Do

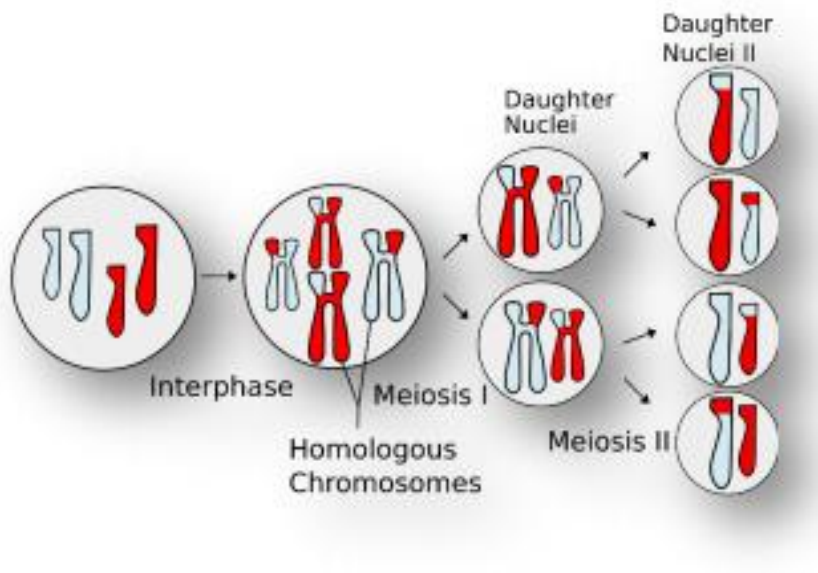
Meiosis

Activity

The purpose of meiosis, a cell division process, is to create gametes with genetic variability for use in sexual reproduction. These gametes, or the sperm and egg, are then used in the process of fertilization to create a zygote.

Procedure Part I:

Take time to observe the image of meiosis below. In the space below, record your observations about this process.



Observations:

-
-
-
-
-

Meiosis

Activity, continued

Part I: The Process of Meiosis

Meiosis is a type of cell division that only takes place in the gametes, or sex cells, and is the process that makes sexual reproduction possible. The purpose of meiosis is to provide genetic diversity in the offspring and to reduce the number of chromosomes in each sex cell from diploid to haploid (a haploid has only one set of each chromosome).

Just like with mitosis, the chromosomes must replicate before meiosis can take place. This process takes place during interphase, and makes sure that each chromosome is composed of two sister chromatids held together by a centromere. The cells spend the majority of their life in this stage. Besides DNA replication, the cell is also growing in size, synthesizing proteins, and going through various check points to make sure that there have not been any errors, or mutations, in the replication process.

Meiosis is different from mitosis because there are two cell divisions that create 4 daughter cells instead of just 2. The reason for this is to make sure that each daughter cell is a haploid *(n)*. In normal somatic cells, or the body cells, a human has 23 sets of chromosomes or 46 chromosomes in total. Each set of homologous chromosomes contains one chromosome from the father and one from the mother. These cells are considered diploid *(2n)*. However, because of the two cell divisions during meiosis, each daughter cell would only contain 23 total chromosomes because they are no longer paired up in sets. The purpose of this is so that during fertilization, or the fusion of the sperm and egg, a diploid zygote is formed with the correct number of chromosomes. If meiosis does not separate the chromosomes correctly, this can cause many different developmental problems for the growing fetus.

Meiosis I:

During the first cell division, or meiosis I, the homologous chromosomes pair up and exchange sections of their chromosomes. This process is called crossing over and is one of the main reason that there is so much genetic diversity between the parents, offspring, and siblings. Crossing over makes sure that none of the chromosomes present in the daughter cells are identical to each other.

After crossing over takes place, the homologous sets of chromosomes are pulled to the opposite poles of their cells. Meiosis I ends with a cell division that creates two cells, each containing a replicated chromosome still held together by a centromere. However, the two homologous chromosomes are now separated into two different cells.

Variation of Traits

Meiosis

Activity, continued

Meiosis II:

During meiosis II, the cell will complete a second round of cell division to the two cells that were produced during meiosis I. However, during meiosis II, there is no crossing over that takes place and the replicated sister chromatids are now separated. After meiosis II, 4 haploid (*n)* daughter cells are produced, each containing only one of each type of chromosome.

Part I: The Process of Meiosis, continued

1. Why is it important for the DNA in a cell to be completely replicated prior to meiosis?

   _____
   _____
   _____

2. Why do siblings look different even though they have the same parents?

   _____
   _____
   _____

3. Hypothesize the possible outcomes if a diploid sperm fertilized an egg.

   _____
   _____
   _____

4. The skin cell of a mouse has 40 chromosomes. How many chromosomes would the egg cell of that mouse have? How do you know this?

