIEW AND REINFORCE**

## The DNA Connection

### ◆ Understanding Main Ideas

Complete the table below by stating whether each mutation is helpful, harmful, or neutral.

Mutation	Effect
White buffalo (on a farm)	1.
Cancer	2.
Antibiotic-resistant bacteria	3.
White buffalo (in the wild)	4.

Answer the following questions on a separate sheet of paper.

- Describe what occurs during protein synthesis.
- What is the genetic code?

### ◆ Building Vocabulary

Fill in the blank to complete each statement.

- A type of RNA that carries amino acids and adds them to the growing protein is called \_\_\_\_\_.
- \_\_\_\_\_ is RNA that copies the coded message from the DNA in the nucleus and carries the message into the cytoplasm.
- A change that occurs in a gene or chromosome is called a(n) \_\_\_\_\_.

Name: \_\_\_\_\_

Class: Life Science  
Ch. 3 Review

Choose the letter of the correct answer.

1. What did Gregor Mendel do to study different characteristics in his genetics experiments?  
[A] He cross-pollinated animals. [B] He cross-pollinated plants.  
[C] He studied only asexual animals. [D] He studied only self-pollinating plants.
2. What is the chromosome theory of inheritance?  
[A] Codominant genes combine to form new hybrids.  
[B] Hybrid pairs of chromosomes combine to form offspring.  
[C] Genes are carried from parents to offspring on chromosomes.  
[D] Chromosomes are carried from parents to offspring on hybrids.
3. Which term refers to physical characteristics that are studied in genetics?  
[A] generations [B] hybrids [C] offspring [D] traits
4. What is probability?  
[A] the way the results of one event affect the next event  
[B] the likelihood that a particular event will occur  
[C] the actual results from a series of events [D] the number of times a coin lands heads up
5. Walter Sutton discovered that the sex cells of grasshoppers have exactly  
[A] the same number of chromosomes found in the body cells.  
[B] half the number of chromosomes found in the body cells.  
[C] 12 times the number of chromosomes found in the body cells.  
[D] twice the number of chromosomes found in the body cells.
6. What happens during meiosis?  
[A] Each sex cell copies itself to form four new chromosomes.  
[B] Chromosome pairs separate to form new sex cells.  
[C] Each sex cell loses half of its chromosomes.  
[D] Chromosome pairs remain together when new sex cells are formed.

Choose the letter of the correct answer.

7. Factors that control traits are called  
[A] parents. [B] recessives. [C] genes. [D] purebreds.
8. An organism's physical appearance is its  
[A] codominance [B] phenotype [C] heterozygous [D] genotype

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

9. If  $D$  represents the dominant allele of a gene, then \_\_\_\_\_ represents the recessive allele.
10. The substitution of one base for another during DNA replication is an example of a(n) \_\_\_\_\_.
11. If each of ten events is equally likely to occur, the probability of each individual event occurring is \_\_\_\_\_ percent.
12. \_\_\_\_\_ RNA adds amino acids to a growing protein.
13. Mendel used \_\_\_\_\_ -pollination to produce purebred plants.
14. If a \_\_\_\_\_ allele is present, its trait will appear in the organism.
15. Alleles that are neither dominant nor recessive produce an inheritance pattern known as \_\_\_\_\_.
16. In a cross between two hybrid  $Tt$  pea plants, \_\_\_\_\_ percent of the offspring will be  $Tt$ .
17. Sets of three bases code for the production of \_\_\_\_\_ that make up proteins.
18. A cell produces proteins in its ribosomes during the process of \_\_\_\_\_.

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

19. Chromosomes carry genes from parents to offspring.
20. A pea plant that is heterozygous for tall stems has the alleles  $Tt$ .

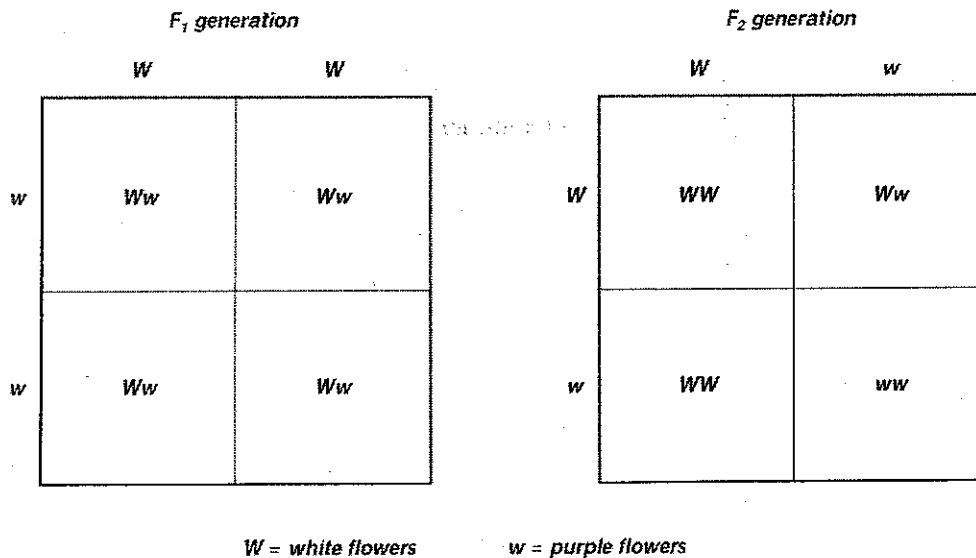


If the statement is true, write true. If it is false, change the underlined word or words to make the statement true.

