

**Assessment Anchors/Eligible Content: S8.B.2.1.1** Explain how inherited structures or behaviors help organisms survive and reproduce in different environments.

**S8.B.2.2.1** Identify and explain differences between inherited and acquired traits.

**S8.B.2.2.2** Recognize that the gene is the basic unit of inheritance, that there are dominant and recessive genes, that traits are inherited.

**Academic Standards: 3.3.7.C, 3.3.7.D**

**Explain the difference between inherited and acquired traits.**

**Inherited traits** pass from a parent to its offspring.

**Heredity** is the passing of traits from parents to offspring.

**Acquired traits** develop as an organism interacts with its environment.

**DNA** molecules store the genetic information of an organism.

**Chromosomes** are bundles of DNA and proteins.

**Genes** are segments of DNA that carry the instructions for inherited traits.

**Guided  
Instruction**

**DIRECTIONS** Read the following information and answer the questions.

Perhaps you have heard people say about a person, “she has her mother’s nose” or “she has her father’s eyes.” In general, they are saying that she has traits similar, but not identical, to those of her parents. The color of a person’s eyes and the shape of a person’s nose are examples of **inherited traits**. Inherited traits are passed on from parents to offspring. The passing of traits from one generation to the next generation is called **heredity**.

Not all traits are inherited traits. Some traits are acquired. Acquired traits develop as an organism interacts with its environment. Parents do not pass acquired traits to their offspring. For example, suppose a person gets a scar from a cut. The scar is an acquired trait. If the person has children, the children will not be born with the scar.

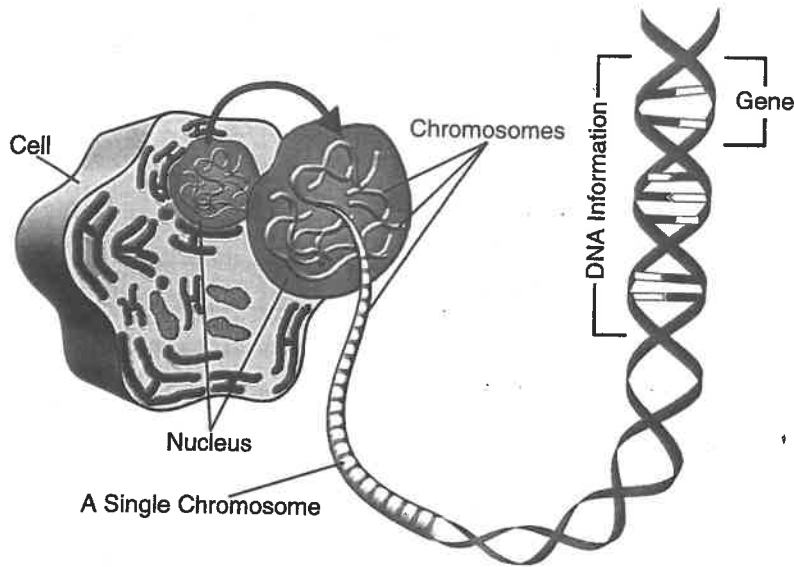
Inside the nucleus of every cell in your body is a complete set of coded instructions that determine most of your traits. **DNA** is the molecule that stores the instructions for inherited traits. Molecules of DNA are bundled with proteins in structures called chromosomes. Most human cells have 23 pairs of chromosomes inside their nuclei. Segments of DNA called **genes** carry the individual instructions for traits. Unless you have an identical twin, no one else has genetic instructions exactly like yours.

**Guided Questions**

What is an **inherited trait**?

How is an **acquired trait** different from an **inherited trait**?

What is the relationship between **DNA** and **genes**?



**Guided Questions**

Because no two individuals have the exact same genetic instructions, individuals have different traits. Even members of the same species have slightly different traits. For example, you do not have exactly the same traits as your teacher, your classmates, or even your parents. In many cases, a particular trait, such as thicker fur or sharper eyesight, allows the individual with the trait to survive and reproduce more successfully than other individuals. Over time, more and more members of a population will likely have the beneficial trait.

