

# Ch 11. Introduction to Genetics. Biology. Landis

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## Section 11–1 The Work of Gregor Mendel (pages 263–266)

*This section describes how Gregor Mendel studied the inheritance of traits in garden peas and what his conclusions were.*

### Introduction (page 263)

1. The scientific study of heredity is called

### Gregor Mendel's Peas (pages 263–264)

2. What does it mean when pea plants are described as being truebreeding?

3. To perform his experiments, how did Mendel prevent pea flowers from self-pollinating and control their cross-pollination?

### Genes and Dominance (pages 264–265)

4. Match the term with its definition.

#### Definition

Specific characteristics that vary from one individual to another

The offspring of crosses between parents with different traits

Chemical factors that determine traits

The different forms of a gene

#### Terms

a. genes

b. hybrids

c. traits

d. alleles

5. State the principle of dominance.

### Segregation (pages 265–266)

6. How did Mendel find out whether the recessive alleles were still present in the F<sub>1</sub> plants?

7. About one fourth of the F<sub>2</sub> plants from Mendel's F<sub>1</sub> crosses showed the trait controlled by the

\_\_\_\_\_ allele.

8. Circle the letter of each sentence that is true about Mendel's explanation of the results from his F<sub>1</sub> cross.

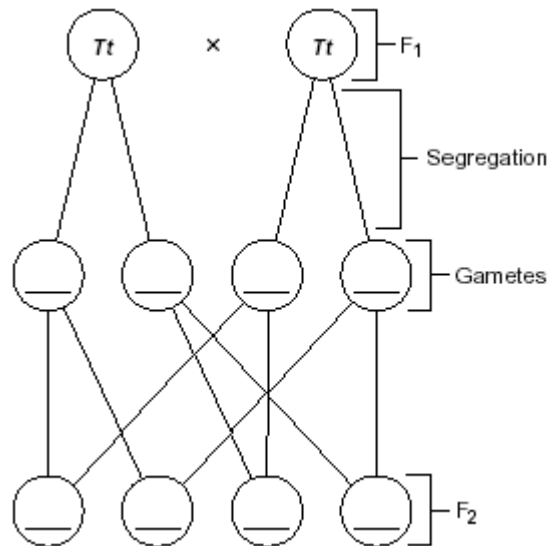
- Mendel assumed that a dominant allele had masked the corresponding recessive allele in the F<sub>1</sub> generation.
- The trait controlled by the recessive allele never showed up in any F<sub>2</sub> plants.
- The allele for shortness was always inherited with the allele for tallness.

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d. At some point, the allele for shortness was segregated, or separated, from the allele for tallness.

9. What are gametes?

10. Complete the following diagram to show how alleles segregate during the formation of gametes.



## Section 11–2 Probability and Punnett Squares (pages 267–269)

*This section explains how geneticists use the principles of probability.*

### Genetics and Probability (page 267)

11. Circle the letter of the probability that a single coin flip will come up heads.  
a. 100 percent      b. 75 percent      c. 50 percent      d. 25 percent

12. Is the following sentence true or false? The past outcomes of coin flips greatly affect the outcomes of future coin flips.

13. Why can the principles of probability be used to predict the outcomes of genetic crosses?

### Punnett Squares (page 268)

14. How do geneticists use Punnett squares?

15. Complete the Punnett square to show the possible gene combinations for the F<sub>2</sub> offspring.

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PUNNETT SQUARE FOR  $Tt \times Tt$

	T	t
T		
t		

16. Match the terms with the definitions.

### Definitions

Organisms that have two identical alleles for a particular trait (TT or tt)

Organisms that have two different alleles for the same trait (Tt)

Physical characteristic of an organism (tall)

Genetic makeup of an organism (Tt)

### Terms

a. genotype

b. homozygous

c. phenotype

d. heterozygous

17. Is the following sentence true or false? Homozygous organisms are true-breeding for a particular trait.

18. Is the following sentence true or false? Plants with the same phenotype always have the same genotype.

### Probability and Segregation (page 269)

19. Circle the letter of each sentence that is true about probability and segregation.

- In an  $F_1$  cross between two hybrid tall pea plants (Tt), 1.2 of the  $F_2$  plants will have two alleles for tallness (TT).
- The  $F_2$  ratio of tall plants to short plants produced in a cross between two hybrid tall pea plants (Tt) is 3 tall plants for every 1 short plant.
- Mendel observed that about 3.4 of the  $F_2$  offspring showed the dominant trait.
- Segregation occurs according to Mendel's model.

