

Name: \_\_\_\_\_

AP Biology

## **Chapter 12 Active Reading Guide**

### **The Chromosomal Basis of Inheritance**

#### **Section 1**

1. What is the chromosome theory of inheritance?
2. Explain the law of segregation. Use two different colored pencils to illustrate the segregation of alleles. You may want to consult Figure 12.2 in your text, and model your sketches on this.
3. Explain the law of independent assortment. To demonstrate that you understand this concept, consider a cell with two pairs of chromosomes. Sketch the two different ways these chromosomes might be arranged during metaphase I.
4. Thomas Hunt Morgan selected *Drosophila melanogaster* as his experimental organism. List at least three reasons the fruit fly is an excellent subject for genetic studies.

5. The notation for wild type and mutant traits follows some accepted conventions. Notate the following genotypes for a female fruit fly:
  - a. a fly homozygous for red eyes \_\_\_\_\_
  - b. a fly heterozygous for red eyes \_\_\_\_\_
  - c. a fly homozygous for white eyes \_\_\_\_\_
6. When Thomas Hunt Morgan mated a white-eyed male fly with a red-eyed female, he came to the startling conclusion that the trait for eye color was located on the chromosome that determines sex. Show this cross. Begin with the parental generation, and go through the F<sub>2</sub>.

Parental generation:

F<sub>1</sub> generation:

F<sub>2</sub> generation:
7. What unusual result suggested that the eye-color trait is located on the X chromosome?

## **Section 2**

8. What is the SRY gene? Where is it found, and what does it do?
9. What is the definition of a sex-linked gene?
10. In humans, how has that term been historically modified?
11. Name and describe three human sex-linked disorders.

12. Try the following problem (Figure 12.7b in your text). A female who carries an allele for color blindness, but who is not color-blind, mates with a male who has normal color vision. What is the probability that they will have a son who is color-blind?
  
13. What is a Barr body? Why do human females show a Barr body in their cells?
  
14. X inactivation maintains the proper gene dosage. How is the X chromosome inactivated?
  
15. Why can you say that all calico cats are females?

### **Section 3**

16. What are linked genes? Do linked genes sort independently?
  
17. If two genes are linked on the same chromosome, we call this combination the parental combination. These genes will be transmitted as a unit and will not sort independently. However, during meiosis, crossing over occurs between homologous chromosomes, and the linked genes can become “unlinked.” In general, the farther two genes are from each other along the chromosome, the more often they will come “unlinked.” Genetic recombination is the process during which linked genes become unlinked. What do geneticists call the offspring that show these new combinations?
  
18. Review meiosis. When does crossing over occur?

19. Alfred H. Sturtevant, a student of Thomas Hunt Morgan, used assumptions from observations of crossovers to map genes. What is a linkage map?
20. What is a map unit?
21. Figure 15.10 shows the results of a cross between a fruit fly that is heterozygous for a gray body with normal wings, and a fruit fly that has a black body with vestigial wings. Because these genes are linked, the results are not what might have been predicted. Show the phenotypes and number of each type of offspring. Indicate which offspring are the recombinants and which are the parental type. Finally, calculate the map distance between the two genes. Show all your work here.

#### **Section 4**

22. What occurs in nondisjunction?
23. Explain each of the following terms:
- aneuploidy:
  - monosomy:
  - trisomy:
  - polyploidy:
24. What causes Down syndrome? What are four characteristics of Down syndrome?

25. For each of the following human aneuploidies, give the sex of the individual as well as any physical manifestation of the syndrome.

	<b>Sex</b>	<b>Physical Traits</b>
XXY		
XXX		
XO		
XYY		

26. Chromosome structure can be altered in several ways. Explain what occurs in each type of alteration.

deletion:

duplication:

inversion:

translocation:

Just as in Chapter 11, it would be helpful to do a series of problems at the end of the chapter. Work neatly, and show all work. As you know, you can check your solutions in your text.