

Name: \_\_\_\_\_

## Mitosis and Meiosis Review Sheet

Chromosomes are DNA wrapped around proteins to form an X-shaped structure.

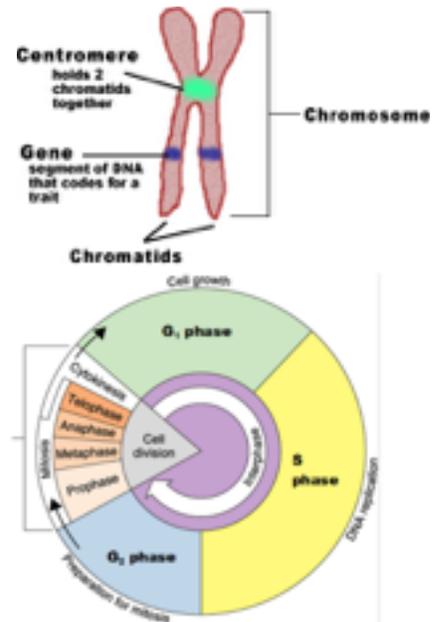
1. Chromosomes are found in the nucleus
2. Chromosomes are made of DNA
3. Sections of chromosomes are called genes

DNA - deoxyribonucleic acid (it is the genetic code that contains all the information needed to build and maintain an organism)

The **Cell Cycle** represents all events that take place in the period of time from the beginning of one cell division to the beginning of the next. The Cell Cycle includes two periods:

- **Interphase:** Cells increase in size and grow. Chromosomes are replicated. Cells produce of many organelles and molecules.
- **Cell division:** during which a parent cell divides into daughter cells: Mitosis & Cytokinesis

There are two different types of cell divisions: **Mitosis** or mitotic cell division, and **meiosis** or meiotic cell division.



**Mitosis** is the process that a somatic cell divides into two daughter cells. It is an important process in normal organism development. When mitosis is out of control, diseases such as cancer may occur.

**Prophase:** The nuclear membrane dissolves. Wind DNA (chromatin) into chromosomes. Appearance of spindle fibers and centrioles.

**Metaphase:** Chromosomes line up in the middle of the nucleus. Spindle fibers attach to each chromosome at the centromere.

**Anaphase:** Spindle fibers pull one-half of each chromosome (chromatid) apart at the centromere to the opposite end of the cell.

**Telophase:** Nuclear membrane forms. DNA unwinds into chromatin. Spindle fibers and centrioles disappear.

**Cytokinesis:** Cell splits with its own set of chromosomes into 2 daughter cells that are identical to the parent cell.

**Meiosis** is a specialized type of cell division which reduces the chromosome number by half. This process occurs in all sexually reproducing eukaryotes (both single-celled and multicellular) including animals, plants, and fungi.

**Prophase I:** Homologous pairs of chromosomes are tangled together by a process called **Crossing Over**. The homologous chromosomes will exchange some DNA. Spindle fibers and centrioles appear.

**Metaphase I:** The **homologous pairs** of chromosomes line up next to each other along the equatorial plate.

**Anaphase I:** Spindle fibers pull the **homologous chromosomes apart**.

**Telophase I and Cytokinesis:** Nuclear membrane forms and **two new haploid** daughter cells form.

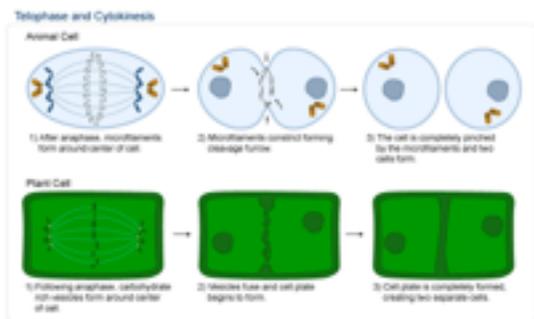
**Prophase II:** Spindle fibers forms in each of the two new cells and the fibers attach to the chromosomes of the two new daughter cells.

