Meiosis

Biology 30: Cell Divison

Interphase

- happens normally (same as in mitosis)
- DNA replicates in S-phase

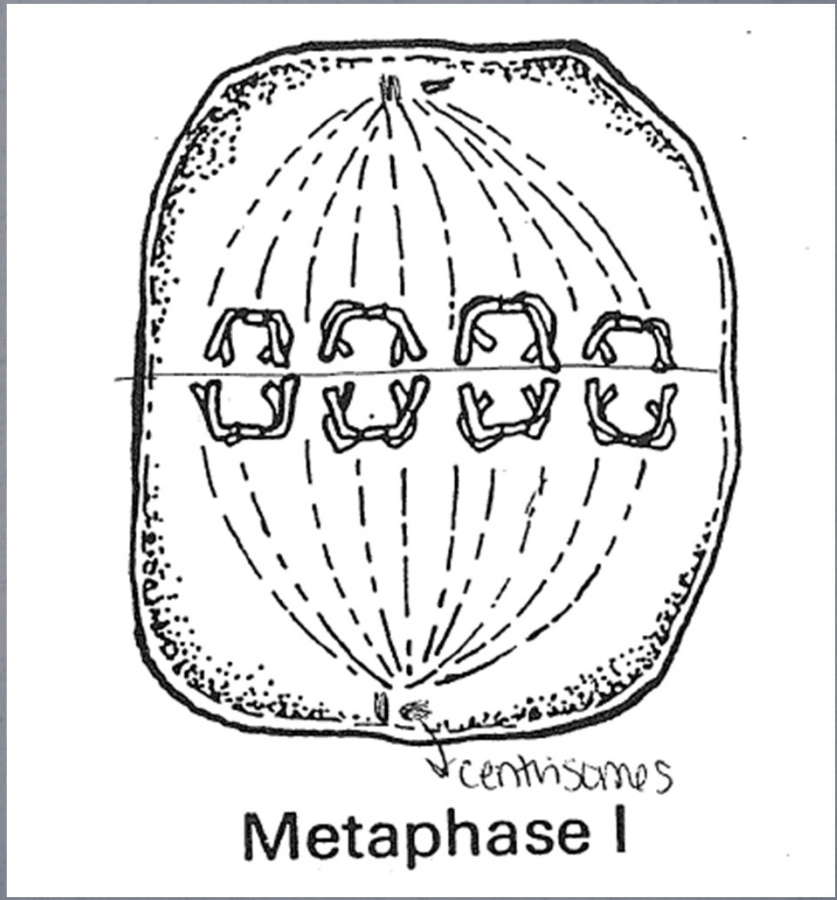
Prophase I

Prophase I:

- DNA changes from chromatin to chromosome form
- homologous chromosomes begin to pair up (*synapsis*)
- each homolog is referred to as a *bivalent*
- collectively: 2 bivalents = *tetrad*
- along the tetrad, it is possible for non-sister chromatids to overlap with each other (*chiasma*)
- if the arms of non-sister chromatids overlap, then exchange occurs – *crossover* (increases variation)
    - diagram