   _____
   _____
   _____

5. A dog has 39 chromosomes in the sperm cells. How many chromosomes would a dog's zygote contain? How do you know this?

   _____
   _____
   _____

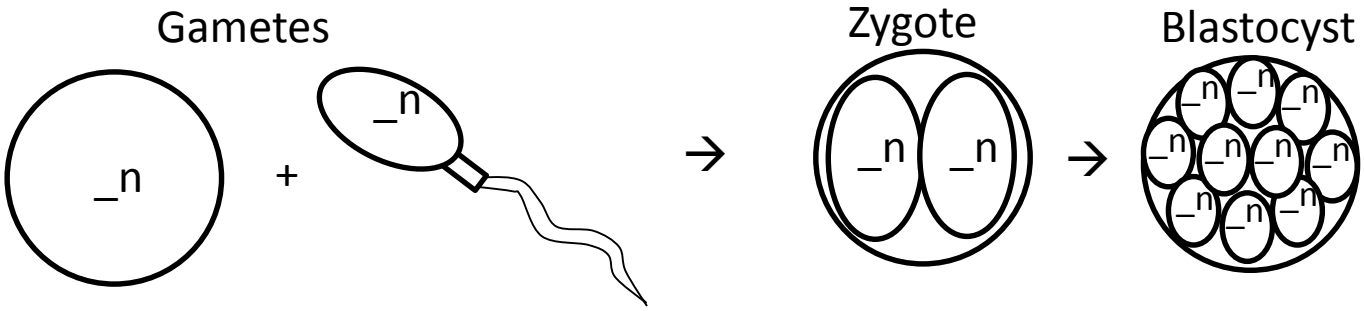
Variation of Traits

Meiosis

Activity, continued

Part I: The Process of Meiosis, continued

6. Use what you learned about the purpose of meiosis to fill in the ploidy (haploid *(n)* or diploid (*2n)*) for each of the following cells below.



7. What process is occurring between the gametes above to create the zygote?

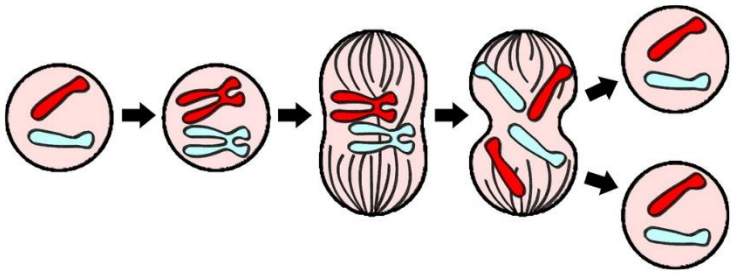
_____

_____

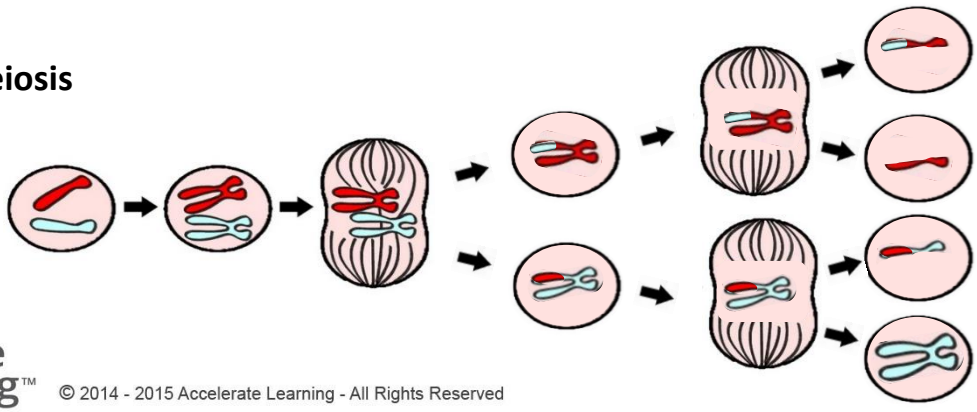
Part II: Comparing Mitosis and Meiosis

Using what you have learned about mitosis from previous lessons and meiosis from this lesson, complete the table below comparing the two processes.

Mitosis



Meiosis



Variation of Traits

Meiosis

Activity, continued

	Mitosis	Meiosis
Sexual or asexual reproduction?		
Does chromosomal replication take place before division?		
How many cell divisions?		
Starts haploid or diploid?		
Ends haploid or diploid?		
Creates genetically identical or different daughter cells?		
How many daughter cells are created?		