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Date _____

Professor/TA _____



Activity 13.1 What is meiosis?

What is meiosis?

1. What is the overall purpose of meiosis?
2. In what types of organism(s) and cells does meiosis occur?

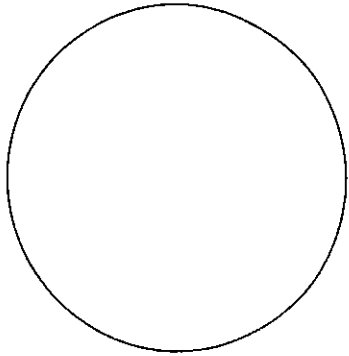
What are the stages of meiosis?



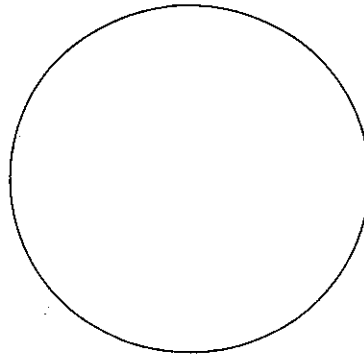
3. The fruit fly, *Drosophila melanogaster*, has a total of eight chromosomes (four pairs) in each of its somatic cells. Somatic cells are all cells of the body except those that will divide to form the gametes (ova or sperm). Review the events that occur in the various stages of meiosis.

Keep in mind that the stages of cell division were first recognized from an examination of fixed slides of tissues undergoing division. On fixed slides, cells are captured or frozen at particular points in the division cycle. Using these static slides, early microscopists identified specific arrangements or patterns of chromosomes that occurred at various stages of the cycle and gave these stages names (interphase, prophase I, and so on). Later work using time-lapse photography made it clear that meiosis is a continuous process. Once division begins, the chromosomes move fluidly from one phase to the next.

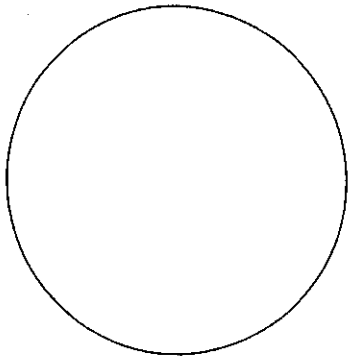
Assume you are a microscopist viewing fruit fly cells that are undergoing meiosis. Within each of the circles (which represent cell membranes) on the next pages, draw what you would expect to see if you were looking at a cell in the stage of meiosis indicated. If no circle is present, draw what you would expect to see at the given stage.



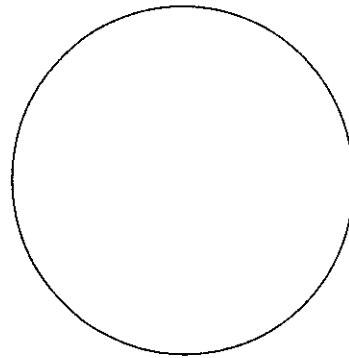
Prophase I



Metaphase I



Anaphase I



Telophase I

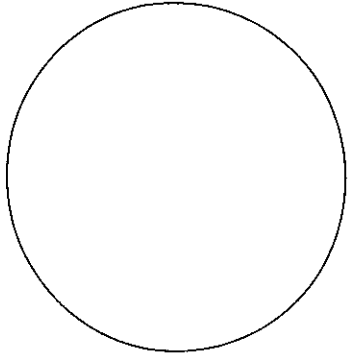
Cytokinesis

Daughter cells

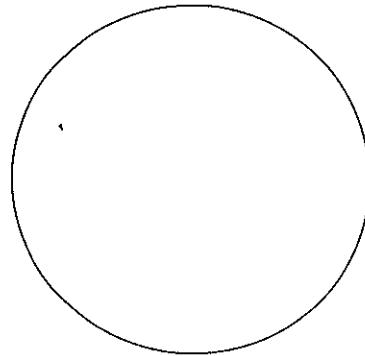
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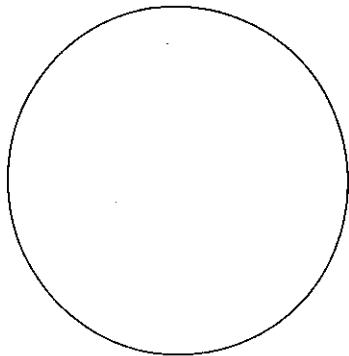
Follow one daughter cell through meiosis II.



