

Inheritance

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End of Chapter Questions

Simple Review Questions

6.1 How Cells Reproduce

1. What are the stages of the cell cycle? What happens during synthesis (S)?

2. Describe the phases of mitosis.

3. What are the end products of mitosis?

6.2 Cell Division and Genetic Diversity

4. What is crossing over? Why is crossing over important to genetic diversity?



5. What are the products of meiosis?

6.3 Traits and Inheritance

6. What is the difference between a dominant trait and a recessive trait?

6.4 Mendel's First Law of Inheritance

7. When Mendel bred pea plants that differed in a single trait, what did he see in the offspring? When Mendel allowed these offspring to self-fertilize, what did he see?

6.5 Mendel's Second Law of Inheritance

8. What does Mendel's Second Law of Inheritance say?

6.6 Beyond Mendelian Inheritance

9. What is codominance? Provide an example of codominance.



10. What is a polygenic trait? Provide at least one example of a polygenic trait.

11. What is pleiotropy?

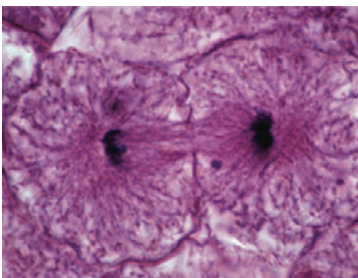
(CLICK TO CHECK YOUR ANSWERS)

Challenging Review Questions

6.1 How Cells Reproduce

12. Imagine that a cell goes through all the stages in the cell cycle, except that cytokinesis doesn't happen. How will that cell be different from normal cells?

13. The figure below shows a cell in the process of cell division. Which stage of the cell cycle does it show?



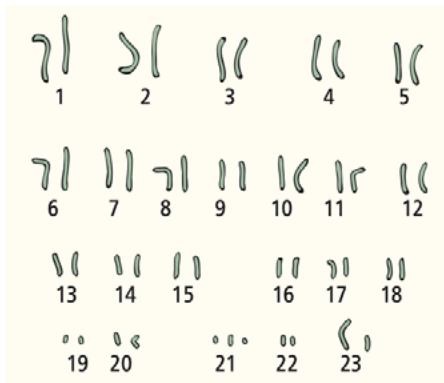
6.2 Cell Division and Genetic Diversity

14. How can the same two parents produce children that are all different?



15. Describe three differences between mitosis and meiosis.

16. The figure below shows a set of human chromosomes. What is unusual about this person's genetic makeup? How does a problem during meiosis relate to this condition? What health issues might this person suffer from?



6.3 Traits and Inheritance

17. Some fruit flies have straight wings, whereas others have curly wings. A fruit fly biologist takes a line of curly-winged flies that breeds true and a line of straight-winged flies that breed true. She then performs a cross, mating a curly-winged fly with a straight-winged fly. She finds that all the offspring have curly wings. Is the curly-wing trait dominant or recessive.

6.4 Mendel's First Law of Inheritance

18. Explain how a trait can skip generations.

19. If you have dimples, will all your children have dimples? (Remember that "dimples" is a dominant trait.)



20. Is it possible for two parents with widow's peaks to have a child who has a straight hairline? Is it possible for two parents with straight hairlines to have a child with a widow's peak? (Remember that a widow's peak hairline is dominant, and a straight hairline is recessive.)

6.5 Mendel's Second Law of Inheritance

21. Suppose that you repeat Mendel's breeding experiments. First, you breed plants with round yellow peas ($RRYY$) to plants with wrinkled green peas ($rryy$) to obtain $RrYy$ pea plants. Then, you cross the $RrYy$ plants with themselves and collect the resulting peas. You find only 3 wrinkled green peas. About how many wrinkled yellow peas should you expect? What about round green peas? What about round yellow peas?

6.6 Beyond Mendelian Inheritance

22. Can you tell what alleles a pea plant with round seeds has? Can you tell what alleles a red snapdragon has? Why are your answers different?