21. An organism's physical appearance is its phenotype.
22. A mutation in a sex cell can be passed to offspring.
23. A Punnett square shows all the possible combinations of alleles in parents.
24. Transfer RNA carries coded messages from the nucleus to the cytoplasm.

Use the diagram to answer the question(s).

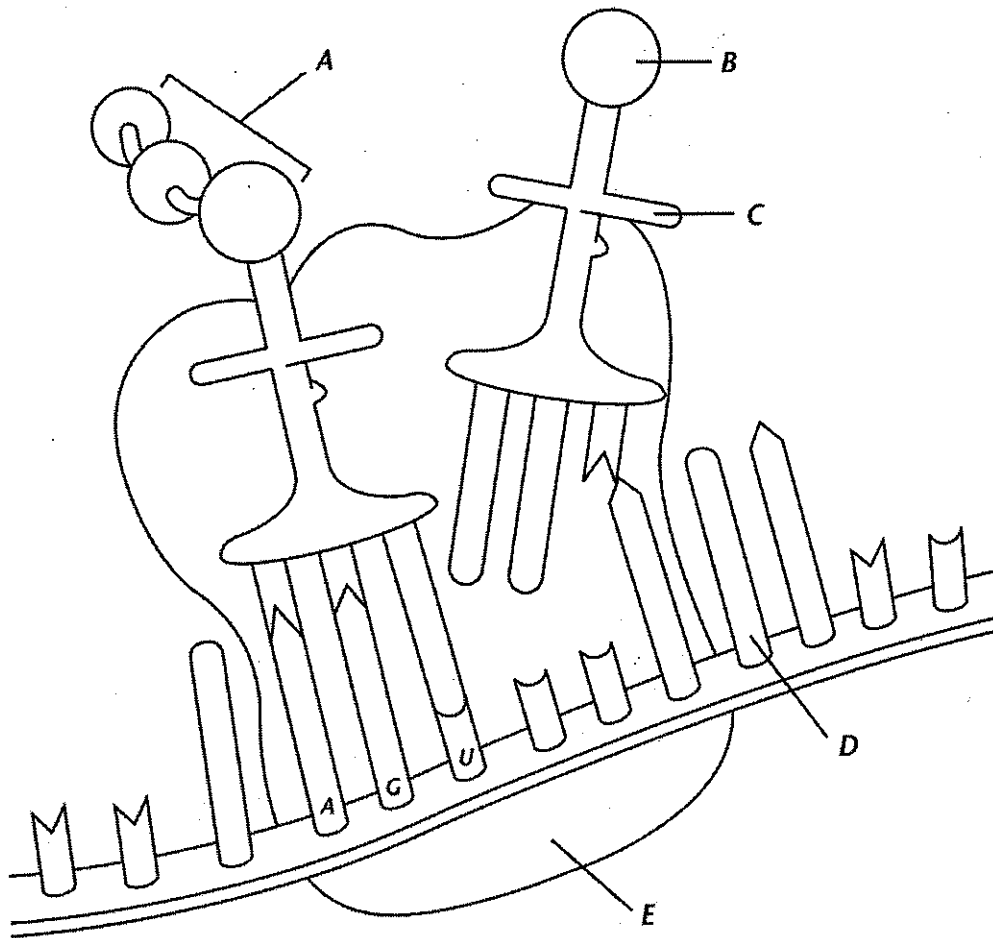
**Punnett Squares**



25. In the  $F_1$  generation, what is the genotype of the offspring? What is their phenotype?
26. In the  $F_2$  generation, what percent of the offspring have white flowers? What are the genotypes of the white-flowered offspring?
27. In which generation are the parents purebred? In which generation are they hybrids?

Use the diagram to answer the question(s).

### Protein Synthesis



28. Identify structure D and state where it is made.

Write an answer to each of the following question(s).

29. Some clover plants have leaves with a white stripe. Other clover plants have leaves with a white spot. When these two types of plants are crossed, the leaves of the offspring have a white stripe and a white spot. Explain how this inheritance pattern occurs.

Write an answer to the following question(s).

30. Explain why Mendel's cross of purebred tall and short pea plants resulted in only tall plants.

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