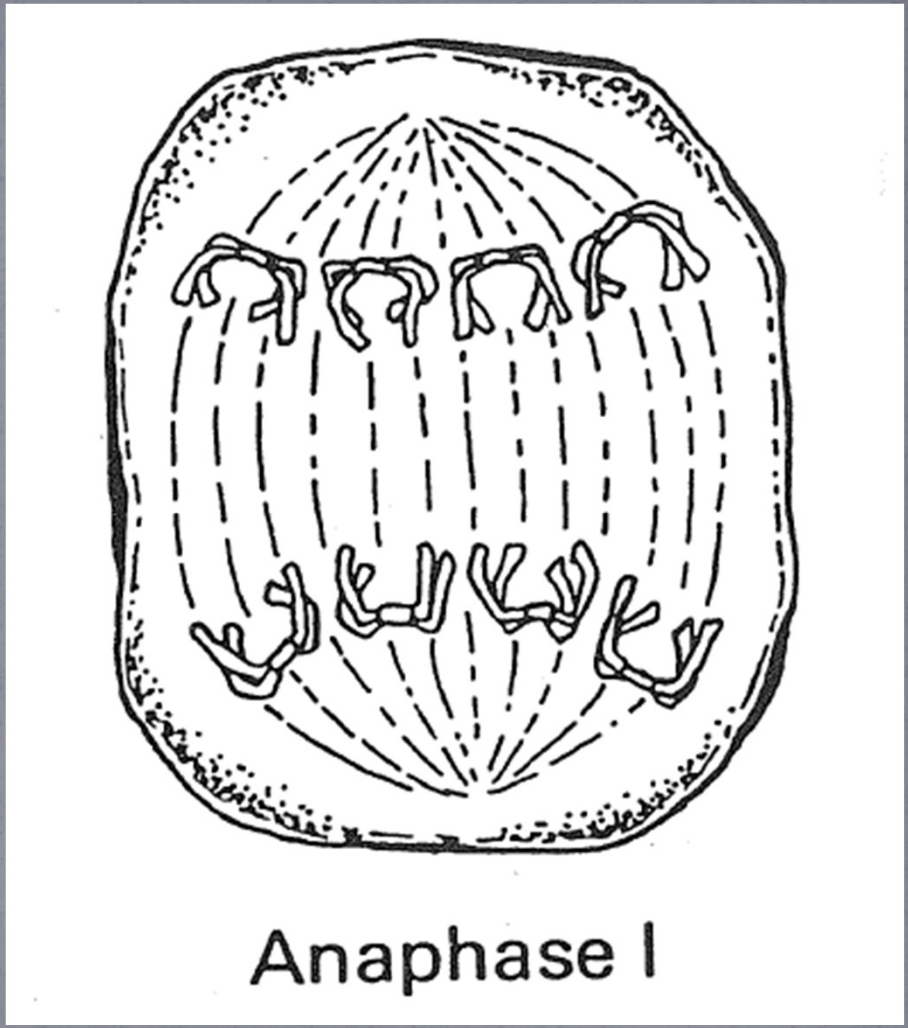
Metaphase I:

- homologous double chromosomes (tetrads) align <u>along</u> the metaphase plate
- spindle fibers completed



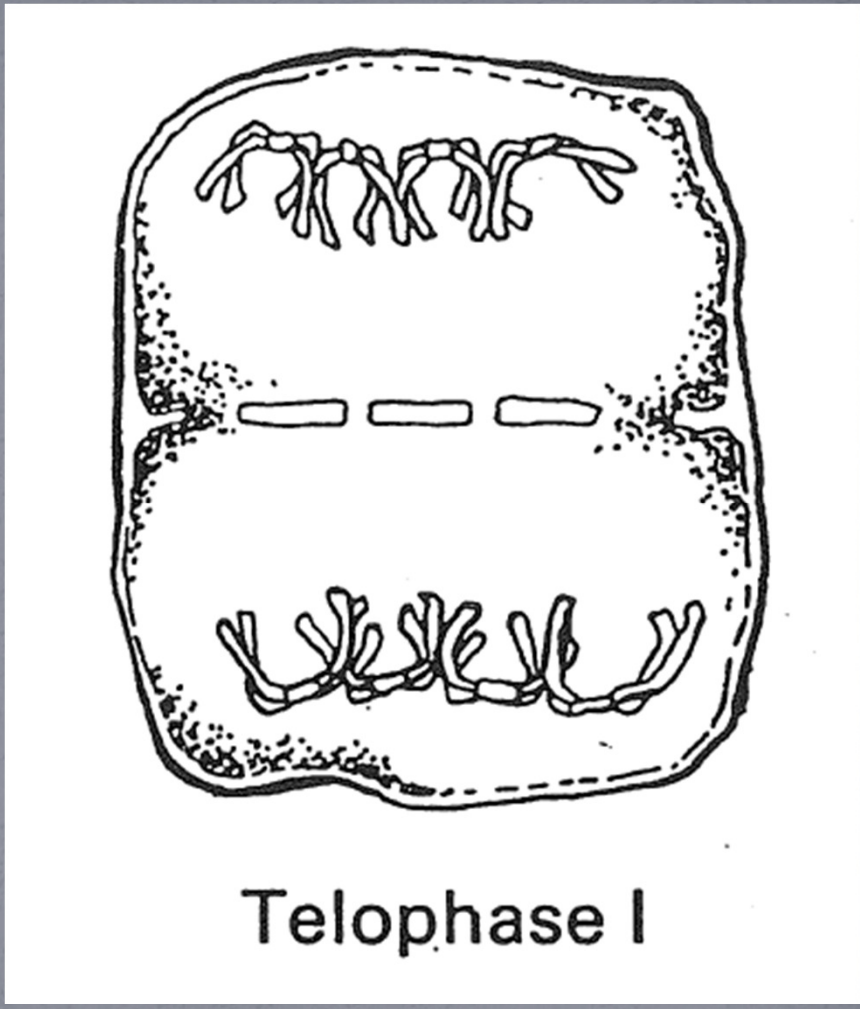
Anaphase I:

- homologous chromosomes separate
- each chromosome consists of sister chromatids at this point
- if crossing over has occurred – genetic mixing

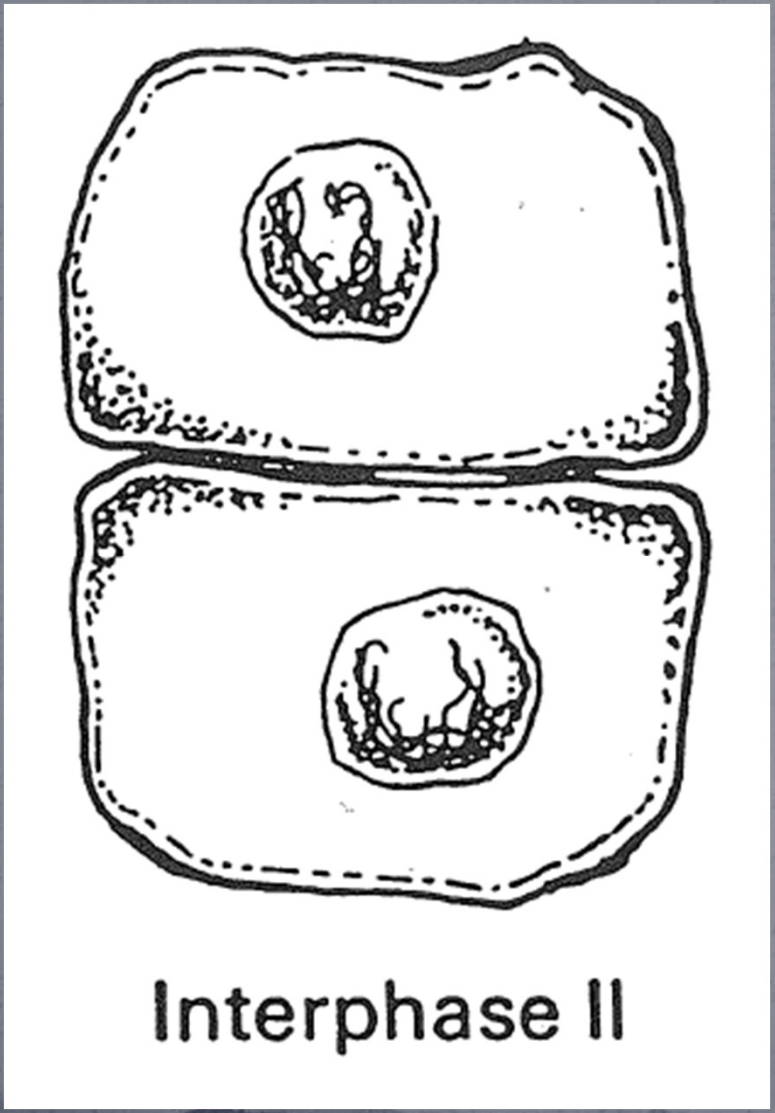


Telophase I:

- 2 new daughter cells
- haploid (n)
- 1 set of complete sister chromatids
- nuclei reform
- spindle fibers disappear
- cytokenesis complete
- 2 cells – half the size of the original parent

