

Name: _____ Date: _____ Group: _____

The Father of Modern Genetics

1 Between 1856 and 1863 Gregor Mendel conducted over 29,000 experiments in a monastery garden. This curious and observant priest was an avid gardener. He noticed during his many hours of gardening that the same type of plants would grow in highly predictable ways. What he found out is that heredity—the passing of traits from parent to offspring—happens in a foreseeable manner. His work would go unappreciated and unacknowledged until 40 years after his death, when it was rediscovered by biologists attempting to figure out how traits are passed from one generation to another. His work now stands as the foundation upon which our understanding of heredity and genetics rests.



2 Mendel, who is now called the Father of Genetics, grew vegetables in the monastery garden. He spent many hours growing peas for the inhabitants of the abbey. While gardening, he noticed that some peas grow on short plants and some grow on tall plants. At the time, most people believed in the theory of blended inheritance, which suggested that one tall parent and one short parent would produce a child somewhere in-between in height.

3 Gregor Mendel, however, was a very perceptive man. He saw that when purebred tall and purebred short peas were cultivated they only produced tall peas. If the blended inheritance theory were true, the merging of short and tall peas should produce peas that were somewhere in-between—yet that never happened. In fact, what happened was that a cross between purebred short and tall peas always produced tall peas. The tall trait always won over the short trait, even though this made no sense. How could short peas keep appearing if it were so easy to erase the short trait? This mystery was solved when the first generation of offspring (F_1) were mixed. That union usually produced a ratio of three tall plants for every one short plant. The second generation (F_2) demonstrated the fact that inherited traits carry on, even when they are hidden from our eyes.

- 4 The factors that control traits are called genes. Different forms of genes are called alleles. For example, hair color is determined by genes, and red hair is a particular allele of the hair color gene. Each organism inherits two alleles for each trait, forming a set of genetic possibilities or genotypes. Some of these possibilities are expressed, or observable. If they are visible, they are called phenotypes. Even if an allele is not visible because it is recessive, or overpowered by the dominant allele, it is still present. Like the short trait in impure pea plants, it is lurking in the genotypes, waiting to be joined with another recessive allele and become visible again.
- 5 The discovery of recessive alleles revolutionized scientific thought about inheritance. Now there could be an explanation for a red-headed child born to brown-haired parents. The two brown-haired parents could carry both the brown-hair and red-hair allele. Since the brown-hair allele is dominant, the parents would each have brown hair. However, they would still be capable of passing on their recessive red-hair allele. If both passed on the red-hair allele to the same offspring, that child would have red hair.
- 6 Recessive alleles can wait unexpressed for generations to be matched with another recessive allele and become phenotypes. They explain many genetic disorders such as sickle cell anemia and Huntington's disease. Although they seem like little surprises from nature when they appear, we can calculate the probability that an offspring will have a certain combination of alleles using a Punnett Square. A Punnett Square is a chart that shows all the possible combinations of alleles that can be the product of a genetic cross. This kind of predictive possibility was unfathomable before Mendel's discovery. It is unfortunate that he never learned how important his work would be for the advancement of science.

- 1** Which words in the story help the reader understand the meaning of the word **avid** in paragraph 1?
- A** "What he found out"
 - B** "Many hours gardening"
 - C** "This curious and observant"
 - D** "He noticed"
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- 2** Eye color is also determined by genes. Brown eyes are dominant, and blue eyes are recessive. What must be true for two brown-eyed parents to produce a blue-eyed child?
- A** One person passes on the blue-eye allele.
 - B** They each pass on the blue-eye allele.
 - C** One person's parents are blue-eyed.
 - D** One person's grandparents are blue-eyed.
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- 3** What can the reader reasonably conclude based on the information in this passage?
- A** Gregor Mendel was well paid for his research.
 - B** Gregor Mendel noticed other things about peas.
 - C** Gregor Mendel won a Nobel Prize for his work.
 - D** Gregor Mendel hated gardening.

- 4 What can a Punnett Square be used to determine?
- A the possible combinations of alleles in offspring
 - B what an offspring will look like
 - C the height of offspring
 - D genetic heritage
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- 5 Which words in the story help the reader understand the meaning of the word **foreseeable** in paragraph 1?
- A "Same type of plants"
 - B "No one noticed"
 - C "The passing of traits"
 - D "Highly predictable ways"
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- 6 What will the result be if a purebred tall pea plant is mixed with a purebred short pea plant?
- A a short pea plant. due to chance
 - B a short pea plant, because short is the dominant allele
 - C a tall pea plant, because tall is the dominant allele
 - D a tall pea plant. due to chance