Answer Key

Directed Reading A

SECTION: MENDEL AND HIS PEAS

1. the passing of traits from parents to offspring
2. Answers may vary. Sample answer: I have brown eyes like my mother.
3. B
4. C
5. A
6. self-pollinating
7. true-breeding
8. cross-pollinate
9. wind, insects
10. Answers may vary. Sample answer: Self-pollinating was important because it allowed Mendel to grow true-breeding plants. Cross-pollination was important because he could mix different traits to check results.
11. characteristic
12. traits
13. Answers may vary. Sample answer: True-breeding plants are important because he then knew what to expect if his plants self-pollinated.
14. Answers may vary. Sample answer: Mendel removed the anthers of one plant so that the plant could not self-pollinate. He then did the cross-pollinating himself.
15. C
16. B
17. A
18. B
19. A
20. C
21. D

SECTION: TRAITS AND INHERITANCE

1. C
2. D
3. A
4. B
5. A
6. B
7. G
8. A
9. B
10. F
11. D
12. C
13. E
14. *Pp*
15. It will be passed on to the next generation.
16. *PP, Pp, pP*
17. *Pp, pP*
18. C
19. 25%
20. There are only two possibilities for each trait.
21. incomplete dominance
22. Answers may vary. Sample answer: A cross between a true-breeding red snapdragon and a true-breeding white snapdragon produces pink flowers, because both alleles of the gene have some degree of influence.
23. trait
24. environment

SECTION: MEIOSIS

1. C
2. B
3. one
4. C
5. A
6. B
7. B
8. meiosis
9. 46
10. nucleus
11. genes
12. Two identical copies of the original cell are formed.
13. C
14. A
15. B
16. D
17. 3
18. 5
19. 8
20. 1
21. 7
22. 4
23. 6
24. 2

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25. half the number of chromosomes that were present in the original cell
26. meiosis
27. genotype
28. sex chromosomes
29. two X chromosomes
30. one X and one Y chromosome
31. the X chromosome
32. the Y chromosome
33. They are more likely to have a sex-linked disorder.
34. Answers may vary. Sample answer: color blindness and hemophilia
35. pedigree
36. carrier
37. recessive
38. selective breeding

Directed Reading B

SECTION: MENDEL AND HIS PEAS

1. B
2. B
3. D
4. C
5. A
6. C
7. B
8. B
9. C
10. A
11. dominant
12. recessive
13. D
14. B
15. A

SECTION: TRAITS AND INHERITANCE

1. C
2. D
3. A
4. D
5. B
6. B
7. C
8. B
9. D
10. C
11. D
12. B
13. A
14. C
15. B
16. A
17. D
18. meiosis
19. X chromosomes
20. Y chromosome
21. hemophilia
22. pedigree
23. carriers
24. recessive
25. selective breeding

Vocabulary and Section Summary

SECTION: MENDEL AND HIS PEAS

1. heredity: the passing of genetic traits from parent to offspring
2. dominant trait: the trait observed in the first generation when parents that have different traits are bred
3. recessive trait: a trait that reappears in the second generation after disappearing in the first generation when parents with different traits are bred

SECTION: TRAITS AND INHERITANCE

1. gene: one set of instructions for an inherited trait
2. allele: one of the alternative forms of a gene that governs a characteristic, such as hair color
3. phenotype: an organism's appearance or other detectable characteristic
4. genotype: the entire genetic makeup of an organism; also, the combination of genes for one or more specific traits
5. probability: the likelihood that a possible future event will occur in any given instance of the event

SECTION: MEIOSIS

1. homologous chromosomes: chromosomes that have the same sequence of genes and the same structure
2. meiosis: a process in cell division during which the number of chromosomes decreases to half the original number by two divisions of the nucleus, which results in the production of sex cells

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3. sex chromosome: one of the pair of Teacher Resource Pagechromosomes that determine the sex of an individual
4. pedigree: a diagram that shows the occurrence of a genetic trait in several generations of a family

Section Review

SECTION: MENDEL AND HIS PEAS

1. Sample answer: Heredity is the passing of traits from parents to their offspring. A dominant trait is a trait that is present in the first generation when parents with different traits produce offspring. A recessive trait is a trait that is not present in the first generation but often reappears in the second generation.
2. B
3. Self-pollination occurs when pollen from a particular plant is deposited on a stigma from the same plant. Cross-pollination occurs when the pollen and stigma are from two different plants.
4. Sample answer: A characteristic is something that has different forms in a population, and a trait is each one of the possible forms. For example, eye color is a characteristic in humans, and brown-eyed, green-eyed, and blue-eyed are all possible traits.
5. Sample answer: During Mendel's first experiments he crossed two plants that were true breeding for different traits. In each case, the offspring had the dominant trait
6. During Mendel's second experiments he allowed the plants that were the offspring from his first experiments to self-pollinate. In these cases, some of the second-generation plants had the recessive trait.
7. 7:2, or 3.5:1, brown to green; 2:7, or 1:3.5,green to brown
8. Sample answer: If Mendel had used plants that were not true breeding, the dominant trait would not have been as clear for each characteristic, and he would not have gotten such a clear 3:1 ratio. The concept of dominant and recessive may have hidden for a longer period of time.
9. Curly ears are dominant because it is the trait that is represented in the first generation.
10. Sample answer: sociology, physics, and chemistry