Why do individuals have different traits?

**DIRECTIONS** Answer the following questions.

1. What is the relationship between a parent's traits and the traits of its offspring?

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2. Give one example of an inherited trait and one example of an acquired trait. Choose examples that are not in the reading.

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3. What will likely happen to a trait that helps an individual survive and reproduce more successfully than other individuals?

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Apply the  
Pennsylvania  
Academic  
Standards

**DIRECTIONS** Study the chart and answer the questions.

Organism	Number of Chromosomes per Cell
Human	46
Lettuce	18
Fruit fly	8
Cat	38
Potato	48
Crayfish	400
Dog	78
Bacterium	1
Sunflower	34
Goldfish	94

1. Which of these organisms has the smallest number of chromosomes? Which organism has the largest?

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2. How many pairs of chromosomes does a dog have in each body cell? How many chromosomes does a dog get from each of its parents?

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3. Can you conclude that a pattern can be found between the number of chromosomes in plant cells and the number of chromosomes in animal cells? Explain.

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4. Can you conclude that larger organisms have a greater number of chromosomes than smaller organisms? Explain.

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**PSSA  
Practice**

**Directions:** Read each question. Then circle the letter for the best answer.

1. Which trait is **most likely** determined by genes?
- A how old a person is
  - B what a person likes to eat
  - C whether a person has dimples
  - D the time a person wakes up each day



2. An individual plant produces seeds that are more drought-tolerant than the seeds of other individuals. What will **most likely** happen during a long period of drought in the area?

- A All individuals will survive, but none will be able to reproduce.
- B All individuals will reproduce, but they will be unable to survive for long.
- C The plant with drought-tolerant seeds will have more offspring than other individuals.
- D The plant with drought-tolerant seeds will be more likely to survive than other individuals.

3. Which of the following contains only a single instruction for determining a trait in an organism?

- A chromosome
- B DNA
- C gene
- D nucleus



4. A man travels to Mexico to learn to speak Spanish. What is the relationship between the man's genes and his learning to speak Spanish?

- A His genes prevented him from learning Spanish as his native language.
- B His genes carry instructions for the ability to learn language.
- C His genes have instructions that allow him to learn Spanish but not French.
- D His genes determined that he would be able to learn Spanish only as an adult.

**Assessment Anchors/Eligible Content:** **S8.B.2.2.1** Identify and explain differences between inherited and acquired traits.  
**S8.B.2.2.2** Recognize that the gene is the basic unit of inheritance, that there are dominant and recessive genes, that traits are inherited.  
**Academic Standards:** **3.3.7.C, 3.3.7.D, 4.7.7.A, 4.7.7.B**

**Explain how combinations of alleles determine traits.**

A **gene** is a piece of DNA that contains hereditary instructions and is passed from parent to child.

**Alleles** are different forms of the same gene.

A **dominant allele** masks the expression of a **recessive allele**.

A **Punnett square** is a chart that helps predict the traits of offspring from different crosses.

**Guided  
Instruction**

**DIRECTIONS** Read the following information and answer the questions.

In general, offspring produced by sexual reproduction receive genetic material from two parents. Each parent passes on one set of its genetic material to its offspring. Thus, an individual has two copies of each **gene**, one from the mother and one from the father. These copies are not always identical. Most genes exist in more than one form. The different forms of a gene are called **alleles**.

Many genes have two different alleles. Some genes have only one allele. Others have many different alleles. Even though a particular gene may have many different forms, humans and most other animals have only two total alleles for each gene. Different combinations of alleles can lead to different traits.

Having dimples is a trait that is determined by two alleles. One allele, *D*, produces dimples. The other allele, *d*, does not produce dimples. There are four possible combinations of these alleles: *DD*, *Dd*, *dD*, and *dd*. The *D* allele for dimples is dominant, or always expressed. This means that a person with at least one *D* allele will have the dimples trait. The *d* allele is recessive. This means that only a person with the *dd* combination will not have dimples.

