

References: Hoefnagels, Mariëlle. 2009. *Biology*, 1<sup>st</sup> ed., McGraw-Hill, NY  
Ch 8 pp 154-163, 166; Ch 9 pp 174-182, 188-189  
Mader, Sylvia S. 2010. *Biology*, 10th ed., McGraw-Hill, NY  
Ch 9; Ch 10 pp 170-178

### Objectives

1. Define mitosis, meiosis, and cytokinesis.
2. Describe each phase of mitosis and each phase of meiosis.
3. Compare and contrast mitosis and meiosis.
4. Draw what happens with chromosomes in mitosis and in meiosis.
5. Describe oogenesis and spermatogenesis.
6. Compare normal cell activity and cancer cell activity.

### Cell cycle

Interphase ( $G_1$ , S,  $G_2$ ), mitosis

Cytokinesis is the division of one cell into two cells.

Mitosis is the separation of replicate chromatids in preparation for cytokinesis.

Prophase--Chromatin condenses into chromosomes.

Metaphase--Chromosomes line up across cell.

Anaphase--Spindle fibers attach to centromeres and pull chromatids apart.

Telophase--Chromosomes separate into daughter cells.

Ploidy of daughter cells is same as ploidy of parent cell.

If parent cell is haploid (1N), daughter cells will be haploid.

If parent cell is diploid (2N), daughter cells will be diploid.

Meiosis is the segregation of homologous chromosomes into haploid gametes.

Meiosis I (reduction division)

Prophase I--Chromatin condenses into chromosomes.

Metaphase I--Pairs of homologous chromosomes line up across cell.

Anaphase I--Spindle fibers attach to centromeres and pull homologues apart.

Telophase I--Chromosomes separate into daughter cells.

Ploidy is reduced from diploid (parent cell) to haploid (daughter cells).

Independent assortment of genes on different chromosomes.

Meiosis II

Metaphase II--Chromosomes line up across cell.

Anaphase II--Spindle fibers attach to centromeres and pull chromatids apart.

Telophase II--Chromosomes separate into daughter cells.

Parent cells and daughter cells are haploid.

### Gametogenesis

Spermatogenesis in mammals

Primary spermatocyte (2N), secondary spermatocytes (1N), spermatids (1N), sperm

Oogenesis in mammals

Primary oocyte (2N), secondary oocyte & polar bodies (1N), fertilization, zygote (2N)

### Normal cell activity

contact inhibition, apoptosis, normal nucleus, differentiation, organized tissues, no angiogenesis

### Cancer cell activity

No contact inhibition, no apoptosis, abnormal nucleus, non-differentiated

Disorganized, multilayered, metastasis, angiogenesis