SECTION: TRAITS AND INHERITANCE

1. Sample answer: Alleles are different versions of the same gene.
2. Sample answer: Genotype is the set of alleles an organism has inherited from its parents. Phenotype is what the organism looks like physically.
3. B
4. The genotype of an organism contains the two alleles for each characteristic. One allele of each pair was inherited from each of the organism's parents. The phenotype of the organism is the way the genotype affects the organism physically. For example, if an organism inherits one dominant allele for brown fur and one recessive allele for white fur, its phenotype will be brown fur.
5. incomplete dominance; one gene influencing more than one trait, and one trait being influenced by many genes
6. $1/6 \times 1/6 \times 1/6 = 1/216$
7. Approximately half of the offspring will have the phenotype of cleft chins (genotypes *Cc*) and half will not (genotypes *cc*).
8. *BB*, *bb*
9. Sample answer: a shade of gray

SECTION: MEIOSIS

1. Sample answer: At the end of meiosis, each sex cell will contain only one sex chromosome (either X or Y).
2. During meiosis, chromosomes are copied, and then the nucleus divides twice.
3. A pedigree is used to show how inherited traits move through a family.
4. During meiosis, homologous chromosomes line up in the middle of the cell.
5. A
6. 7
7. Answers may vary. Students' drawings should be similar to the diagram of meiosis in the student text.
8. Sample answer: yes; The disorder seems to be sex-linked because the females are carriers of the disease but only males have the disease itself.

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9. gene, chromosome, cell
10. Sample answer: Because the purple gene *(P)* is dominant over the white gene *(p)*, the genotype of the purple-flowered pea plant could be either *PP* or *Pp*. Thus, the possible alleles carried by the sex cells would be *P* or *p*.

Chapter Review

1. sex cells
2. phenotype, genotype
3. Meiosis
4. alleles
5. D
6. C
7. B
8. B
9. C
10. C
11. B
12. Females have two X chromosomes. Males have one X and one Y chromosome.
13. Sample answer: A recessive trait is a genetic trait that is expressed only if there is not a dominant allele present.
14. Sex cells have half the number of chromosomes as other body cells.
15. Sample answer: A sex-linked disorder is a disorder that is caused by a gene on one of the sex chromosomes and so is expressed in one sex more than the other. Color blindness is a sex-linked disorder found in humans.
16. An answer to this exercise can be found at the end of the Teacher Edition.
17. Sample answer: A genetic counselor could test my spouse to see if my spouse is also a carrier of the recessive allele. The counselor could then predict what the chances are that we could have a child with the recessive disorder.
18. The allele for blond hair is recessive.
19. *PP*
20. *TT*
21. All the parents and offspring are tall pea plants.
22. Students should make two new Punnett squares. Self-fertilization of *TT* (*TT* × *TT*) will yield offspring that are all *TT*. Self-fertilization of *Tt* (*Tt* × *Tt*) will yield offspring that are *TT*, *Tt*, and *tt*.
23. *TT* has a 100% probability with a *TT* parent and a 25% probability with a *Tt* parent. *Tt* has a 50% probability with a *Tt* parent, and a 0% probability with a *TT* parent. The genotype tt has a 25% probability with a *Tt* parent, and a 0% probability with a *TT* parent.

Reinforcement

DIMPLES AND DNA

1. *Dd* in three squares
2. Only the genotype *Dd* is possible for the offspring of Parent A and Parent B.
3. The probability that the offspring of Parent A and Parent B will have dimpled cheeks is 25% + 25% 1 25% + 25% = 100%.
4. Top row: *DD*, *Dd*
   Bottom row: *Dd*, *dd*
5. *DD*: 25%
   Dd: 25% + 25% = 50%
   dd: 25%
6. The probability of these offspring having nondimpled cheeks is 25 percent.
7. The probability of these offspring having dimpled cheeks is 75 percent.

Critical Thinking

A BITTERSWEET SOLUTION

1. The hybrid produced larger, more bitter fruit. The original orange trees had smaller, sweeter fruit.
2. Eighty percent of the hybrid orange trees grew quickly and produced larger fruit that tasted bitter. These characteristics came from the P'tooey plant. We know that these traits are dominant because a high percentage of the hybrid plants exhibit those traits.
3. Answers may vary. Sample answer: The genes donated by the original kiwi plant—sweet taste and average growth—produce dominant traits in the new kiwi hybrid. Rapid growth and bitter taste are recessive traits.
4. Answers may vary. Sample answer: If the first hybrid generation is crossed with itself, the recessive sweet trait could reappear and could occur with the trait for rapid growth.

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5. Answers may vary. Sample answer: The introduction of a new plant hybrid could have an impact on the island's ecosystem. Any change to a part of an ecosystem will affect the web of organisms in that system. For example, animals that fed on the original plants might be unable to eat the hybrid fruit and would therefore die off.

