AP Biology **Name** _____

Chapter 15 Guided Reading: The Chromosomal Basis of Inheritance
10ed

1. How does the chromosome theory of inheritance provide a physical explanation for Mendelian inheritance?

2. Explain the *law of segregation*. Use two different colored pencils to illustrate the segregation of alleles. Consult Figure 15.2 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 notations 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_2.

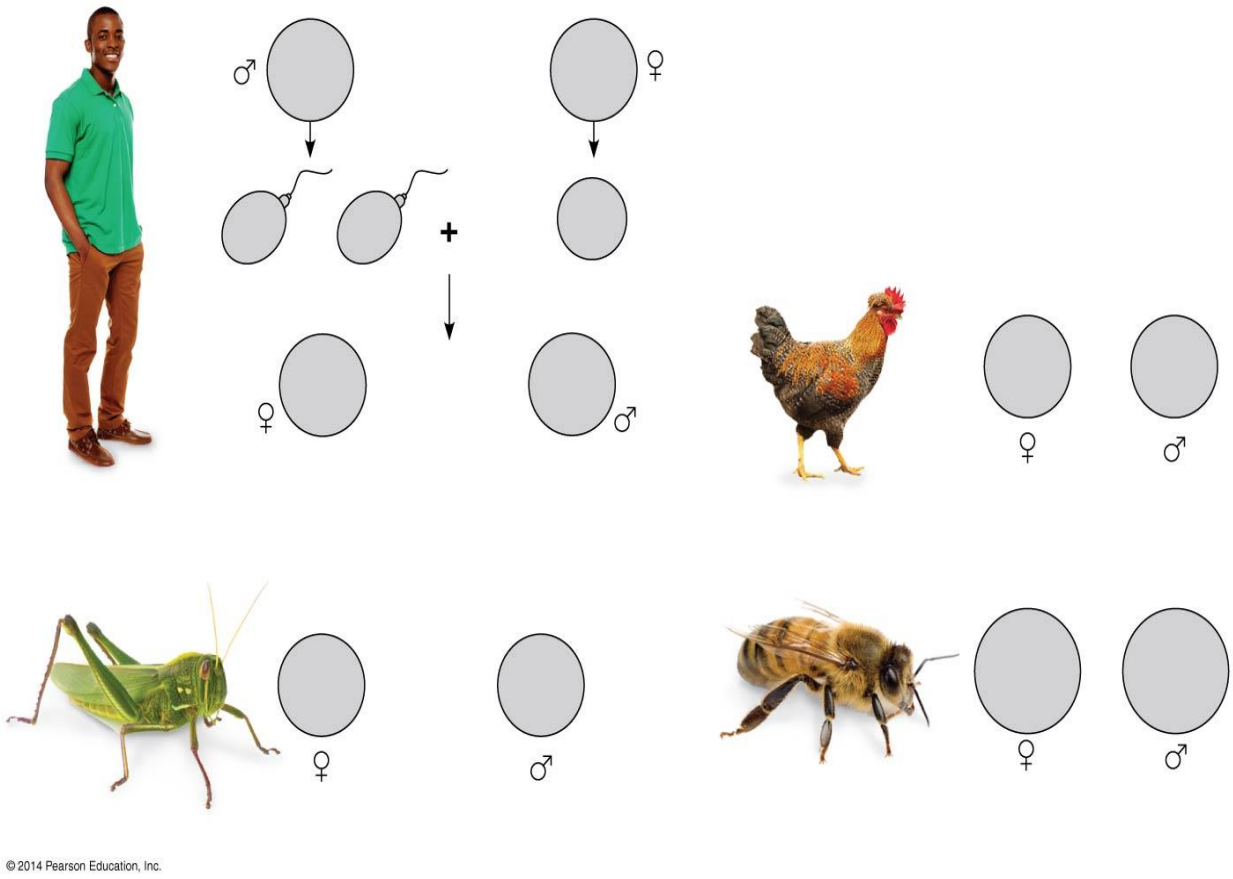
   parental generation

   F_1 generation

   F_2 generation

7. What unusual result suggested that the eye-color trait located on the X chromosome?

8. There are several variations in the way sex is determined in different species. Complete the following figure to explain four different methods of sex determination.



