

Lesson Title: *Meiosis Flip Book*

I. Identification

Course title: *Biology/Life Science*

Teaching unit: *"Meiosis: The Steps to Creating Life"*

CDE Standards Addressed: *Biology/Life Sciences*

- a. *Students know meiosis is an early step in sexual reproduction in which the pairs of chromosomes separate and segregate randomly during cell division to produce gametes containing one chromosome of each type.*
- b. *Students know only certain cells in a multicellular organism undergo meiosis.*
- c. *Students know how random chromosome segregation explains the probability that a particular allele will be in a gamete.*
- d. *Students know new combinations of alleles may be generated in a zygote through the fusion of male and female gametes (fertilization).*
- e. *Students know why approximately half of an individual's DNA sequence comes from each parent.*
- f. *Students know the role of chromosomes in determining an individual's sex.*
- g. *Students know how to predict possible combinations of alleles in a zygote from the genetic makeup of the parents.*

Lesson number in this unit: #2

Length (time): *one class period*

II. Specific Instructional Objective(s): *Upon completion of this lesson student should be able to:*

- *Analyze how Meiosis maintains a constant number of chromosomes within a species.*
- *Infer how Meiosis leads to variation within a species.*
- *Relate Mendel's laws of heredity to the events of Meiosis.*
- *Describe the process of fertilization in living organisms.*
- *Discuss the transmission of genes through meiotic division to form sperm and ova*
- *Define the terms phenotype, genotype, haploid, diploid, homozygous, heterozygous, segregation, and homologous and use them correctly in discussing meiosis and the genetic makeup of organisms.*

III. Equipment, materials, supplies, books, resources needed for this lesson (attach handouts):

- *BrainPOP – Online Science Video*
<http://www.brainpop.com/science/cellularlifeandgenetics/heredity/>
- *Meiosis Flip Book Project Rubric*
- *Meiosis Flip Book Project Handouts*

IV. Academic Vocabulary:

- *Prophase*
- *Metaphase*
- *Anaphase*
- *Telophase*

V. Teaching procedures:

- a. **Anticipatory set:** *Good morning everyone! Today we are going to be taking our newly found knowledge about Meiosis and the roles it plays in sexual reproduction, and we are going to organize it in our very own "Meiosis Flip Book". Before we get started we are going to watch a short video on Heredity. (Show "BrainPOP" video).*
- b. **Stated objective(s):** *You be making your very own "Meiosis Flip Book" by taking the information you have acquired in this class (obtained directly from your notes & book) and combining it with the best thing about picture books – the pictures!!! In doing this, you will create an illustrated picture book that can be used to teach other people about Meiosis. You will have two days to complete this project as it will be due the day of the Meiosis Quiz.*
- c. **Purpose:** *To gain a visual understanding of Meiosis and the many phases it plays in sexual reproduction.*
- d. **Input (presentation):**

Subject Matter (outlined)

Teaching Methods

<p>Prophase I</p> <ol style="list-style-type: none"> 1. <i>The chromosomes coil up and a spindle forms.</i> 2. <i>As the chromosomes coil, homologous chromosomes line up with each other gene by gene along their length, to form a four-part structure called a tetrad.</i> 3. <i>The chromatids in a tetrad pair tightly.</i> 4. <i>In fact, they pair so tightly that non-sister chromatids from homologous chromosomes can actually break and exchange genetic material in a process known as crossing over.</i> 5. <i>Crossing over can occur at any location on a chromosome, and it can occur at several locations at the same time.</i> 6. <i>It is estimated that during prophase I of meiosis in humans, there is an average of two to three crossovers for each pair of homologous chromosomes.</i> 7. <i>Crossing over results in new combinations of alleles on a chromosome.</i> <p>Metaphase I</p> <ol style="list-style-type: none"> 1. <i>During metaphase I, the centromere of each chromosome becomes attached to a spindle fiber.</i> 2. <i>The spindle fibers pull the tetrads into the middle, or equator, of the spindle.</i> <p>Anaphase I</p> <ol style="list-style-type: none"> 1. <i>Anaphase I begins as homologous chromosomes, each with its two chromatids, separate and move to opposite ends of the cell.</i> 2. <i>This critical step ensures that each new cell will receive only one chromosome from each homologous pair.</i> <p>Telophase I</p> <ol style="list-style-type: none"> 1. <i>Events occur in the reverse order from the events of prophase I.</i> 2. <i>The spindle is broken down, the chromosomes uncoil, and the cytoplasm divides to yield two new cells.</i> 3. <i>Each cell has half the genetic information of the original cell</i> 	<p><i>Review the phases of Meiosis with students. Revisit any areas that students are having trouble understanding.</i></p>
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because it has only one chromosome from each homologous pair.

The Phases of Meiosis II

- 1. The second division in meiosis is simply a mitotic division of the products of meiosis I.*
- 2. Meiosis II consists of prophase II, metaphase II, anaphase II, and telophase II.*
- 3. During prophase II, a spindle forms in each of the two new cells and the spindle fibers attach to the chromosomes.*
- 4. The chromosomes, still made up of sister chromatids, are pulled to the center of the cell and line up randomly at the equator during metaphase II.*
- 5. Anaphase II begins as the centromere of each chromosome splits, allowing the sister chromatids to separate and move to opposite poles.*
- 6. Finally nuclei reform, the spindles break down, and the cytoplasm divides during telophase II.*
- 7. At the end of meiosis II, four haploid cells have been formed from one diploid cell.*
- 8. These haploid cells will become gametes, transmitting the genes they contain to offspring.*

Your assignment:

You will take the information you have acquired in this class (obtained directly from your notes & book) and combine it with the best thing about picture books – the pictures!!! In doing this, you will create an illustrated picture book that can be used to teach other people about Meiosis.

Your book will include:

- 1. An illustrated cover*
- 2. Illustrated pages (use the pictures in your book) Must be in color.*
- 3. Written Text covering all of the information in your illustrated outline.*
- 4. Prophase I, Metaphase I, Anaphase I, Telophase I, Prophase II, Metaphase II, Anaphase II, Telophase II, and Cytokinesis must be described and illustrated.*

Your book will be graded in the following 3 ways:

- 1. Completeness- all phases are included in book.*
- 2. Accuracy- all of the information in your book is true and correct and pictures are labeled if necessary.*
- 3. Clarity- Each illustration CLEARLY depicts a subtopic for your project and the pictures in color.*

Artistic talent is NOT required to successfully complete this project. You may use lots of labels or trace pictures if it helps.

Pass out the “Meiosis Flip Book” Project Rubric & Handouts to students. Explain the “Meiosis Flip Book Project to students.

e. Check for understanding (write it out fully):

- 1. What questions do you have about the “Meiosis Flip Book” Project?*

- g. Guided practice (application ... bullets or paragraph):** *Students can work on their "Meiosis Flip Book" projects for the remainder on the period.*
- h. Quest activities (optional, if time permits):** *Students can make flash cards to help them study for the upcoming Meiosis Quiz.*
- i. Closure (Select one or more. Review, summarize, evaluation, synthesis, prep for tomorrow.):** *Good job today. Continue working on your "Meiosis Flip Book" projects as they will be a beneficial study tool for the upcoming Meiosis Quiz. Tomorrow we will be doing a lab to give you a visual demonstration of how Meiosis actually occurs during sexual reproduction.*
- j. Independent practice (homework):** *"Meiosis Flip Book" Project*
- k. Ell / Special Needs:** *Allowing students to work in teams (paring up bilingual students with ELL), using visuals & handouts, repeating directions, demonstrating directions while saying them aloud, and including guided practice of the topic.*