Name_____ Class_____ Date _____

Section 14–2 Human Chromosomes (pages 349–353)

Key Concepts

- Why are sex-linked disorders more common in males than in females?
- What is nondisjunction, and what problems does it cause?

Human Genes and Chromosomes (page 349)

1. Circle the letter of each sentence that is true about human genes and chromosomes.
   a. Chromosomes 21 and 22 are the largest human chromosomes.
   b. Chromosome 22 contains long stretches of repetitive DNA that do not code for proteins.
   c. Biologists know everything about how the arrangements of genes on chromosomes affect gene expression.
   d. Human genes located close together on the same chromosome tend to be inherited together.

Sex-Linked Genes (pages 350–351)

2. What are sex-linked genes? _____

_____

3. Is the following sentence true or false? The Y chromosome does not contain any genes at all. _____

4. Complete the table describing sex-linked disorders.

SEX-LINKED DISORDERS IN HUMANS

Disorder	Description	Cause
Colorblindness		
		A recessive allele in either of two genes resulting in a missing protein required for normal blood clotting
		A defective version of the gene that codes for a muscle protein

5. Is the following sentence true or false? All X-linked alleles are expressed in males, even if they are recessive. _____

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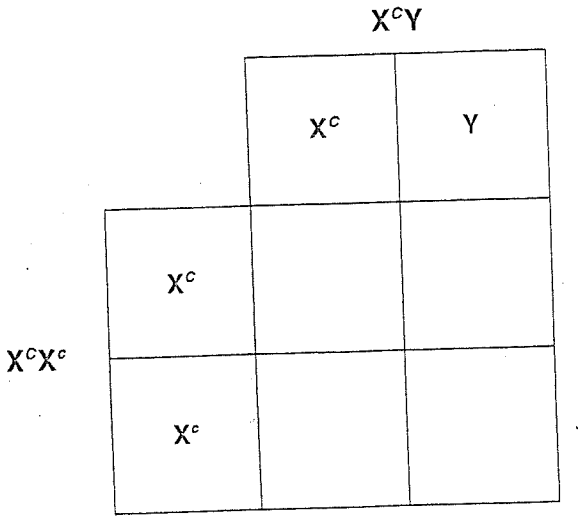
6. Complete the Punnett square to show how colorblindness is inherited.



Chromosomal Disorders (pages 352–353)

11. What occurs during nondisjunction? _____

_____

_____

12. Is the following sentence true or false? If nondisjunction occurs, gametes may have abnormal numbers of chromosomes. _____

13. The condition in which an individual has three copies of a chromosome is known as _____, which means "three bodies."

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14. Is the following sentence true or false? Down syndrome occurs when an individual has two copies of chromosome 21. _____

15. Circle the letter of the characteristic of Down syndrome.

a. dwarfism
c. colorblindness
b. mental retardation
d. muscle loss

16. Why does an extra copy of one chromosome cause so much trouble? _____

_____

_____

17. Circle the letter of each sentence that is true about sex chromosome disorders.

a. A female with the karyotype 45,X has inherited only one X chromosome and is sterile.
b. Females with the karyotype 47,XXY have Klinefelter's syndrome.
c. Babies have been born without an X chromosome.
d. The Y chromosome contains a sex-determining region that is necessary for male sexual development.

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Section 11-2 The Inheritance of Human Traits (pages 230–234)

SECTION REVIEW

In this section, you examined the inheritance of several specific human traits. First, you studied how ABO and Rh blood groups are inherited. ABO blood groups, which are of particular importance in blood transfusions, are determined by multiple alleles. Two alleles, I^A and I^B, are codominant. One allele, *i*, is recessive. Rh blood groups are determined by a dominant Rh positive allele and a recessive Rh negative allele. Next, you learned about Huntington disease, which is caused by a dominant allele. You then learned about sickle cell anemia, which is caused by codominant alleles: one for normal hemoglobin and one for sickle cell hemoglobin. Sickle cell hemoglobin crystallizes when oxygen is in short supply, causing red blood cells to become sickle-shaped and rigid. The sickle-shaped blood cells tend to become stuck in capillaries, blocking the flow of blood and thus damaging cells and tissues. Finally, you read about polygenic traits in humans. Polygenic traits include height and skin color.

ABO Blood Groups: Using the Main Ideas

Use the space provided to the side of the following genetics problems to draw Punnett squares to help you solve the problems.

1. A man with type O blood and a woman with type AB blood get married.

   a. What is the probability that they will have a child with type A blood? _____

   b. Suppose that one of the couple's children needs an operation. This child has type B blood. Can the child safely receive a blood transfusion from either parent? Explain. _____

2. Vincent has type A blood and his mother has type O blood. Christine has type B blood and her father has type O blood.

   a. What is Vincent's genotype? _____

   b. What is Christine's genotype? _____

c. What genotype(s) might Christine's mother have? _____

_____

_____

d. Suppose Vincent and Christine get married. What is the probable phenotypic ratio for their offspring? _____

_____

_____

e. What is the probable genotypic ratio for their offspring? _____

_____

Genetic Disorders: Applying the Main Ideas

In the space provided to the side of each of the following genetics problems, draw a Punnett square to help you solve the problem. Then answer the questions.

1. The allele for normal hemoglobin can be represented as H^A. The allele for the sickle cell hemoglobin can be represented as H^S.

   a. What type of gene interaction is involved in sickle cell anemia? _____

   _____

   Consider the offspring of two people who both have the genotype H^AH^S.

   b. What percentage of their offspring are likely to be sickle cell sufferers? _____

   c. What percentage of their offspring are likely to be resistant to malaria and suffer few effects of the disease? _____

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2. **a.** How is Huntington disease inherited?

_____

_____

b. What is the probability that an individual who has one parent with Huntington disease will also have the disease? (Assume the other parent does not have the disease.) _____

3. Phenylketonuria (PKU) is a genetic disease in which the body cannot safely break down the amino acid phenylalanine. If untreated, PKU causes severe brain damage. To avoid this, people with PKU must eat a special diet low in phenylalanine.

Two people who have normal phenotypes have a child. A blood test at birth shows that the child has PKU.

a. How is PKU inherited? Explain. _____

_____

_____

_____

b. What is the probability that this couple's next child will have PKU? _____

c. What is the probability that this couple's next child will be homozygous for the normal allele?

_____

4. Achondroplasia, a form of dwarfism, is caused by the dominant allele *A*. Embryos with the genotype *AA* do not survive. Suppose that two people with achondroplasia get married and have children.

a. What phenotypic ratio would you probably observe in the couple's children?

_____

_____

_____

_____

_____

_____

b. One of this couple's children, who has a normal phenotype, marries a person who also has a normal phenotype. What percentage of the children from this marriage are likely to have achondroplasia? Explain. _____

_____

_____

_____

_____

_____

5. The disease cystic fibrosis is caused by the recessive allele *n*.

   a. What percentage of the children of a couple with genotypes *NN* and *Nn* will probably have cystic fibrosis? Explain.

_____

_____

_____

_____

   b. What are the phenotypic and genotypic ratios for the offspring of two people who both have the genotype *Nn*?

_____

_____

_____

_____

_____

Concept Mapping

The construction of and theory behind concept mapping are discussed on pages vii–ix in the front of this Study Guide. Read those pages carefully. Then consider the concepts presented in Section 11–2 and how you would organize them into a concept map. Now look at the concept map for Chapter 11 on page 115. Notice that the concept map has been started for you. Add the key facts and concepts you feel are important for Section 11–2. When you have finished the chapter, you will have a completed concept map.