Unit 1: Meiosis Notes Guide-Gen Biology B

Objective 1: Describe how meiosis can increase genetic variability for sexual reproduction.

Students will be able to:
1) Describe how crossing over and sexual reproduction has an evolutionary advantage.
2) Explain how meiosis produces an increase in genetic variability.
3) Explain how the numbers of chromosomes vary in sex cells and non-sex cells (autosomal cells)?

Meiosis
A process of reduction division in which the number of chromosomes per cell is cut in half through the separation of homologous chromosomes in a diploid cell.
--Diploid – _____ sets of chromosomes (one chromosome from each parent)
--Haploid – 1 set of chromosomes
--Homologous chromosomes that each have a corresponding chromosome from the opposite sex parent

Meiosis
-- Similar in many ways to mitosis
-- Several differences
-- Involves 2 cell divisions
-- Results in 4 cells with 1/2 the normal genetic information

Vocabulary
--_____(2N) - Normal amount of genetic material
--_____(N) - 1/2 the genetic material.
-- Meiosis results in the formation of haploid cells.
-- In Humans, these are the **Ova** (egg) and **sperm**.

-- Ova are produced in the **_____** in females
-- Process is called **oogenesis**
-- Sperm are produced in the **_____** of males.
-- Process is called **spermatogenesis**

Meiosis Phases
--Meiosis occurs in 2 phases; **Meiosis _____**, & **Meiosis _____.**
--Meiosis I.
--Prior to division, amount of DNA doubles

Prophase I
-- Each chromosome pairs with its corresponding homologous chromosome to form a tetrad.
-- There are 4 chromosomes in a tetrad.
-- The pairing of homologous chromosomes is the key to understanding meiosis.
-- Crossing-over may occur here
-- Crossing-over is when chromosomes overlap and exchange portions of their chromatids.

Crossing over
--_____Over of genes occurs now in prophase 1
-- Segments of homologous chromosomes break and reform at similar locations.
-- Results in new genetic combinations of offspring.
--This is the main advantage of sexual reproduction

Describe how crossing over and sexual reproduction has an evolutionary advantage.
-Crossing over changes which genes are on a chromosome. This means that each brother/sister may have the

same chromosome from their parent but it may have different genes on it. This makes siblings more different from each other.
-This is an advantage because if there is a disease which may kill individuals that have a specific gene. If an individual has a different gene, it may allow the individual to survive. Variation often increases the chance of survival.

Metaphase I
-- Spindle fibers attach to the chromosomes

Anaphase I
-- The fibers pull the homologous chromosomes toward opposite ends of the cell.
Nondisjunction: During the process of meiosis, chromosomes are dividing. If the chromosomes do not separate properly, the result may be that the haploid cell (gamete) may have more genetic information or less genetic information than it is normal.

Chromosome reduction
-- During anaphase 1, each homologous chromosome is pulled to opposite sides of the cell. Unlike mitosis, THE CENTROMERES DO NOT _____.

Telophase I & Cytokinesis
--Nuclear membranes form.
--The cell separates into 2 cells.

Prophase II
-- Meiosis I results in two haploid (N) cells.
-- Each cell has half the number of chromosomes as the original cell.
-- During prophase II, a spindle forms in each of the two new cells and the spindle fibers attach to the chromosomes.

Metaphase II
-- The chromosomes line up similar to metaphase in mitosis.

Anaphase II
-- Sister chromatids separate and move to opposite ends of the cell.

Telophase II
-- Meiosis II results in 4 haploid cells.

Meiosis II
- DNA **does** _____ double
- Chromosomes randomly line-up along metaphase plate like regular mitosis.
- During anaphase 2, **CENTROMERES**_____ and each chromosome is pulled to opposite sides of the cell.
- Nuclei reform and cytokinesis usually occurs (although it is often unequal).

Spermatogenesis and oogenesis
-- In males, meiosis results in 4 sperm cells
-- In females, meiosis results in 1 egg cell and three polar bodies, which are not used in reproduction.

Mitosis vs Meiosis

	Mitosis	Meiosis
Results in	2 Diploid Cells (2N)	4 Haploid Cells (N)
Cells are	Genetically Identical	Genetically Different

Occurs in	Somatic (Body) Cells	Sex Cells

2. Explain how meiosis produces an increase in genetic variability
-Meiosis produces 4 cells from one cell. Each new cell is different from each other due to the division of the chromosomes and crossing over.

3) Explain how the numbers of chromosomes vary in sex cells and non-sex cells (somatic-body cells)?
-Sex cells have half the number of chromosomes as somatic cells- body cells. Two sex cells combine together to produce a cell with the correct number of chromosomes. Somatic cells (body cells) have all the chromosomes for that organism. Remember all body cells have ALL the chromosomes. They may only use genes that the cell needs but they have ALL of the genes.