23. You need a blood transfusion, but you don't know your blood type. Which type of blood should you be given? Does this explain why people with type O blood are called universal donors?

24. Universal receivers are people who can safely receive any blood type during a blood transfusion. Which blood type do universal receivers have? Explain your answer.



25. Why are there more color-blind men than color-blind women?

(CLICK TO CHECK YOUR ANSWERS)

Apply & Discuss Questions

26. Does the process of meiosis explain Mendel's two laws: the principle of segregation and the principle of independent assortment?

27. In the case of linked genes, explain why two genes are more likely to be inherited together the closer together they are on a chromosome.

28. You learned that when red snapdragons are bred with white snapdragons, the offspring are pink snapdragons—an example of incomplete dominance. What happens when you breed a pink snapdragon with another pink snapdragon?

(CLICK TO CHECK YOUR ANSWERS)



End of Chapter Solutions

Simple Review Solutions

1. The cell cycle is divided into four stages—gap 1, synthesis, gap 2, and mitosis and cytokinesis. During synthesis (S), the cell creates an exact copy of its genetic material—its DNA.
3. The end products of mitosis are two daughter cells, each of which contains the same genetic information as the parent cell.
5. In meiosis, one diploid cell, with two of each kind of chromosome, divides into four haploid cells, each with only one of each kind of chromosome.
7. Mendel found that when he bred two plants that differed in a single trait, all of the offspring resembled one of the two parents. Then, Mendel bred the offspring with themselves. Mendel was surprised to find that the recessive trait, which had disappeared in the first generation, reappeared in the second generation. Moreover, in the second generation, the ratio of plants expressing the dominant trait to plants expressing the recessive trait was 3:1—that is, there were three times as many plants expressing the dominant trait as there were plants expressing the recessive trait.
9. In codominance, there are two alleles, and the heterozygote expresses the traits of both alleles. An example can be found in human blood type. Your blood type describes molecules on the surface of your red blood cells. You can have the A molecule (blood type A), the B molecule (blood type B), neither (blood type O), or both (blood type AB). There are three blood type alleles: A, B, and O. A person with genotype AA or AO has A molecules (blood type A). A person with genotype BB or BO has B molecules (blood type B). A person with genotype OO has neither molecule (blood type O). A person with genotype AB has both A and B molecules (blood type AB)—both the A trait and the B trait are expressed. The A and B alleles are codominant.
11. In pleiotropy, a single gene affects more than one trait.

Challenging Review Solutions

13. Since it is dividing, the cell is in mitosis.
15. The key differences between mitosis and meiosis include: (1) Mitosis produces two cells. Meiosis produces four cells. (2) Mitosis produces diploid cells. Meiosis produces haploid cells. (3) The cells produced by mitosis are identical to one another and to the original cell. The cells produced by meiosis are all different.
17. Since all the offspring of the cross have curly wings, the curly-wing trait is dominant.
19. Not necessarily. You may be a heterozygote with genotype *Dd*. You may pass a *d* allele to your child. If your child also receives a *d* allele from your spouse, he or she will have no dimples.
21. In this cross, you expect to obtain round yellow:round green:wrinkled yellow:wrinkled green peas in a ratio of 9:3:3:1. So, if you find 3 wrinkled green peas, you expect to find three times as many wrinkled yellow peas—so, about 9. You also expect to find three times as many round green peas—again, about 9. You expect to find nine times as many round yellow peas, so about 27.



23. Anyone can receive type O blood, so this is the type they should give you. The red blood cells in Type O blood have neither A nor B molecules that could cause the cells to be rejected and attacked. This is why people with type O blood are called universal donors—they can donate blood to anyone.

25. Colorblindness is a recessive sex-linked trait. These traits affect more males than females because males have only one X chromosome. Males are affected if they have only one recessive allele, whereas females are only affected if both their alleles are recessive.

Apply & Discuss Solutions

27. Genes that are on the same chromosome will be inherited together unless crossing over occurs at a point between their two locations. The closer two alleles are on a chromosome, the less likely it will be for crossing over to occur between them.