**Metaphase II:** the chromosomes are pulled to the center of the cell and line up randomly at the equator

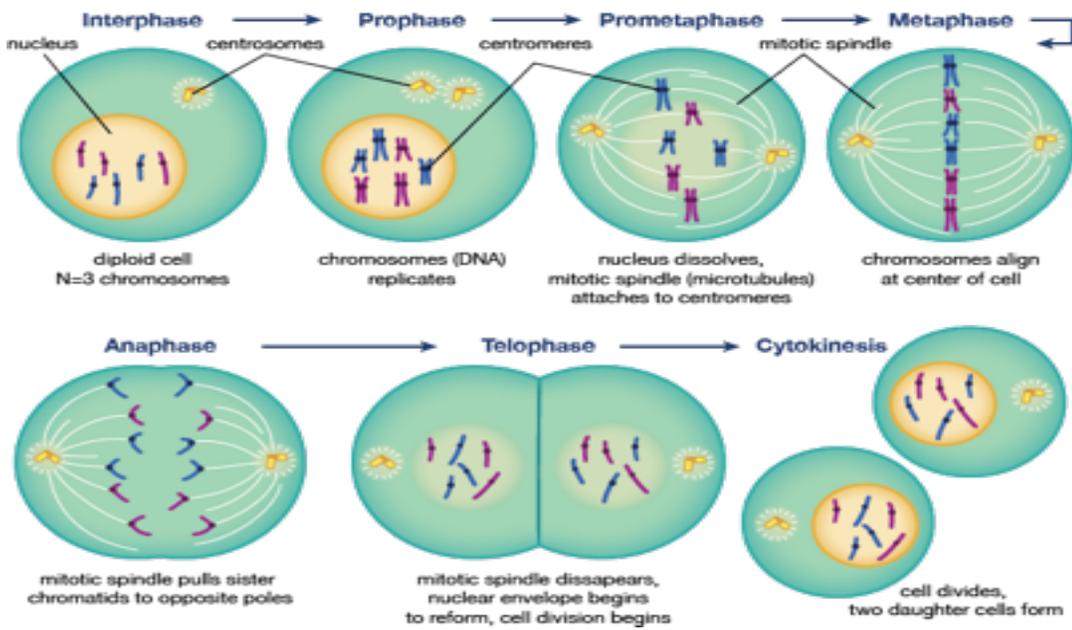
**Anaphase II:** the centromere of each chromosome splits. The **sister chromatids separate** and move to opposite poles

**Telophase II:** Nuclear membrane re-forms. The spindle fibers and centrioles disappear.

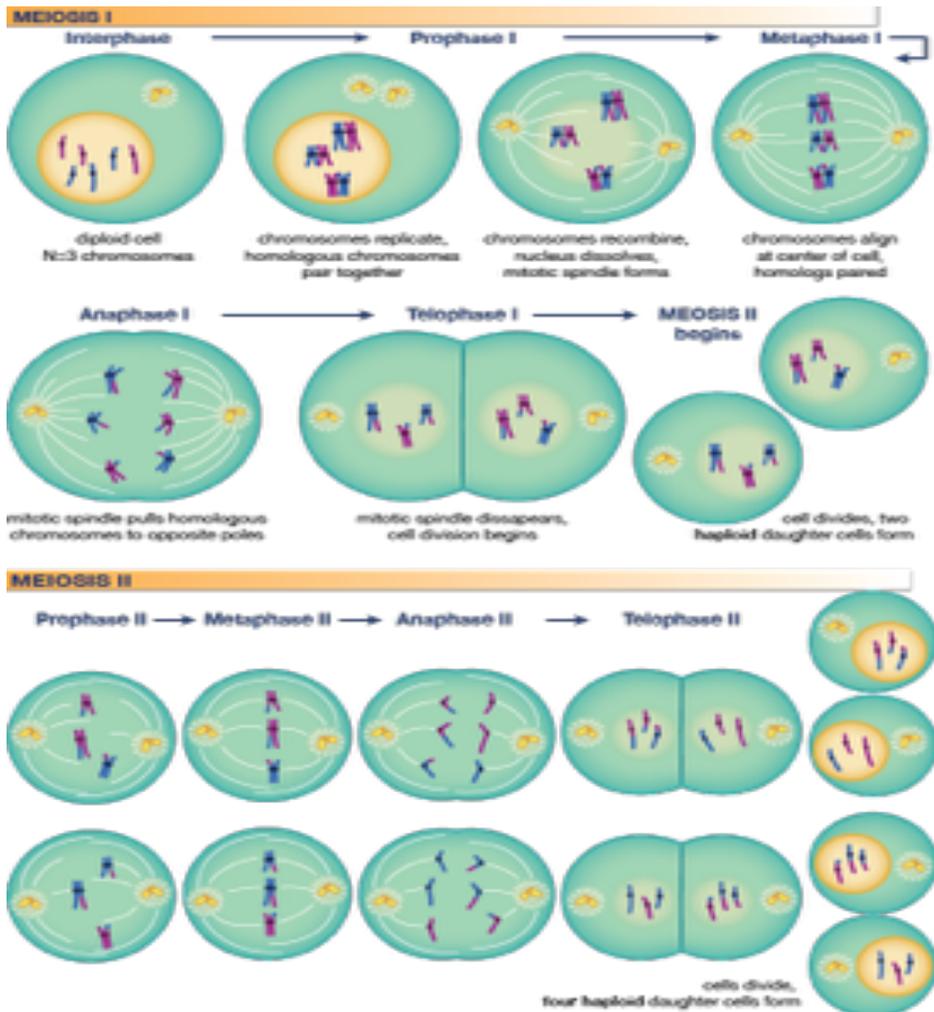
**Cytokinesis II:** Formation of four daughter cells. Each daughter cell has half the number of chromosomes of the parent cell



