Name: _____   **AP Biology**

Chapter 11 Active Reading Guide
Mendel and the Gene Idea

If you have completed a first-year high school biology course, some of this chapter will serve as a review for the basic concepts of Mendelian genetics. For other students, this may be your first exposure to genetics. In either case, this is a chapter that should be carefully mastered. Spending some time with this chapter, especially working genetics problems, will give you a solid foundation for the extensive genetics unit in the chapters to come.

Overview:

1. In the 1800s the most widely favored explanation of genetics was "blending." Explain the concept of blending, and then describe how Mendel's "particulate" (gene) hypothesis was different.

Section 1

2. 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?

3. What is the difference between a character and a trait? Explain using an example.

4. 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:

5. Explain how Mendel's simple cross of purple and white flowers did the following:
   a. refuted blending:

b. determined dominant and recessive characteristics:

c. demonstrated the merit of experiments that covered multiple generations:

6. In sexually reproducing organisms, why are there exactly two chromosomes in each homologous pair?

7. 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)	

8. 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.
    a. What is the F_2 phenotypic and genotypic ratio?

    b. Which generation is completely heterozygous?

    c. Which generation has both heterozygous and homozygous offspring?

9. 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.

10. Explain the difference between a monohybrid cross and a dihybrid cross.

11. As you start to work word problems in genetics, two things are critical: the parent's genotype must be correct, and the gametes must be formed correctly. 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

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

13. Explain Mendel's law of independent assortment.

Section 2

14. An event that is certain to occur has a probability of _____, while an event that is certain not to occur has a probability of _____.

15. In probability, what is an independent event?

16. State the multiplication rule and give an original example.

17. State the addition rule and give an original example.

18. What is the probability that a couple will have a girl, a boy, a girl, and a boy in this specific order?

Section 3

19. Explain how incomplete dominance is different from complete dominance, and give an example of incomplete dominance.

20. Compare and contrast codominance with incomplete dominance.

21. Dominant alleles are not necessarily more common than recessive alleles in the gene pool. Explain why this is true.

22. Explain what is meant when a gene is said to have multiple alleles. Blood groups are an excellent human example of this.

23. 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		

24. Question 2 in the Concept Check 11.3 is a blood type problem. Complete it here, and show your work.

25. What is pleiotropy? Explain why this is important in diseases like cystic fibrosis and sickle-cell disease.

26. Explain epistasis.

27. 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.

28. Why is height a good example of polygenic inheritance?

29. Quantitative variation usually indicates _____.

30. Using the terms norm of reaction and multifactorial, explain the potential influence of the environment on phenotypic expression.

Unit 4
31. 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; then complete the unlabeled pedigree by indicating the genotypes for all involved. What is the mode of inheritance for this pedigree? _____

32. Describe what you think is medically important to know about the behavior of recessive alleles.

33. 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.
    a. cystic fibrosis:

    b. sickle-cell disease:

c. achondroplasia:

d. Huntington's disease:

One of the ways to determine your understanding of Mendelian genetics is to work many genetics problems. Complete the questions for the problems at the end of the chapter. Before starting, it would be productive to read the "Tips for Genetics Problems" on page 225. Work neatly, and show all work. As you know, you can check your solutions in your text.