Section Quizzes

SECTION: MENDEL AND HIS PEAS

1. C
2. B
3. D
4. A
5. B
6. C
7. C

SECTION: TRAITS AND INHERITANCE

1. C
2. d
3. A
4. B
5. E
6. A
7. C
8. D

SECTION: MEIOSIS

1. B
2. D
3. A
4. C
5. B
6. B
7. A
8. B

Chapter Test A

1. C
2. C
3. D
4. A
5. A
6. B
7. A
8. B
9. B
10. a
11. D
12. C
13. B
14. G
15. E
16. B
17. F
18. A
19. D
20. C
21. A
22. C
23. B

Chapter Test B

1. recessive traits
2. heredity
3. phenotype
4. genotype
5. probability
6. pedigree
7. C
8. D
9. A
10. C
11. B
12. XX
13. XY
14. when each allele has its own degree of influence
15. Answers may vary. Sample answer: Self-pollinating was important because it allowed Mendel to grow true-breeding plants. Cross-pollination was important because he could mix different traits to check results.
16. Answers may vary. Sample answer: The parent cell has 23 pairs of chromosomes making a total of 46. The new cell has 23 single chromosomes—one from each pair of parent cells.
17. Answers may vary. Sample answer: The chromatids in the seventh set are like the original chromatids split in half.
18. B
19. A
20. C

Chapter Test C

1. B
2. C
3. C
4. D
5. B
6. B
7. D
8. C
9. A
10. D
11. A
12. C
13. B
14. genes
15. X chromosomes
16. pedigree
17. color blindness
18. D
19. B
20. A

Standardized Test Preparation

READING

Passage 1

1. C
2. F
3. C

Passage 2

1. A
2. H
3. A

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INTERPRETING GRAPHICS

1. B
2. H
3. B

MATH

1. B
2. H
3. A
4. G
5. D
6. H

Vocabulary Activity

1. homologous
2. sex chromosomes
3. alleles
4. genotype
5. mitosis
6. heredity
7. meiosis
8. recessive
9. Punnett square
10. dominant
11. breeding
12. pollinating
13. sperm
14. phenotype
15. pedigree
16. probability
17. genes

Phrase: Gregor Mendel's Peas

SciLinks Activity

Answers may vary. Students should list eye color and four other inheritable traits, such as hair color, gender, color blindness, ear lobe attachment, and dimples, and provide the requested information for all five. Answers in the final column should make sense in terms of the traits listed for themselves and their parents

Performance-Based Assessment

FORM A HYPOTHESIS

1. Answers may vary. Sample answer: I think the combination of two multicolor eggs will result in the most colorful offspring.

TEST THE HYPOTHESIS

4. Sample answer: There is a 100% chance that the offspring will be mixed blue and red.

ANALYZE THE RESULTS

5. Sample answer: Blue
   Sample answer: There is a 100% chance of blue offspring.
7. There is a 50% chance that the offspring will be mixed in color.
8. Sample answer: 100% of offspring will be blue.
10. Sample answer: There is a 25% chance that the offspring will be blue. There is a 25% chance that the offspring will be red. There is a 50% chance that the offspring will be mixed blue and red.
11. Sample answer: There is a 25% chance that the offspring will be red, and a 75% chance that the offspring will be blue.

DRAW CONCLUSIONS

12. Sample answer: My hypothesis was correct. I expected the offspring of mixed color eggs to have more colorful offspring because both eggs had both colors.
13. Sample answer: No, you cannot exactly predict offspring traits. The percent-ages do not hold for individual cases.

Deleted: ¶
Analyze the results¶
5. Choose one color to be dominant: ¶
¶
¶
What are the phenotypes and their probabilities in this case? Use scratch paper if necessary.¶
¶
Section Break (Continuous)
¶
6¶
¶

Sample answer: There is a 100% chance that the offspring will be mixed blue and red.¶
Sample answer: Blue¶
Sample answer: There is a 100% chance of blue offspring.¶

There is a 50% chance that the offspring will be mixed in color.¶
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Bug Builders, Inc.

ASK A QUESTION

1. There are 128 possible combinations. (Calculation: There are two forms of each of seven characteristics, so $2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 2^7 = 128$)

ANALYZE THE RESULTS

1. Student ratios should be similar to the ratios determined when the alleles were selected by the teacher.
2. If any students have offspring bugs that look like one of the parents, have them compare the genotype of the offspring with the genotype of the parents. The offspring and parents look alike but still have different geno-types for some traits.

DRAW CONCLUSIONS

3. Students answers should reflect the data on parent alleles that were recorded in step 5.
4. Students answers should include Punnett squares based on the parental traits. Except for the results obtained by parental genotypes that are all homozygous recessive, the student will see other possibilities for genotypes and phenotypes from the same parents.

APPLYING YOUR DATA

Students should create Punnett squares to show the possible genotypes, anddescribe phenotypes that follow the rules of dominance for each characteristic.

Making a Punnett Square

Three of the offspring would have round seeds, and one would have wrinkled seeds.

Taking Your Chances

4. Students should get bb on average 1/4 or 25% of the time.
5. 1/4 or 25%
6. 1/4 (If brown fur results from genotype Bb, then brown fur is dominant, and white fur will result from the genotype bb.)