## Mitosis



## Meiosis



	<b>Mitosis</b>	<b>Meiosis</b>
Goals of this cell division	Help body cells grow. Help replace old cells.	Makes sex cells (sperm and eggs) to increase variation in human reproduction
Function of the new daughter cells?	All body cells, except sex cells Growth and repair	Sexual cells for sexual reproduction
Number of cell divisions at the end of each cycle?	one	two
Number of daughter cells produced from parent cell?	Two daughter cells	Four daughter cells
Exchange of genetic material between chromosomes?	No	Yes, Crossing Over during Prophase I
How is the genetic material of daughter cells compared to parent cell?	Same genetic information as parent cells Same function as parent cells	Different genetic information Different function
Number of chromosomes in daughter cells compared to parent cells?	Same as parent cell	Final number of chromosomes is reduced by a half

## DIPLOID VS. HAPLOID

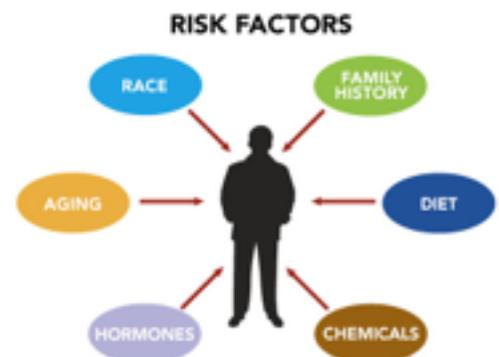
### DIPLOID

- Diploid =  $2(n)$
- In humans:
  - $n=23$  chromosomes
  - $2(n)= 46$  total chromosomes
- 2 sets of each chromosome
- Somatic cells are diploid
  - Body Cells (nerve, muscle, bone, etc.)

### HAPLOID

- Haploid =  $n$
- In humans:
  - $n= 23$  chromosomes
  - Only 23 chromosomes total
- 1 set of each chromosome
- Gametes are haploid
  - Sex Cells (Sperm & Egg)

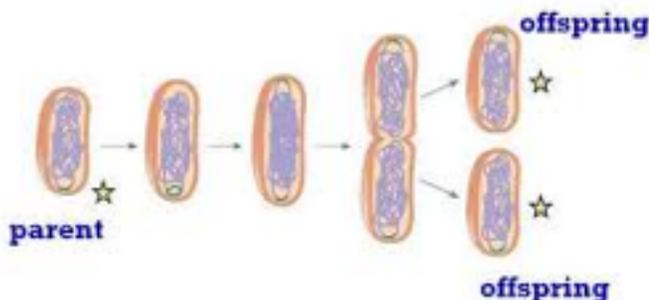
**Cancer:** Cancer is the general name for a group of more than 100 diseases. Although there are many kinds of cancer, all cancers start because abnormal cells grow out of control. When the cells form a mass, it is called a **tumor**.



	ASEXUAL	SEXUAL
+	<ul style="list-style-type: none"> <li>* Much faster process</li> <li>* Population can grow quickly</li> <li>* Little energy is required</li> <li>* No need to search for a mate</li> <li>* Less likely for errors to occur</li> <li>* Less danger involved</li> </ul>	<ul style="list-style-type: none"> <li>* Genetic variation within the species</li> <li>* Less likely to go extinct</li> <li>* Selective breeding is possible (choosing best traits for next generation)</li> <li>* Freedom of mate selection</li> </ul>
-	<ul style="list-style-type: none"> <li>* Lacks genetic variation (because offspring is an exact copy)</li> <li>* Species is more vulnerable to extinction due to environmental change</li> <li>* If parent has disease, offspring has it too</li> </ul>	<ul style="list-style-type: none"> <li>* Slower process</li> <li>* Lots of energy required</li> <li>* Mate required – can be difficult to find</li> <li>* Greater chance of error (harmful mutations)</li> </ul>

### Types of Asexual Reproduction:

Binary fission - a process where one cell divides to form two identical cells. This is an example of asexual reproduction.



### Budding

- The offspring just pops out of the parent
- Examples: hydra and yeast

Panel A: A small, rounded bud is visible at the top of the parent hydra. Panel B: The bud has grown significantly larger and is beginning to form a neck. Panel C: The bud is fully developed and is about to detach from the parent's body.

### Replication cycle of a virus

