

Chapter 11: Mendelian Patterns of Inheritance and Beyond

1. Describe Mendel's scientific approach and how it helped make his experiments successful.
2. Explain why the garden pea was a good choice for Mendel's experiments.
3. Contrast blending and the particulate concept of inheritance.
4. Explain Mendel's laws of segregation and independent assortment.
5. Compare and contrast dominant alleles with recessive alleles and their relation to genotype and phenotype.
6. Use a Punnett square and the law of probability to predict the chances of producing gametes and offspring.
7. Demonstrate how a pedigree may be used to determine the mode of inheritance of a genetic trait.
8. Explain the purpose of a testcross, and identify the possible genotypes of the parents involved.
9. Explain the inheritance pattern of traits where more than two alleles for the trait exist. Be able to work out blood typing problems using multiple alleles and Punnett squares.
10. Contrast incomplete dominance and codominance.
11. Distinguish the inheritance of polygenic traits.
12. Examine X-linked inheritance and its gender-based effects.
13. Explain what linkage means when discussing genes. Identify a map unit in relation to chromosomes.

Past AP Exam Essay Questions**Study Guide Book**

Mendel is known as the "Father of Genetics." His experiments with peas revolutionized the way we understand patterns of inheritance.

- a. Compare what people thought about inheritance before Mendel's experiments with what we now know. Be sure to use the conclusions reached by Mendel in your discussion. (HINT: There are two rules and one law)
- b. Explain how TWO of the following deviates from these conclusion:
 - autosomal linkage
 - sex-linked inheritance
 - polygenic inheritance
 - incomplete dominance

Chi-square Analysis

2003 Question 1

In fruit flies, the phenotype for eye color is determined by a certain locus. **E** indicates the dominant allele and **e** indicates the recessive allele. The cross between a male wild-type fruit fly and a female white-eyed fruit fly produced the following offspring.

	Wild type male	Wild type female	White eyed male	White eyed female	Brown eyed female
F1	0	45	55	0	1

The wild-type and white-eyed individuals from the F1 generation were then crossed to produce the following offspring.

F2	23	31	22	24	0
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- Determine the genotypes of the original parents (P generation) and explain your reasoning. You may use Punnett squares to enhance your description, but the results from the Punnett squares must be discussed in your answer.
- Use a Chi-squared test on the F2 generation data to analyze your prediction of the parental genotypes. Show all your work and explain the importance of your final answer.
- The brown-eyed female in the F1 generation resulted from a mutational change. Explain what a mutation is, and discuss two types of mutations that might have produced the brown-eyed female in the F1 generation.

Critical Values of the Chi-Squared Distribution

Probability	Degrees of Freedom (df)				
	1	2	3	4	5
0.05	3.84	5.99	7.82	9.49	11.1

The formula for Chi-squared is:
$$X^2 = E \left[\frac{(o-e)^2}{e} \right]$$

where o = observed number of individuals

e = expected number of individuals

E = sum of the values (in this case, the differences, squared, divided by the number expected)