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**Chapter 11 Active Reading Guide: Mendel and the Gene Idea**

# Section 1

1. One of the keys to success for Mendel was his selection of pea plants. Explain how using pea plants allowed Mendel to control mating; that is, how did this approach let Mendel be positive about the exact characteristics of each parent?
2. What is the difference between a character and a trait? Explain using an example.
3. Define the following terms. Then, consider your own family. Which generation would your mother’s grandparents be? Your mother? You?

P generation: F1 generation: F2 generation:

1. Explain how Mendel’s simple cross of purple and white flowers did the following:
   1. refuted blending:
   2. determined dominant and recessive characteristics:
   3. demonstrated the merit of experiments that covered multiple generations:
2. In sexually reproducing organisms, why are there exactly two chromosomes in each homologous pair?
3. Mendel’s model consists of four concepts. Describe each concept in the appropriate space below. Indicate which of the concepts can be observed during meiosis by placing an asterisk by the concept.

|  |  |
| --- | --- |
| **Mendel’s Four Concepts** | **Description of Concept** |
| First Concept |  |
| Second Concept |  |
| Third Concept |  |
| Fourth Concept (Law of Segregation) |  |

1. Using Figure 11.5 in your text as your guide, indicate the alleles for each individual as well as the gametes it produces, and complete the Punnett square.
   1. What is the F2 phenotypic and genotypic ratio?
   2. Which generation is completely heterozygous?
   3. Which generation has both heterozygous and homozygous offspring?
2. In pea plants, T is the allele for tall plants, while t is the allele for dwarf plants. If you have a tall plant, demonstrate with a testcross how it could be determined if the plant is homozygous tall or heterozygous tall.
3. Explain the difference between a monohybrid cross and a dihybrid cross.
4. Using Figure 11.8 as your guide, explain how the gametes are derived for the following cross. (You should have four different gametes).

YyRr X YyRr

1. Complete the cross given in question 11 by placing the gametes in a Punnett square. Then provide the phenotypic ratio of the offspring.

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1. Explain Mendel’s law of independent assortment.

# Section 2

1. An event that is certain to occur has a probability of , while an event that is certain not to occur has a probability of .
2. State the multiplication rule and give an original example.
3. State the addition rule and give an original example.
4. What is the probability that a couple will have a girl, a boy, a girl, and a boy in this specific order?

# Section 3

1. Explain how incomplete dominance is different from complete dominance, and give an example of incomplete dominance.
2. Dominant alleles are not necessarily more common than recessive alleles in the gene pool. Explain why this is true.
3. Explain what is meant when a gene is said to have multiple alleles. Blood groups are an excellent human example of this.
4. Blood groups are so important medically that you should be able to solve genetics problems based on blood types. The first step in accomplishing that is to understand the genotypes of each blood type. Before working any problems, complete this ABO blood type chart.

|  |  |  |
| --- | --- | --- |
| **Phenotype (Blood Type)** | **Genotype(s)** | **Red Blood Cell Appearance** |
| A |  |  |
| B |  |  |
| AB |  |  |
| O |  |  |

1. Question 2 in the Concept Check 11.3 is a blood type problem. Complete it here, and show your work.
2. What is pleiotropy? Explain why this is important in diseases like cystic fibrosis and sickle-cell disease.
3. Explain why the dihybrid cross detailed in Figure 11.12 in your text has four yellow Labrador retrievers instead of the three that would have been predicted by Mendel’s work.
4. Quantitative variation usually indicates .
5. Using the terms norm of reaction and multifactorial, explain the potential influence of the environment on phenotypic expression.

# Section 4

1. Pedigree analysis is often used to determine the mode of inheritance (dominant or recessive, for example). Be sure to read the “Tips for pedigree analysis” in Figure

11.14 in your text; What is the mode of inheritance for pedigree (a)? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

(b)?

1. Describe what you think is medically important to know about the behavior of recessive alleles.
2. You are expected to have a general knowledge of the pattern of inheritance and the common symptoms of a number of genetic disorders. Provide this information for the disorders listed below.
   1. cystic fibrosis:
   2. sickle-cell disease:
   3. achondroplasia:
   4. Huntington’s disease: