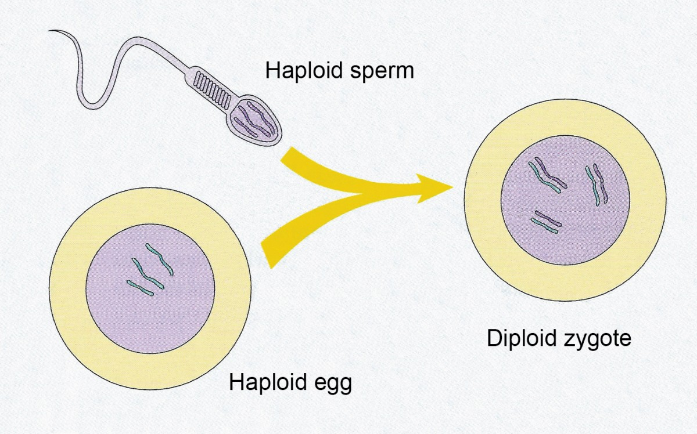
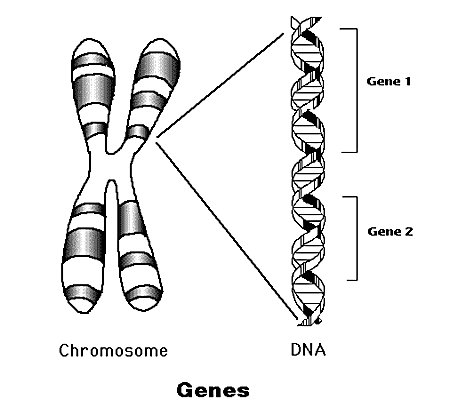
**Meiosis Guided Notes**

1. Organisms that \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ sexually are made up of \_\_\_\_\_\_ different types of cells.
   1. **Somatic Cells** are “\_\_\_\_\_\_\_\_\_\_\_\_” cells and contain the normal number of chromosomes - called the “\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_” number (the symbol is \_\_\_\_\_\_). EX: skin cells, brain cells
   2. **Gametes** are the “\_\_\_\_\_\_\_\_\_” cells and contain only \_\_\_\_\_\_\_\_\_\_ the normal number of chromosomes - called the “\_\_\_\_\_\_\_\_\_\_\_\_\_” number (the symbol is \_\_\_\_\_\_\_\_). Sperm cells and ova (eggs) are gametes.

**n = number of chromosomes in the set… so….2n means 2 chromosomes in the set…. Polyploid cells have more than two chromosomes per set… example: 3n (3 chromosomes per set)**



1. The \_\_\_\_\_\_\_\_\_\_\_\_ gamete is the sperm. The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ gamete is the ovum.
2. **Fertilization**, the joining of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, results in the formation of the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (fertilized egg).
3. If an organism has the *\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_* number (2n) it has a matching pair of *\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_* for each chromosome number.One of the homologues comes from the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (and has the mother’s DNA) and the other homologue comes from the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (and has the father’s DNA). Most organisms are \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Humans have \_\_\_\_\_\_\_ sets of chromosomes, therefore humans have \_\_\_\_\_\_\_\_\_\_ total chromosomes. The diploid number for humans is 46 (46 chromosomes per cell).
4. Genes are located on \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are alternate forms of a gene. EX: The gene for eye color is on a chromosome, it can have several different alleles: blue, brown, green
5. Homologous chromosomes are \_\_\_\_\_\_\_\_\_\_\_\_ of chromosomes (maternal and paternal) that are similar in \_\_\_\_\_\_\_\_\_\_\_\_ and \_\_\_\_\_\_\_\_\_\_\_\_\_. Homologous pairs (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_) carry genes controlling the same inherited traits. Each \_\_\_\_\_\_\_\_\_\_\_ (position of a gene) is in the same position on homologues. Humans have \_\_\_\_\_\_\_ pairs of homologous chromosomes.

