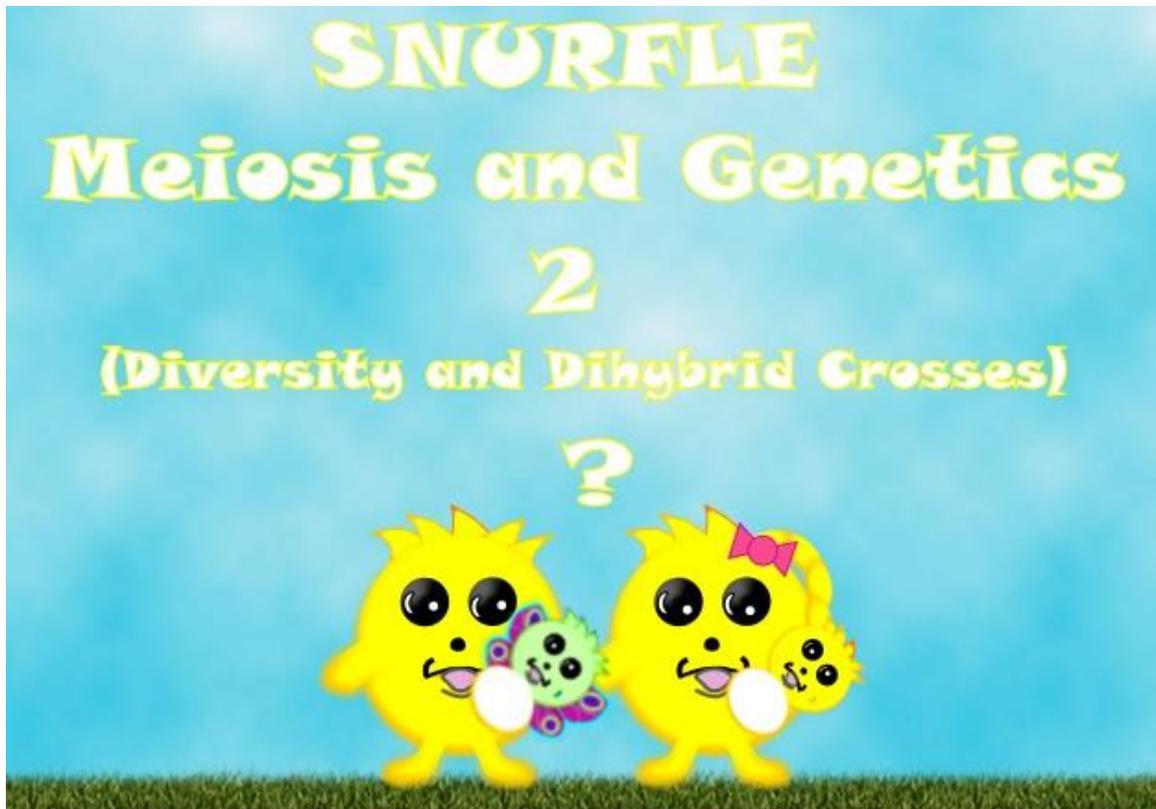


Inquiry Question

Think about all the different ways siblings can vary from each other. How does sexual reproduction result in such diversity?

Name: _____ Date: _____



As a result of sexual reproduction, offspring can end up with a lot of different traits and this produces a lot of diversity in a species. How does meiosis result in such a great amount of diversity?

In this project you will be using an interactive web-based activity that will illustrate the processes involved during meiosis: crossing over, independent assortment, and random fertilization. You will see how these random processes result in increased diversity in the offspring.

You will also learn how to do a dihybrid cross to predict traits of potential offspring. A dihybrid cross is a genetic cross that looks at 2 genes in particular and the possibilities of how they can be combined.

General Instructions

The goal of this project is to use animated characters to build on your understanding of meiosis and how diversity is achieved through sexual reproduction.

Materials you'll need:

- internet
- project worksheet on the following page

Ideas and Hints:

- As an extension to what you have just learned about meiosis in the course notes, do the Snurfle Meiosis and Genetics website activity. Click [HERE](#) for the website to use or download the free app from the Apple app store.
- Answer all of the questions in the project worksheet as you go through the website activity.

Project submission:

Once you have completed the worksheet for this project, upload it to the Biology project drop-box.

Snurfle Meiosis & Genetics 2: Diversity & Dihybrid Crosses

<http://biomanbio.com/GamesandLabs/Genegames/snurflemeiosis2diversity.html>

OR download the free app in the Apple App Store.

In each of these simulations, 4 chromosomes are shown ($2n = 4$).

Once you start the game, click on "Crossing Over!" If you need a review of the basics of meiosis, go to the tutorial. Otherwise, click "Ok" at the bottom of the page.

1. How many cells do you have at the end of Meiosis I? Are these cells $2n$ or $1n$?
2. How many cells do you have at the end of Meiosis II? Are these cells $2n$ or $1n$?
3. How many possible kinds of gametes are produced when there is NO crossing over?
4. Why does the scenario with no crossing over reduce diversity?
5. Genes that are on the same chromosome and are inherited together are referred to as what?
6. When does crossing over occur?
7. Describe the process of crossing over (as shown in the animation).
8. Why does crossing over create more variety in possible gametes?
9. How many different gametes were produced?
10. Crossing over is sometimes called _____ because linked genes (that are normally passed on together) get mixed up! This forms _____ chromosomes. Gametes with these are called _____ gametes.
11. Does crossing over occur every time meiosis happens? Explain your answer.
12. Is there only one way that genes can be recombined? Explain your answer.

Go back to the home screen. Click on "Independent Assortment."

13. What does independent assortment refer to?
14. How do chromosomes line up during metaphase I? Why is this important?
15. It is important to note that the way one pair lines up _____ affect the way that any other pair lines up. The way each chromosome lines up is _____!
16. During the process of meiosis, the chromosomes lined up on the left will go to _____ cells than the chromosomes lined up on the right.

This affects _____

17. How many different possibilities are shown for how the chromosomes can sort (keep in mind that this number can be higher as you increase the number of chromosomes in a cell)?
18. How many different combinations can be formed from EACH independently assorted cell at the end of meiosis I?
19. How many different combinations can be formed TOTAL (use math to figure this out) from meiosis I?
20. Independent assortment can also occur during _____, specifically during _____.
21. Each chromosome can orient _____ different ways in metaphase II.
22. In independent assortment during metaphase II, the _____ of each chromosome independently assort. The alignment of sister chromatids for one chromosome does NOT affect the alignment of sister chromatids of the other chromosomes.

Go back to the home screen. Click on "Random Fertilization."

23. The process of an egg from a female and sperm from a male uniting to make offspring is known as _____.
24. Fertilization is _____ or a chance event.
25. In human beings, there are _____ of possible sperm and _____ of possible eggs that each person can produce during meiosis (due to _____ and _____)! This means that for any two individuals that have a baby together, there are _____ of possible genetic combinations.
26. A genetic cross that looks at 2 genes is known as a _____.
27. What is 'FOIL' and how is it used to help determine the gametes that can be produced by a cell?
28. What is a genotype?
29. What is a phenotype?