20. In Mendel's model of segregation, what was the ratio of tall plants to short plants in the  $F_2$  generation?

### Probabilities Predict Averages (page 269)

21. Do probabilities predict the precise outcome of an individual event?

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22. How can you be sure of getting the expected 50 : 50 ratio from flipping a coin?

23. The \_\_\_\_\_ the number of offspring from a genetic cross, the closer the resulting offspring numbers will get to expected values.

## Section 11–3 Exploring Mendelian Genetics (pages 270–274)

*This section describes Mendel's principle of independent assortment. It also tells about traits that are controlled by multiple alleles or multiple genes.*

### Independent Assortment (pages 270–271)

24. Write the genotypes of the true-breeding plants that Mendel used in his two-factor cross.

**Phenotype**

**Genotype**

a. round yellow peas

\_\_\_\_\_

b. wrinkled green peas

\_\_\_\_\_

25. Circle the letter that best describes the F<sub>1</sub> offspring of Mendel's two-factor cross.

- a. Homozygous dominant with round yellow peas
- b. Homozygous recessive with wrinkled green peas
- c. Heterozygous dominant with round yellow peas
- d. Heterozygous recessive with wrinkled green peas

26. Circle the letter of the phenotypes that Mendel would expect to see if genes segregated independently.

- a. round and yellow
- b. wrinkled and green
- c. round and green
- d. wrinkled and yellow

27. What did Mendel observe in the F<sub>2</sub> offspring that showed him that the alleles for seed shape segregate independently of those for seed color?

28. What were the phenotypes of the F<sub>2</sub> generation that Mendel observed?

29. What was the ratio of Mendel's F<sub>2</sub> generation for the two-factor cross?

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30. Complete the Punnett square below to show the predicted results of Mendel's two-factor cross.

**MENDEL'S TWO-FACTOR CROSS**  
**RrYy × RrYy**

	RY	Ry	rY	ry
RY				
Ry				
rY				
ry				

31. State Mendel's principle of independent assortment.

## **A Summary of Mendel's Principles** (page 272)

32. Circle the letter of each sentence that is true about Mendel's principles.

- a. The inheritance of biological characteristics is determined by genes that are passed from parents to their offspring in organisms that reproduce sexually.
- b. Two or more forms of the gene for a single trait can never exist.
- c. The copies of genes are segregated from each other when gametes are formed.
- d. The alleles for different genes usually segregate independently of one another.

## **Beyond Dominant and Recessive Alleles** (pages 272-273)

33. Complete the compare-and-contrast table of the different patterns of inheritance.

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## PATTERNS OF INHERITANCE

Type	Description	Examples
	One allele is not completely dominant over another. The heterozygous phenotype is somewhere in between the two homozygous phenotypes.	
	Both alleles contribute to the phenotype of the organism.	
	Genes have more than two alleles.	
	Two or more genes control a trait.	

### Applying Mendel's Principles (page 274)

34. List three criteria Thomas Hunt Morgan was looking for in a model organism for genetic studies.

35. In humans, the dominant allele for skin pigmentation produces skin coloration. Homozygous recessive individuals have \_\_\_\_\_; they lack melanin.

### Section 11-4 Meiosis (pages 275-278)

*This section explains how gametes form in the process of meiosis. It also explains how meiosis is different from mitosis.*

### Introduction (page 275)

36. List the two things that Mendel's principles of genetics required in order to be true.

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## Chromosome Number (page 275)

37. What does it mean when two sets of chromosomes are homologous?

38. Circle the letter of each way to describe a diploid cell.

- a.  $2N$
- b. Contains two sets of homologous chromosomes
- c. Contains a single set of homologous chromosomes
- d. A gamete

## Comparing Mitosis and Meiosis (page 278)

39. Circle the letter of each sentence that is true about mitosis and meiosis.

- a. Mitosis produces four genetically different haploid cells.
- b. Meiosis produces two genetically identical diploid cells.
- c. Mitosis begins with a diploid cell.
- d. Meiosis begins with a diploid cell.

## Section 11–5 Linkage and Gene Maps 280)

*This section describes how genes that are linked to the same chromosome assort during meiosis.*

### Gene Linkage (page 279)

40. List the two conclusions that Morgan made about genes and chromosomes.

### Gene Maps (pages 279–280)

41. Explain why two genes found on the same chromosome are not always linked forever.

42. The new combinations of alleles produced by crossover events help to generate genetic

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43. What is a gene map?