Tracing Traits

ANALYZE THE RESULTS

1. Answers may vary.
2. Answers may vary.

, 3. The genotype of the recessive form of the characteristic must be *hh* (homozygous recessive). Each allele came from one of the individual's parents. Possible genotypes for the parents of the individual expressing the recessive form are *Hh* and *hh.* Does the student know whether either of the parents expresses the recessive form of the trait? Does the student know if the individual chosen has brothers or sisters? Are their genotypes known? If so, have the student decide if each of them has a dominant or recessive genotype. If a dominant genotype is found among the siblings and one of the parents is known to have the recessive form, ask the student what the genotype of the other parent must be *(Hh).*

DRAW CONCLUSIONS

4. The Punnett square should show hh in the bottom right-hand corner. One of the parents must have the genotype *hh.* The other parent must have either *hh* or *Hh.* If any sibling has the dominant trait, the genotype of the other parent must be *Hh.*

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Analyze the results

5. Choose one color to be dominant:

What are the phenotypes and their probabilities in this case? Use scratch paper if necessary.

Section Break (Next Page)

6

Sample answer: There is a 100% chance that the offspring will be mixed blue and red.
Sample answer: Blue
Sample answer: There is a 100% chance of blue offspring.

There is a 50% chance that the offspring will be mixed in color.
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Performance-Based Assessment continued

8. Assume that the same color you chose in step 4 is dominant. What are the phenotypes and their probabilities in this case? Use scratch paper if necessary.

9. Open the other two-colored egg. Suppose this egg was to reproduce with the other two-colored egg. Fill in the following Punnett square with the genotypes that would be created.
10. Assume that neither color is dominant. List the possible phenotypes and their probabilities.

11. Assume that the same color you chose before is dominant. What are the phenotypes and their probabilities in this case? Use scratch paper if necessary.

Page Break

draw conclusions

12. Was your hypothesis correct? Explain why or why not.

13. Would you say that you can exactly predict offspring traits? Explain why or why not.

Sample answer: My hypothesis was correct. I expected the offspring of mixed color eggs to have more colorful offspring because both eggs had both colors.

Sample answer: 100% of offspring will be blue.

Sample answer: No, you cannot exactly predict offspring traits. The percentages do not hold for individual cases.

Sample answer: There is a 25% chance that the offspring will be blue. There is a 25% chance that the offspring will be red. There is a 50% chance that the offspring will be mixed blue and red.

Sample answer: There is a 25% chance that the offspring will be red, and a 75% chance that the offspring will be blue.

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ANSWER KEY
Model-Making LabDATASHEET FOR chapter LAB
Bug Builders, Inc.

Teacher Notes and Answer Key
Time Required
Two 45-minute class periods
Rating
Teacher Prep–3
Student Set-Up–2
Concept Level–3
Clean Up–1
MATERIALS
The materials listed on the student page are enough for a group of 3–4 students. For step 3, prepare 14 small paper sacks—representing paired parent alleles for each of seven characteristics—as follows:

1. Use the table in step 5 to decide the genotypes for each of the parent bug's characteristics.
2. Cut 1 in. squares of paper to represent alleles. Use 7 colors of paper, a different color for each characteristic. Cut enough squares so that each student will receive two alleles for each characteristic.

3. Mark half the squares for each characteristic with capital letters to indicate dominant alleles. Mark the other half with lowercase letters to indicate recessive alleles.
4. Label each pair of sacks with one of the seven characteristics. Place an equal number of alleles in each sack, but randomly mix both dominant and recessive alleles.
5. For each characteristic, label one sack “mom” and the other sack “dad.” Have students draw one allele from each sack.

Safety CAUTIONA0

Remind students to review all safety cautions and icons before beginning this lab activity. Students should use caution with toothpicks and should not eat any of the materials used.

Kathy LaRoe
East Valley Middle School
East Helena, Montana

1 2 3 4

Easy Hard

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ANSWER KEY

Name Class Date

Model-Making LabDATASHEET FOR chapter LAB

Bug Builders, Inc.

Imagine that you are a designer for a toy company that makes toy alien bugs. The president of Bug Builders, Inc., wants new versions of the wildly popular Space Bugs, but he wants to use the bug parts that are already in the warehouse. It’s your job to come up with a new bug design. You have studied how traits are passed from one generation to another. You will use this knowledge to come up with new combinations of traits and assemble the bug parts in new ways. Model A and ModelA0B, shown in the textbook and described below, will act as the “parent” bugs.

Objectives

Build models to further your understanding of inheritance.

Examine the traits of a population of offspring.

Materials

Safety 

Model A (“Mom”)

95 red antennae
95 3 body segments
95 curly tail
95 2 pairs of legs
95 green nose
95 black feet
95 3 eyesModel B (“Dad”)
95 green antennae
95 2 body segments
95 straight tail
95 3 pairs of legs
95 blue nose
95 green feet
95 2 eyes
95allele sacks (14) (supplied by your teacher)
95gumdrops, green and black (feet)
95map pins (eyes)
95marshmallows, large (head and body segments)
95pipe cleaners (tails)
95pushpins, green and blue (noses)
95scissors
95toothpicks, red and green (antennae)

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ANSWER KEY

Name Class Date

Bug Builders, Inc. continued

Ask a Question

1. If there are two forms of each of the seven traits, then how many possible combinations are there?

Form a Hypothesis

2. Write a hypothesis that is a possible answer to the question above. Explain your reasoning.

Test the Hypothesis

3. Your teacher will display 14 allele sacks. The sacks will contain slips of paper with capital or lowercase letters on them. Take one piece of paper from each sack. (Remember: Capital letters represent dominant alleles, and lowercase letters represent recessive alleles.) One allele is from "Mom," and one allele is from "Dad." After you have recorded the alleles you have drawn, place the slips of paper back into the sack.