22 pairs of autosomes

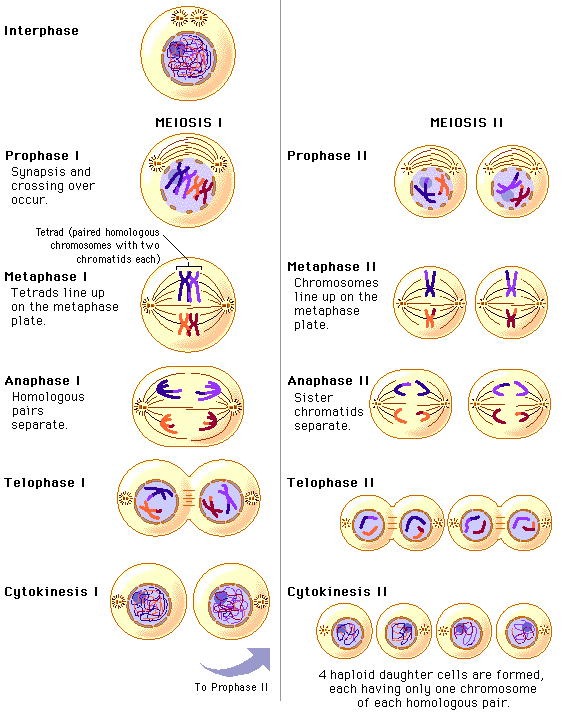
1 pair of sex chromosomes

1. Remember that homologous chromosomes may not be identical because one comes from the mother and one from the father. Humans have 23 sets of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ chromosomes. Each homologous set is made up of 2 homologues.
2. Autosomes code for most of the offspring’s \_\_\_\_\_\_\_\_\_\_\_\_\_\_. In humans the “\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_” are sets 1 – 22.
3. The sex chromosomes code for the \_\_\_\_\_\_\_\_\_ of the offspring. If the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ has two “X” chromosomes it will be a female. If the offspring has one “X” chromosome and one “Y” chromosome it will be a \_\_\_\_\_\_\_\_\_\_\_\_\_. In humans the “sex chromosomes” are the \_\_\_\_\_\_\_\_ set.
4. \_\_\_\_\_\_\_\_\_\_\_\_\_\_ is the process by which ”\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_” (sex cells) , with half the number of chromosomes, are produced. During Meiosis diploid cells are reduced to haploid cells

**Diploid (2n) → Haploid (n)**

If meiosis did not occur the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ number in each new generation would *\_\_\_\_\_\_\_\_\_\_\_\_\_* and the offspring would die.

1. Meiosis is two \_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (called meiosis I and meiosis II) with only one \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of chromosomes.
2. Meiosis in males is called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and produces \_\_\_\_\_\_\_\_\_\_\_\_\_. Meiosis in females is called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ and produces \_\_\_\_\_\_\_\_\_\_\_.
3. **Interphase I** - Similar to \_\_\_\_\_\_\_\_\_\_\_\_ interphase. **Chromosomes** replicate **(S phase).** Each duplicated \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ consists of two identical sister \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ attached at their \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. **Centriole** pairs also replicate.

**Stages of Meiosis**

1. Meiosis I (four phases)

**Cell division** that reduces the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ number by ­­­­­­­­­­­\_\_\_\_\_\_\_\_\_\_\_\_**.**