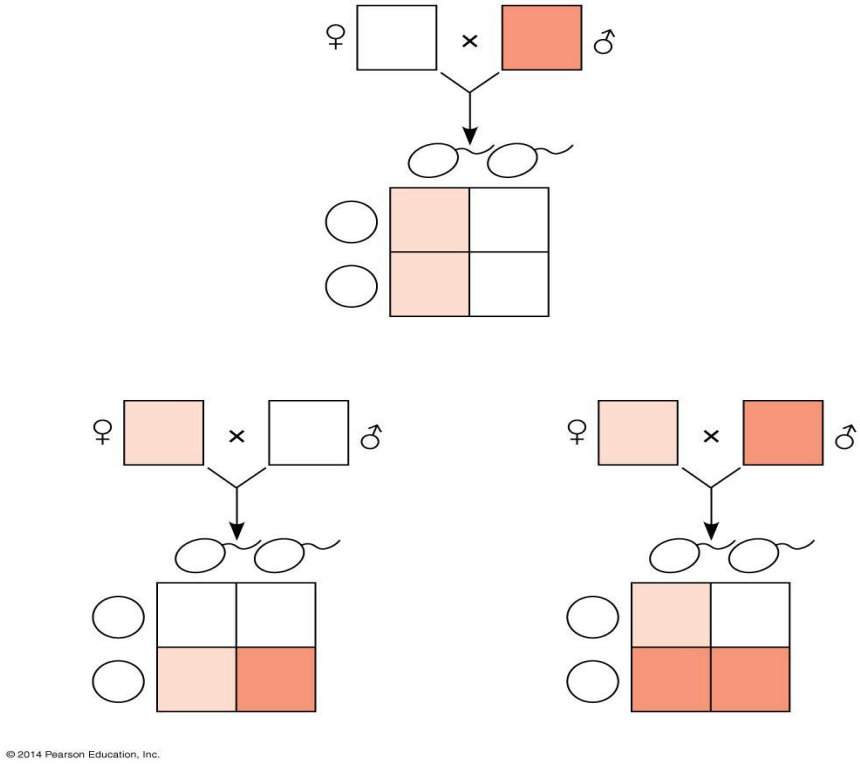
9. What is the SRY gene? Where is it found, and what does it do?

10. What is the definition of a *sex-linked gene*?

11. In humans, how has the term *sex-linked gene* been historically modified?

12. Name and describe three human sex-linked disorder.

13. 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? How would your answer be different if the question asked the probability of a child who would be color-blind?



14. What us a *Barr body?* Why do human females show a Barr body in their cells?

15. X inactivation maintains the proper gene dosage. How is the X chromosome inactivated?

16. Why can you say that all calico cats are females?

17. What are *linked genes?* Do you think genes sort independently?

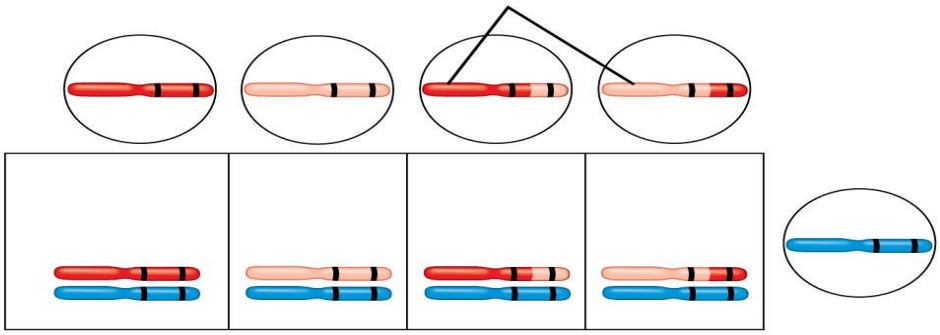
18. If two genes are linked on the same chromosome, we call this combination the *parental combination*. These genes will be transmitted as a unit and will not sort independently. However, during meiosis, *crossing over* occurs between homologous chromosomes, and the linked genes can become "unlinked." 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?