Bug Family Traits

Trait	Model A "Mom" allele	Model B "Dad" allele	New model "Baby" genotype	New model "Baby" phenotype
Antennae color				
Number of body segments				
Tail shape				
Number of leg pairs				
Nose color				
Foot color				
Number of eyes				

There are 128 possible combinations.
(Calculation: There are two forms of each of seven characteristics, so 2 3 2 3 2 3 2 3 2 3 2 3 2 5 27 5 128)
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ANSWER KEY
ANSWER KEY
Name Class Date
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Bug Builders, Inc. continued

4. Use the table on the previous page to record your data. Fill in the first two columns with the alleles that you selected from the sacks. Next, fill in the third column with the genotype of the new model ("Baby").
5. Use the information below to fill in the last column of the table.

6. Now that you have filled out your table, you are ready to pick the parts you need to assemble your bug. (Toothpicks can be used to hold the head and body segments together and as legs to attach the feet to the body.)

Analyze the Results

1. Organizing DataA0Take a poll of the traits of the offspring. What are the ratios for each trait?

2. Examining DataA0Do any of the new models look exactly like the parents? Explain.

Draw Conclusions

3. Interpreting InformationA0What are the possible genotypes of the parent bugs?

4. Making PredictionsA0How many different genotypes are possible in the offspring?

Applying Your Data

Find a mate for your “Baby” bug. What are the possible genotypes and phenotypes of the offspring from this match?

Students answers should reflect the data on parent alleles that were recorded in step 5.

Genotypes and Phenotypes

RR or Rr–red antennaerr–green antennae

SS or Ss–3 body segmentsss–2 body segments

CC or cc–Curly tailcc–straight tail

LL or Ll–3 pairs of legsll–2 pairs of legs

BB or Bb–blue nosebb–green nose

GG or Gg–green feetgg–black feet

EE or Ee–2 eyes ee–3 eyes

Students answers should include Punnett squares based on the parental traits. Except for the results obtained by parental genotypes that are all homozygous recessive, the student will see other possibilities for genotypes and phenotypes from the same parents.

Student ratios should be similar to the ratios determined when the alleles were selected by the teacher.

Students should create Punnett squares to show the possible genotypes, and describe phenotypes that follow the rules of dominance for each characteristic.

If any students have offspring bugs that look like one of the parents, have them compare the genotype of the offspring with the genotype of the
parents. The offspring and parents look alike but still have different genotypes for some traits.
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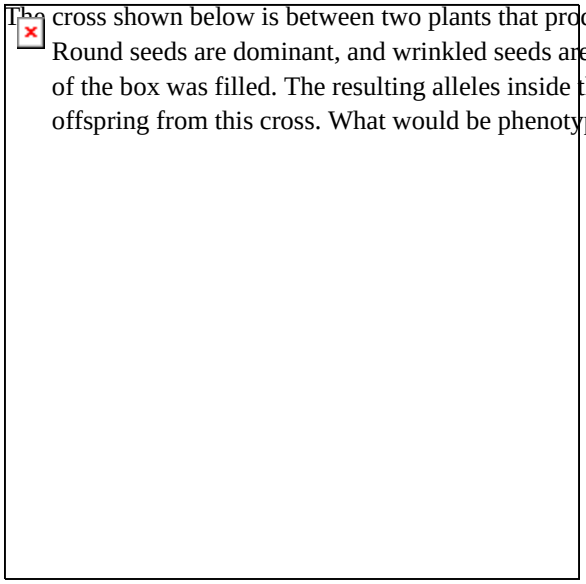
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ANSWER KEY
Name Class Date
Quick LabDATASHEET FOR QUICK LAB
Making a Punnett Square

1. Draw a square, and divide it into four sections.

2. Write the letters that represent alleles from one parent along the top of the box.
3. Write the letters that represent alleles from the other parent along the side of the box.

The cross shown below is between two plants that produce round seeds. The genotype for each is Rr. Round seeds are dominant, and wrinkled seeds are recessive. Follow the arrows to see how the inside of the box was filled. The resulting alleles inside the box show all the possible genotypes for the offspring from this cross. What would be phenotypes for these offspring be?



Three of the offspring would have round seeds, and one would have wrinkled seeds.
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ANSWER KEY

Name Class Date

Quick LabDATASHEET FOR QUICK LAB

Taking Your Chances

You have two guinea pigs. Each has brown fur and the genotype Bb. You want to predict what their offspring might look like. Try this to find out.

1. Stick a piece of masking tape on each side of two quarters.
2. Label one side with a capital B and the other side with a lowercase b.
3. Toss both coins 10 times, making note of your results each time.

4. How many times did you get the bb combination?

5. What is the probability that the next toss will result in bb?

6. What are the chances that the guinea pigs' offspring will have white fur (with the genotype bb)?

Toss Number	Results	Toss Number	Results
1		6	
2		7	
3		8	
4		9	
5		10	

Students should get bb on average 1/4 or 25% of the time.

1/4 or 25%

1/4 (If brown fur results from genotype Bb, then brown fur is dominant, and white fur will result from the genotype bb.)