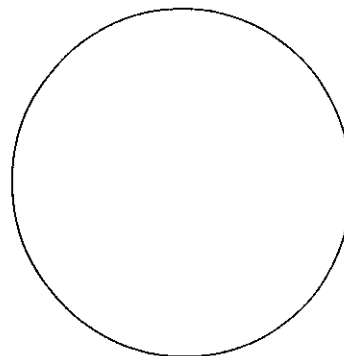
Prophase II



Metaphase II



Anaphase II



Telophase II

Cytokinesis

Daughter cells

What are the products of meiosis?

4. Consider a single cell going through meiosis.
 - a. How many cells are produced at the end of meiosis?
 - b. How many chromosomes, and which chromosomes, does each of the daughter cells contain?

5. Six centromeres are observed in a prophase I cell from another species of insect.
 - a. How many pairs of chromosomes does this organism contain?
 - b. For each stage of meiosis, indicate the number of centromeres you would expect to find and the number of copies of chromosomes attached to each centromere.

Stage of meiosis:	Number of centromeres visible per cell	Number of chromosome copies attached to each centromere
Anaphase I		
Prophase II		

13.1 Test Your Understanding

Nondisjunction of sex chromosomes during human gamete formation may lead to individuals with sex chromosome trisomy. An individual with the sex chromosome trisomy of XXY may have resulted from nondisjunction occurring in (circle T if true, F if false):

- T/F 1. meiosis I in the father's sperm production
- T/F 2. meiosis II in the father's sperm production
- T/F 3. meiosis I in the mother's egg production
- T/F 4. meiosis II in the mother's egg production

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Activity 13.2 How do mitosis and meiosis differ?

Review the processes of mitosis and meiosis in Chapters 12 and 13 of *Biology*, 8th edition, then fill in the chart. Keep in mind that the stages of cell division were first recognized from an examination of fixed slides of tissues undergoing division. On fixed slides, cells are captured or frozen at particular points in the division cycle. Using these static slides, early microscopists identified specific arrangements or patterns of chromosomes that occurred at various stages of the cycle and gave these stages names (interphase, prophase, and so on). Later work using time-lapse photography made it clear that mitosis and meiosis are continuous processes. Once division begins, the chromosomes move fluidly from one phase to the next.

1. What events occur during each phase of mitosis and meiosis?

	Interphase	Prophase	Metaphase	Anaphase	Telophase and cytokinesis
Mitosis	For example: <i>G₁—cell growth</i> <i>S—DNA duplication</i> <i>G₂—cell growth</i>		For example: <i>Duplicated chromosomes, each with two sister chromatids, line up independently on the metaphase plate.</i>		
Meiosis I					
Meiosis II					

2. Fill in the chart to summarize the major similarities and differences in the two types of cell division (mitosis vs. meiosis). For similarities, include the event(s) that always happen(s) at that stage, no matter which of the cell division cycles you're describing.

	Interphase	Prophase	Metaphase	Anaphase	Telophase
a. What similarities do you see?					
b. What differences do you see?					
c. If the amount of DNA in a somatic cell equals C during G_1 of interphase, how much DNA is present in the cell during each of the phases of mitosis and meiosis?					
Amount of DNA in:	Interphase	Prophase	Metaphase	Anaphase	Telophase
Mitosis					
Meiosis I					
Meiosis II					