Remember that a parent passes only one of its alleles for each gene to a particular offspring. You can use a **Punnett square** to predict the possible allele combinations from a particular set of parents. A Punnett square does not show actual numbers of offspring. It shows only the probability that any one offspring will have a particular combination of alleles. The Punnett square below shows that there is a 50% chance that any one offspring will have the combination *Dd*.

**Guided Questions**

What is an **allele**?

What is the relationship between **alleles** and traits?

What kind of **allele** is always expressed?

What is a **Punnett square** used for?

**Guided Questions**

		Parent with dimples		
		D	d	
Parent without dimples	d	Dd	dd	Possible offspring: <i>Dd, Dd, dd, dd</i> Probability of dimples: $\frac{1}{2}$ ( <i>Dd, Dd</i> ) Probability of no dimples: $\frac{1}{2}$ ( <i>dd, dd</i> )
	d	Dd	dd	

**DIRECTIONS** Answer the following questions.

1. How would a person have identical alleles for a particular gene?

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2. How can you tell if a particular allele is dominant?

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3. Under what condition could a recessive allele be expressed?

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4. Does the number of boxes in a Punnett square represent the total number of offspring? Explain your answer.

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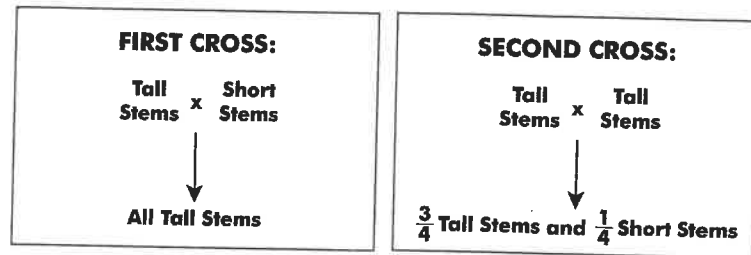


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**DIRECTIONS** Read the paragraph, study the diagrams, and answer the questions.

Like humans, pea plants have many easily recognizable traits. One of these traits is stem height. Some pea plants have tall stems and some have shorter stems. A scientist crossed tall-stemmed plants with shorter-stemmed plants. All the offspring from the first cross had tall stems. He then crossed two of the offspring. Of the offspring from this second cross,  $\frac{3}{4}$  had tall stems and  $\frac{1}{4}$  had short stems.



1. Based on your observations of the diagram above, which allele is most likely dominant in pea plants? Explain your answer.  

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2. If the dominant allele for stem height is represented by  $T$  and the recessive allele is indicated by  $t$ , what combination of alleles does a plant with a short stem have? Explain your answer.  

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3. What is the probability of having a plant with short stems if both the parent plants had short stems? Explain your answer.  

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4. Construct a Punnett square to show the results of crossing two pea plants with the combination  $Tt$ . What is the probability of having offspring with tall stems and with short stems?

**PSSA Practice**

**Directions: Read each question. Then circle the letter for the best answer.**

1. A scientist drawing a Punnett square is probably trying to figure out
  - A how many offspring a cross produces.
  - B how often a trait is likely to appear.
  - C how many alleles a gene has.
  - D how many chromosomes offspring have.

2. Which of these traits in pea plant offspring would you be unable to predict with a Punnett square?

- A seed color      B seed shape
- C leaf damage    D flower position

3. If the allele for brown eyes, *B*, is dominant and the allele for blue eyes, *b* is recessive, which combination could produce a child with blue eyes?

- A *Bb*
- B *BB*
- C *bb*
- D *bB*

4. A baby goat has straight hair. Suppose the gene controlling hair texture in goats has two alleles, one dominant and one recessive. The dominant allele codes for curly hair. The recessive allele codes for straight hair.

A. Describe and explain the possible allele combinations that each of the goat's parents could have.

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B. Suppose the baby goat has a sibling with curly hair. What possible allele combinations could the goats' parents **not** have? Explain your answer.

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