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ANSWER KEY

Inquiry LabDATASHEET FOR labbook
Tracing Traits

Teacher Notes and Answer Key
Time Required
Two 45-minute class periods, separated by several days so students have time to complete their surveys
Lab Ratings
Teacher Prep–1
Student Set-Up–1
Concept Level–2
Clean Up–1
Lab Notes
Family histories will vary. Encourage students to include at least three generations in their histories.
Survey results will vary. Make sure that students actually surveyed each family member who was available. Responses will vary. You may check family members with shaded symbols against the survey results for accuracy.
Percentages will vary. A family member may receive a recessive allele from the father and a recessive allele from the mother. In such a case, this family member will exhibit the recessive form of the trait rather than the dominant form. Because so many children are adopted or live in foster homes or group homes, please emphasize to your students that they may choose any family to study.
Kerry Johnson
Isbell Middle School
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1 2 3 4
Easy Hard
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ANSWER KEY
Name Class Date
Inquiry LabDATASHEET FOR labbook
Tracing Traits
Have you ever wondered about the traits you inherited from your parents? Do you have a trait that neither of your parents has? In this project, you will develop a family tree, or pedigree, similar to the one shown in the diagram below. You will trace an inherited trait through a family to determine how it has passed from generation to generation.
Procedure
1. The diagram at right shows a family history. On a separate piece of paper, draw a similar diagram of the family you have chosen. Include as many family members as possible, such as grandparents, parents, children, and grandchildren. Use circles to represent females and squares to represent males. You may include other information, such as the family member's name, birth date, or picture.
2. Use table below to record data about your family. Survey each of the family members shown in your family tree. Ask them if they have hair on the middle segment of their fingers. Write each person's name in the appropriate square. Explain to each person that it is normal to have either trait. The presence of hair on the middle segment is the dominant form of this trait.

Dominant trait	Recessive trait	Family members with the dominant trait	Family members with the recessive trait
Hair present on the middle segment of fingers (H)	Hair absent on the middle segment of fingers (h)		

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ANSWER KEY

Name Class Date

Tracing Traits continued

3. Trace this trait throughout the family tree you diagrammed in step 1. Shade or color the symbols of the family members who demonstrate the dominant form of this trait.

Analyze the Results

1. What percentage of the family members demonstrate the dominant form of the trait? Calculate this by counting the number of people who have the dominant trait and dividing this number by the total number of people you surveyed. Multiply your answer by 100. An example has been done below.
   Example: Calculating percentage
   10 people with trait 5 1
   20 people surveyed 2
   1 5 0.50 3 100 5 50%
   2

2. What percentage of the family members demonstrate the recessive form of the trait? Why doesn't every family member have the dominant form of the trait?

3. Choose one of the family members who demonstrates the recessive form of the chosen trait. What is this person's genotype? What are the possible genotypes for the parents of this individual? Does this person have any brothers or sisters? Do they show the dominant or recessive trait?

Answers may vary.

Answers may vary.

The genotype of the recessive form of the characteristic must be hh (homozygous recessive). Each allele came from one of the individual's parents. Possible genotypes for the parents of the individual expressing the recessive form are Hh and hh. Does the student know whether either of the parents expresses the recessive form of the trait? Does the student know if the individual chosen has brothers or sisters? Are their genotypes known? If so, have the student decide if each of them has a dominant or recessive genotype. If a dominant genotype is found among the siblings and one of the parents is known to have the recessive form, ask the student what the genotype of the other parent must be (Hh).

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ANSWER KEY

Name Class Date

Tracing Traits continued

Draw Conclusions

4. In the space below, draw a Punnett square like the one at right. Use this to determine the genotypes of the parents of the person you chose in step 3. Write this person's genotype in the bottom right-hand corner of your Punnett square. Hint: There may be more than one possible genotype for the parents. Don't forget to consider the genotypes of the person's brothers and sisters.

Father

? ?

?

?

Mother

The Punnett square should show hh in the bottom right-hand corner. One of the parents must have the genotype hh. The other parent must have either hh or Hh. If any sibling has the dominant trait, the genotype of the other parent must be Hh.

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ANSWER KEY

Answer Key

Directed Reading A

Section: Mendel and his peas

1. the passing of traits from parents to offspring
2. Answers may vary. Sample answer: I have brown eyes like my mother.
3. B
4. C
5. A
6. self-pollinating
7. true-breeding
8. cross-pollinate
9. wind, insects
10. Answers may vary. Sample answer: Self-pollinating was important because it allowed Mendel to grow true-breeding plants. Cross-pollination was important because he could mix different traits to check results.
11. characteristic
12. traits
13. Answers may vary. Sample answer: True-breeding plants are important because he then knew what to expect if his plants self-pollinated.
14. Answers may vary. Sample answer: Mendel removed the anthers of one plant so that the plant could not self-pollinate. He then did the cross-pollinating himself.
15. C
16. B
17. A
18. B
19. A
20. C
21. D

Section: Traits and inheritance

1. C
2. D
3. A
4. B
5. A
6. B

7. G
8. A
9. B
10. F
11. D
12. C
13. E
14. Pp
15. It will be passed on to the next generation.
16. PP, Pp, pP
17. Pp, pP
18. C
19. 25%
20. There are only two possibilities for each trait.
21. incomplete dominance
22. Answers may vary. Sample answer: A cross between a true-breeding red snapdragon and a true-breeding white snapdragon produces pink flowers, because both alleles of the gene have some degree of influence.
23. trait
24. environment