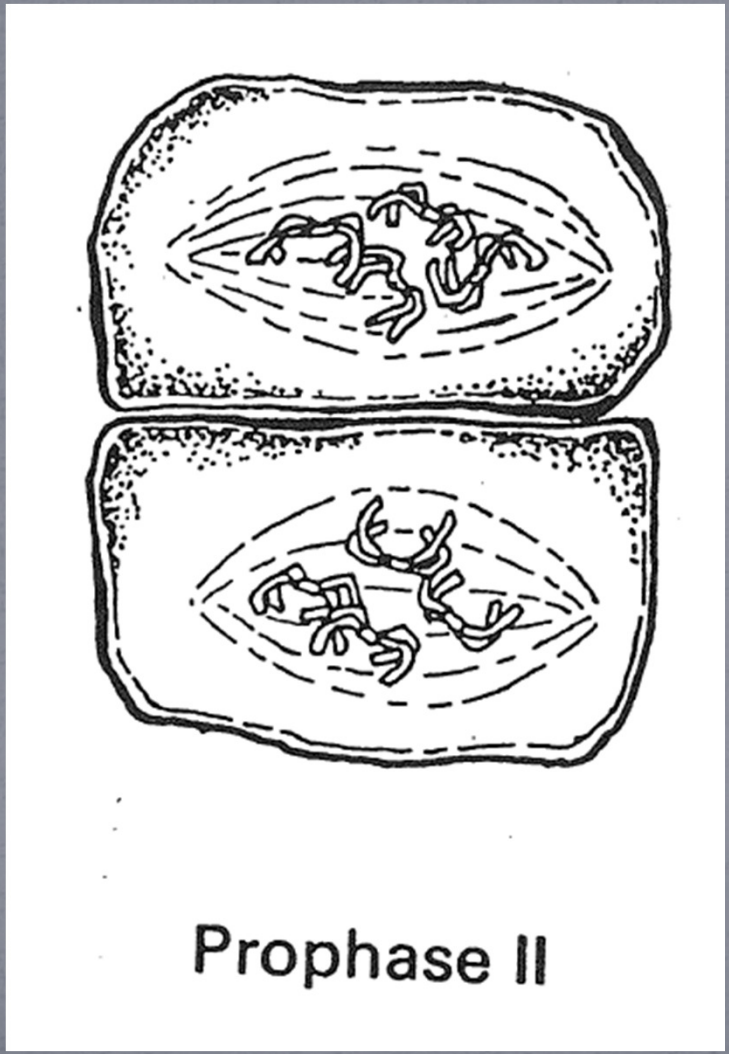


Interphase II:



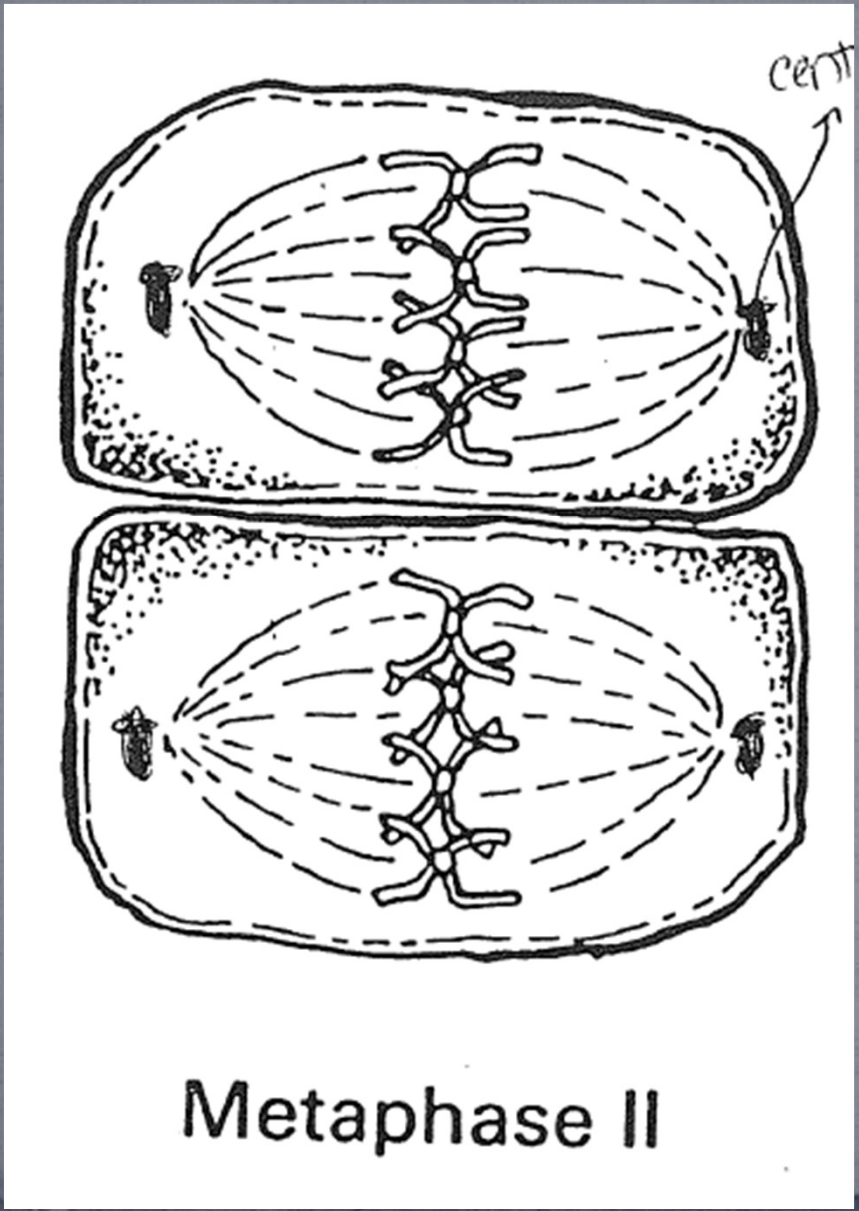
- no growth
- no synthesis
- DNA is in chromatin form