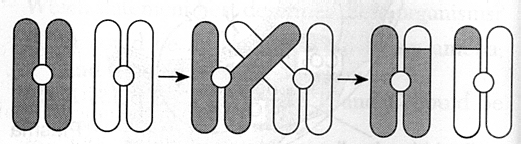
Four phases:

a. prophase I

b. metaphase I

c. anaphase I

d. telophase I

1. **Prophase I**
   1. Longest and most \_\_\_\_\_\_\_\_\_\_ phase. 90% of the meiotic process is spent in Prophase I.
   2. Spindle fibers form, centrioles move to the poles and nuclear envelope dissolves.
   3. Chromatin condenses into replicated chromosomes ( 2 \_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_).
   4. As homologous chromosomes condense, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ occurs: homologous chromosomes come together
2. During synapsis (Prophase I) “\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_” occurs. Crossing over is one of the two major occurrences of Meiosis (The other is non-disjunction). During crossing over segments of \_\_\_\_\_\_\_\_\_\_\_\_\_ break off and reattach to the paired homologous chromosome. This leads to greater genetic \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_!
3. **Metaphase I**
   1. Spindle fibers attach to the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of each homologous chromosome
   2. ***Pairs*** of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ chromosomes line up at the equator of the cell.
   3. This is a major difference between Meiosis and Mitosis. Recall in Mitosis, individual chromosomes line up at the equator.
   4. Independent \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ occurs:

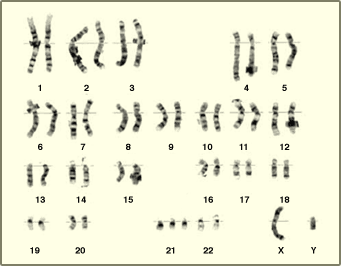
i. Orientation of homologous pair to poles is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

ii. Leads to greater genetic \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. **Anaphase I**
   1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ chromosomesseparate and move towards the poles.
   2. Sister chromatidsremain attached at their \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
2. **Telophase I**

Chromosomes uncoil and spindle fibers break down. Nuclear envelopes form around the DNA at each pole creating 2 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Each pole now has one of the 2 homologous chromosomes consisting of 2 sister chromatids. The sister chromatids may not be identical due to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

1. **Cytokinesis** occurs and two haploid daughter cells are formed. Because there is only one copy of each chromosome at each pole, the chromosome number is said to be \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**.**
2. **Meiosis II**
   1. No interphase II (or very short period call interkinesis - no \_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_)
   2. Meiosis II is similar to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. **Prophase II**
   1. Same as prophase in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. **Metaphase II**
   1. Same as \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in mitosis
5. **Anaphase II**
   1. same as anaphase in mitosis
   2. \_\_\_\_\_\_\_\_\_­­ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ separate
6. **Telophase II**
   1. Same as telophase in mitosis
   2. ­­­­­­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ form
   3. Cytokinesis occurs
   4. Remember: four haploid daughter cells are produced.
   5. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ = sperm or egg
7. Non-disjunction is one of the two major occurrences. The other is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_. \_\_\_\_\_-\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is the failure of homologous chromosomes, or sister chromatids, to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ during *meiosis*. Non-disjunction results in the production of \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ with abnormal chromosome number. An abnormal chromosome number (abnormal amount of DNA) is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ to the offspring.
8. Non-disjunction is the failure of homologous chromosomes, or sister chromatids, to separate during \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ *­­­­­­­­­­­­­­­*. Non-disjunction results in the production of zygotes with abnormal chromosome numbers…… remember…. An abnormal chromosome number (abnormal amount of DNA) is damaging to the offspring.
9. Non-disjunction is displayed in one of two fashions. The first is called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, the second is called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. If an organism has Trisomy 18 it has three chromosomes in the 18th set, Trisomy 21…. Three chromosomes in the 21st set. If an organism has Monosomy 23 it has only one \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in the 23rd set.
10. Common Non-disjunction disorders
    1. Down’s Syndrome – Trisomy 21
    2. Turner’s Syndrome – Monosomy 23 (X)
    3. Kleinfelter’s Syndrome – Trisomy 23 (XXY)
    4. Edward’s Syndrome – Trisomy 18
11. An \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ is a procedure a pregnant woman can have in order to detect some genetics disorders such as non-disjunction.
12. One of the ways to analyze the amniocentesis is to make a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. What genetic disorder does this karyotype show?

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ 21 - Down’s Syndrome