SECTION: Meiosis

1. C
2. B
3. one
4. C
5. A
6. B
7. B
8. meiosis
9. 46
10. nucleus
11. genes
12. Two identical copies of the original cell are formed.
13. C
14. A
15. B
16. D
17. 3
18. 5
19. 8
20. 1
21. 7
22. 4
23. 6
24. 2
25. half the number of chromosomes that

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ANSWER KEY
Teacher Resource Page

were present in the original cell
26. meiosis
27. genotype
28. sex chromosomes
29. two X chromosomes
30. one X and one Y chromosome
31. the X chromosome
32. the Y chromosome
33. They are more likely to have a sex-linked disorder.
34. Answers may vary. Sample answer: color blindness and hemophilia
35. pedigree
36. carrier
37. recessive
38. selective breeding

Directed Reading B
section: Mendel and his peas

1. B
2. B
3. D
4. C
5. A
6. C
7. B
8. B
9. C
10. A
11. dominant
12. recessive
13. D
14. B
15. A

Section: Traits and inheritance

1. C
2. D
3. A
4. D
5. B
6. B
7. C
8. B
9. D
10. B
11. A
12. D
13. B
14. C
15. D
16. C
17. A
18. B
19. A
20. D
21. B
22. C

section: Meiosis

1. C
2. B
3. A
4. C
5. B
6. B

7. B
8. B
9. D
10. C
11. D
12. B
13. A
14. C
15. B
16. A
17. D
18. meiosis
19. X chromosomes
20. Y chromosome
21. hemophilia
22. pedigree
23. carriers
24. recessive
25. selective breeding

Vocabulary and Section Summary

section: Mendel and his peas

1. heredity: the passing of genetic traits from parent to offspring
2. dominant trait: the trait observed in the first generation when parents that have different traits are bred
3. recessive trait: a trait that reappears in the second generation after disappearing in the first generation when parents with different traits are bred

section: Traits and inheritance

1. gene: one set of instructions for an inherited trait
2. allele: one of the alternative forms of a gene that governs a characteristic, such as hair color
3. phenotype: an organism's appearance or other detectable characteristic
4. genotype: the entire genetic makeup of an organism; also, the combination of genes for one or more specific traits
5. probability: the likelihood that a possible future event will occur in any given instance of the event

section: meiosis

1. homologous chromosomes: chromosomes that have the same sequence of genes and the same structure
2. meiosis: a process in cell division during which the number of chromosomes decreases to half the original number by two divisions of the nucleus, which results in the production of sex cells
3. sex chromosome: one of the pair of

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ANSWER KEY

chromosomes that determine the sex of an individual

4. pedigree: a diagram that shows the occurrence of a genetic trait in several generations of a family

Section Review

section: Mendel and his peas

1. Sample answer: Heredity is the passing of traits from parents to their offspring. A dominant trait is a trait that is present in the first generation when parents with different traits produce offspring. A recessive trait is a trait that is not present in the first generation but often reappears in the second generation.
2. B
3. Self-pollination occurs when pollen from a particular plant is deposited on a stigma from the same plant. Cross-pollination occurs when the pollen and stigma are from two different plants.
4. Sample answer: A characteristic is something that has different forms in a population, and a trait is each one of the possible forms. For example, eye color is a characteristic in humans, and brown-eyed, green-eyed, and blue-eyed are all possible traits.
5. Sample answer: During Mendel's first experiments he crossed two plants that were true breeding for different traits. In each case, the offspring had the dominant trait
6. During Mendel's second experiments he allowed the plants that were the offspring from his first experiments to self-pollinate. In these cases, some of the second-generation plants had the recessive trait.
7. 7:2, or 3.5:1, brown to green;
   2:7, or 1:3.5,green to brown
8. Sample answer: If Mendel had used plants that were not true breeding, the dominant trait would not have been as clear for each characteristic, and he would not have gotten such a clear 3:1 ratio. The concept of dominant and recessive may have hidden for a longer period of time. 9. Curly ears are dominant because it is the trait that is represented in the first generation.
10. Sample answer: sociology, physics, and chemistry

section: Traits and inheritance

1. Sample answer: Alleles are different versions of the same gene.
2. Sample answer: Genotype is the set of alleles an organism has inherited from its parents. Phenotype is what the organism looks like physically.
3. B
4. The genotype of an organism contains the two alleles for each characteristic. One allele of each pair was inherited from each of the organism's parents. The phenotype of the organism is the way the genotype affects the organism physically. For example, if an organism inherits one dominant allele for brown fur and one recessive allele for white fur, its phenotype will be brown fur.
5. incomplete dominance; one gene influencing more than one trait, and one trait being influenced by many genes
6. 1/6 3 1/6 3 1/6 = 1/216
7. Approximately half of the offspring will have the phenotype of cleft chins (genotypes Cc) and half will not (genotypes cc).
8. BB, bb
9. Sample answer: a shade of gray

section: meiosis

1. Sample answer: At the end of meiosis, each sex cell will contain only one sex chromosome (either X or Y).
2. During meiosis, chromosomes are copied, and then the nucleus divides twice.
3. A pedigree is used to show how inherited traits move through a family.
4. During meiosis, homologous chromosomes line up in the middle of the cell.
5. A
6. 7

7. Answers may vary. Students' drawings should be similar to the diagram of meiosis in the student text.
8. Sample answer: yes; The disorder

seems to be sex-linked because the females are carriers of the disease but only males have the disease itself.