19. Review meiosis. When does crossing over occur?

20. *Alfred H. Sturtevant,* a student of Thomas Hunt Morgan, used assumptions from observations of crossovers to map genes. What is a *linkage map*?

21. What is a *map unit?*

22. Figure 15.10 in your text shows the results of a cross between a fruit fly that is heterozygous for 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 work.



23. What occurs in *nondisjunction?*

24. Explain each of the following terms: (note the percentage of aneuploidy human conceptions!)
Aneuploidy

Monosomy

Trisomy

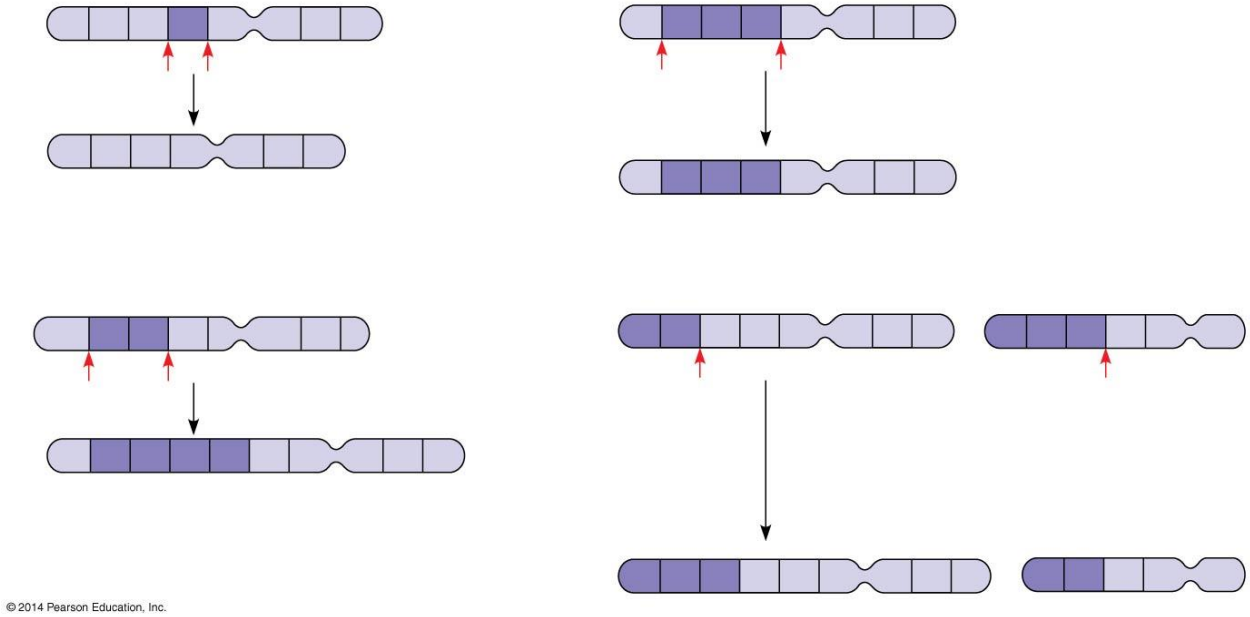
Polyploidy

25. What causes *Down syndrome?* What are four characteristics of Down syndrome?

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

	Sex	Physical Traits
XXY		
XXX		
XO		
XYY		

27. Chromosome structure can be altered in several ways. Place letters in the blocks to represent genes, and then explain what occurs in each type of alteration.



28. A number of genes will cause a variation in phenotype, depending on whether the gene came from the father or the mother. This variation occurs because of *genomic imprinting.* Explain genomic imprinting.

29. Although you inherited one chromosome of each pair from your mother and your father, you have inherited a group of genes from your mother only. What genes are these?

30. What other organelle has its own genes? These are *extranuclear* genes.