9. gene, chromosome, cell
10. Sample answer: Because the purple gene (P) is dominant over the white gene (p), the genotype of the purple-flowered pea plant could be either PP or Pp. Thus, the possible alleles carried by the sex cells would be P or p.

Chapter Review

1. sex cells
2. phenotype, genotype
3. Meiosis
4. alleles
5. D
6. C
7. B
8. B
9. C
10. C
11. B
12. Females have two X chromosomes. Males have one X and one Y chromosome.
13. Sample answer: A recessive trait is a genetic trait that is expressed only if there is not a dominant allele present.
14. Sex cells have half the number of chromosomes as other body cells.
15. Sample answer: A sex-linked disorder is a disorder that is caused by a gene on one of the sex chromosomes and so is expressed in one sex more than the other. Color blindness is a sex-linked disorder found in humans.
16. An answer to this exercise can be found at the end of the Teacher Edition.
17. Sample answer: A genetic counselor could test my spouse to see if my spouse is also a carrier of the recessive allele. The counselor could then predict what the chances are that we could have a child with the recessive disorder.
18. The allele for blond hair is recessive.
19. PP
20. TT
21. All the parents and offspring are tall pea plants.
22. Students should make two new Punnett squares. Self-fertilization of TT (TT 3 TT) will yield offspring that are all TT. Self-fertilization of Tt (Tt 3 Tt) will yield offspring that are TT, Tt, and tt.
23. TT has a 100% probability with a TT parent and a 25% probability with a Tt parent. Tt has a 50% probability with a Tt parent, and a 0% probability with a TT parent. The genotype tt has a 25% probability with a Tt parent, and a 0% probability with a TT parent.

Reinforcement

Dimples and DNA

1. Dd in three squares
2. Only the genotype Dd is possible for the offspring of Parent A and Parent B.
3. The probability that the offspring of Parent A and Parent B will have dimpled cheeks is 25% 1 25% 1 25% 1 25% = 100%.
4. Top row: DD, Dd
   Bottom row: Dd, dd

5. DD: 25%
   Dd: 25% + 25% = 50%
   dd: 25%
6. The probability of these offspring having nondimpled cheeks is 25 percent.
7. The probability of these offspring having dimpled cheeks is 75 percent.

Critical Thinking

a bittersweet solution

1. The hybrid produced larger, more bitter fruit. The original orange trees had smaller, sweeter fruit.
2. Eighty percent of the hybrid orange trees grew quickly and produced larger fruit that tasted bitter. These characteristics came from the P'tooey plant. We know that these traits are dominant because a high percentage of the hybrid plants exhibit those traits.
3. Answers may vary. Sample answer: The genes donated by the original kiwi plant—sweet taste and average growth—produce dominant traits in the new kiwi hybrid. Rapid growth and bitter taste are recessive traits.
4. Answers may vary. Sample answer: If the first hybrid generation is crossed

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with itself, the recessive sweet trait could reappear and could occur with the trait for rapid growth. 5. Answers may vary. Sample answer: The introduction of a new plant hybrid could have an impact on the island's ecosystem. Any change to a part of an ecosystem will affect the web of organisms in that system. For example, animals that fed on the original plants might be unable to eat the hybrid fruit and would therefore die off.

Section Quizzes

section: Mendel and His Peas

1. C
2. B
3. D
4. A
5. B
6. C
7. C

section: Traits and inheritance

1. C
2. d
3. A
4. B
5. E
6. A
7. C
8. D

section: meiosis

1. B
2. D
3. A
4. C
5. B
6. B
7. A
8. B

Chapter Test A

1. C
2. C
3. D
4. A
5. A
6. B
7. A
8. B
9. B
10. a
11. D
12. C
13. B
14. G
15. E
16. B
17. F
18. A
19. D
20. C
21. A
22. C
23. B

Chapter Test B

1. recessive traits
2. heredity
3. phenotype
4. genotype
5. probability
6. pedigree
7. C
8. D

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ANSWER KEY

9. A
10. C
11. B
12. XX
13. XY
14. when each allele has its own degree of influence
15. Answers may vary. Sample answer: Self-pollinating was important because it allowed Mendel to grow true-breeding plants. Cross-pollination was important because he could mix different traits to check results.
16. Answers may vary. Sample answer: The parent cell has 23 pairs of chromosomes making a total of 46. The new cell has 23 single chromosomes—one from each pair of parent cells.
17. Answers may vary. Sample answer: The chromatids in the seventh set are like the original chromatids split in half.
18. B
19. A
20. C

Chapter Test C

1. B
2. C
3. C
11. A
12. C
13. B

4. D
5. B
6. B
7. D
8. C
9. A
10. D
14. genes
15. X chromosomes
16. pedigree
17. color blindness
18. D
19. B
20. A

Standardized Test Preparation

Reading

Passage 1

1. C
2. F
3. C

Passage 2

1. A
2. H
3. A

Graphics

1. B
2. H
3. B

Math

1. B
2. H
3. A
4. G
5. D
6. H

Vocabulary Activity

1. homologous
2. sex chromosomes
3. alleles
4. genotype
5. mitosis
6. heredity
7. meiosis
8. recessive
9. Punnett square