Prophase II:



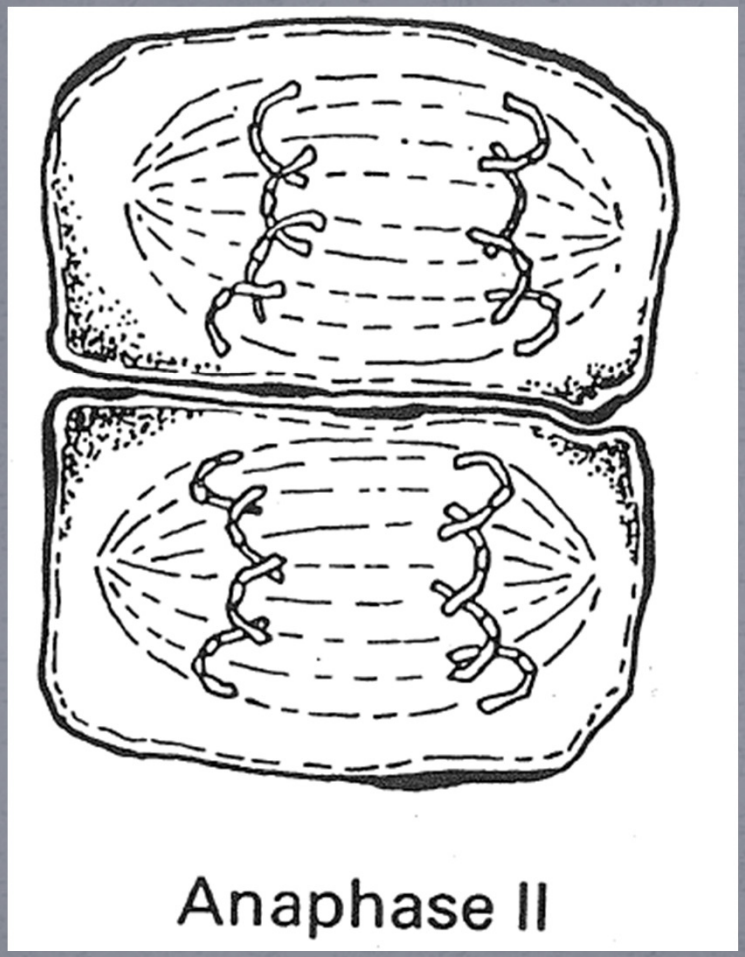
- condensing (chromatin to chromosomes)
- nucleus dissolves
- sister chromatids (double chromosomes)
- haploid (one set of replicated chromosome)

Metaphase II:



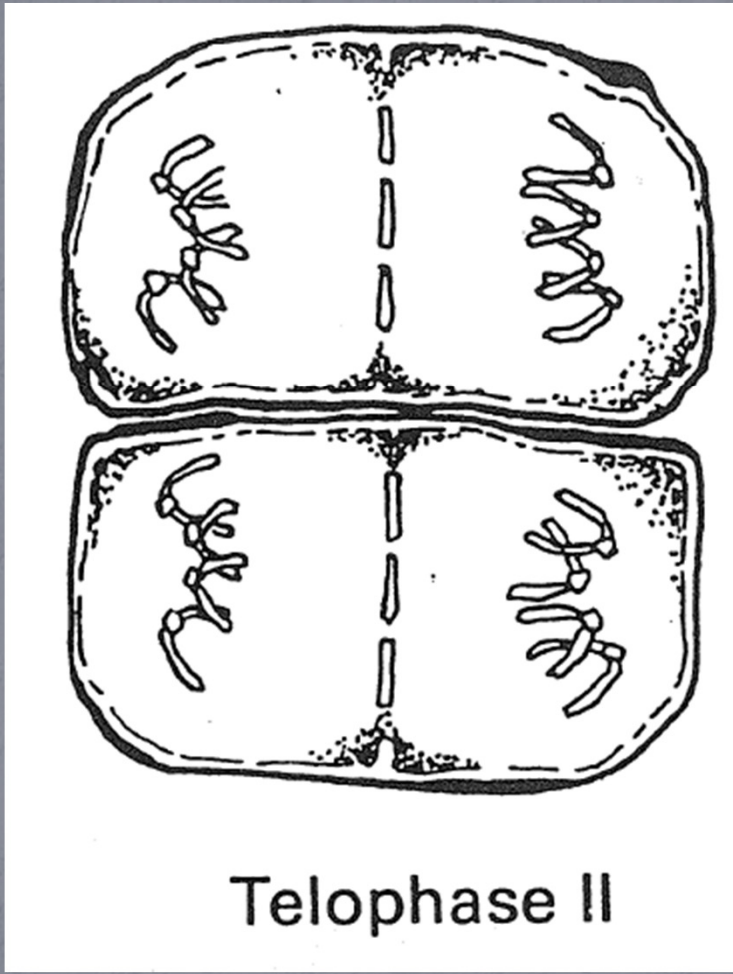
- sister chromatids align <u>on</u> the equator (metaphase plate)
- spindle fibers formed

Anaphase II:



- sister chromatids separate
- centromeres are pulled to the poles by the spindle fibers

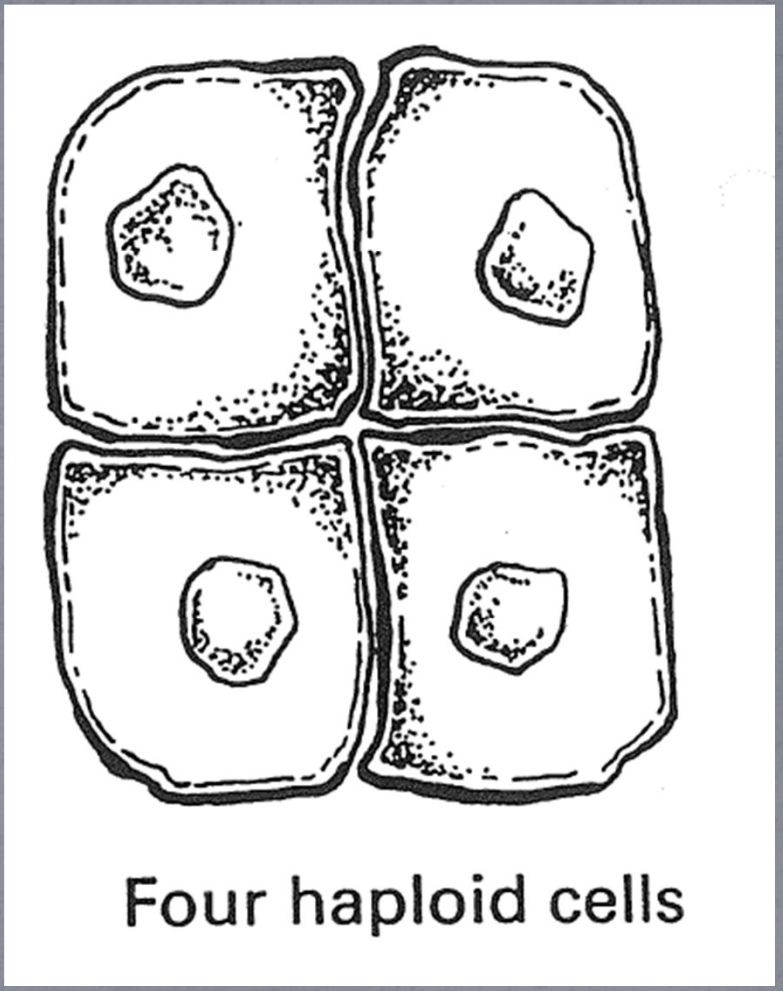
Telophase II:



- chromsome to chromatin
- nucleus reforms
- cytokenesis completes
- cleavage furrow/cell plate forms

Four haploid cells

- ½ of parent cells genetic content
- 1 of each *kind* of chromosome
- gametes (sex cells)
- each cell is ¼ the size of the original cell



Meiosis Animation

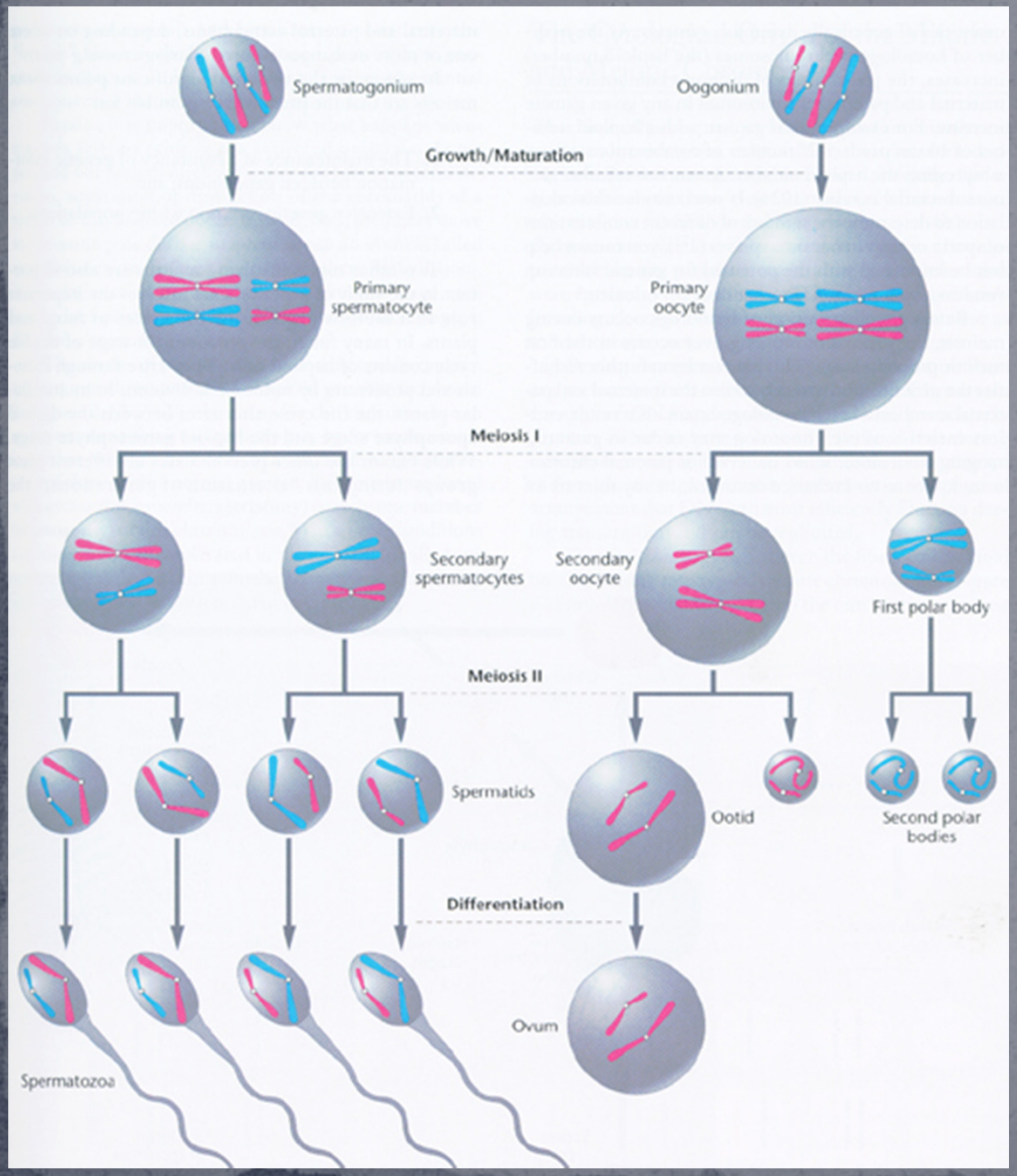
To Do:

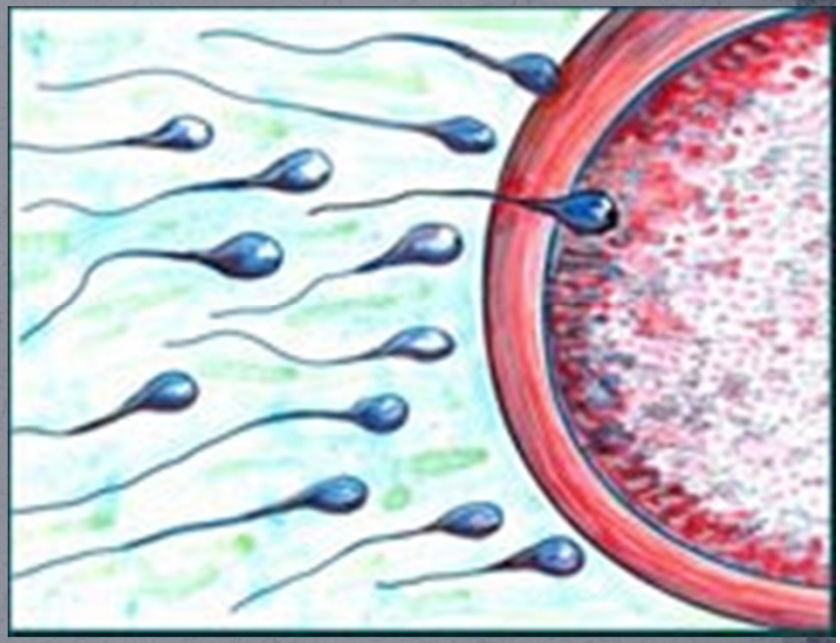
- Use the pipecleaners from the other class to simulate meiosis on your desks
- Cell Cycle, Mitosis, Meiosis Worksheet – due tomorrow

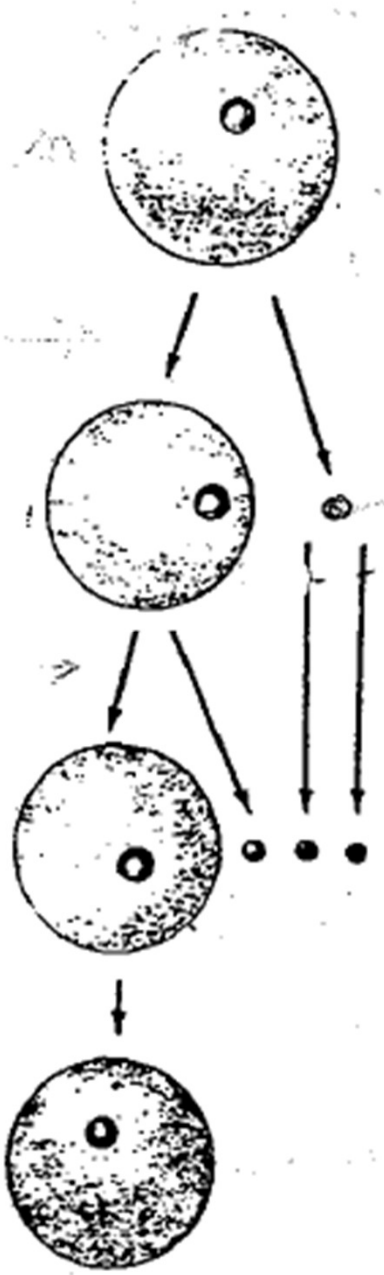
Learner Outcome:

- Describe the process of Meiosis (spermatogenesis and oogenesis) and the necessity for the reduction of chromosome number.

Gametogenesis

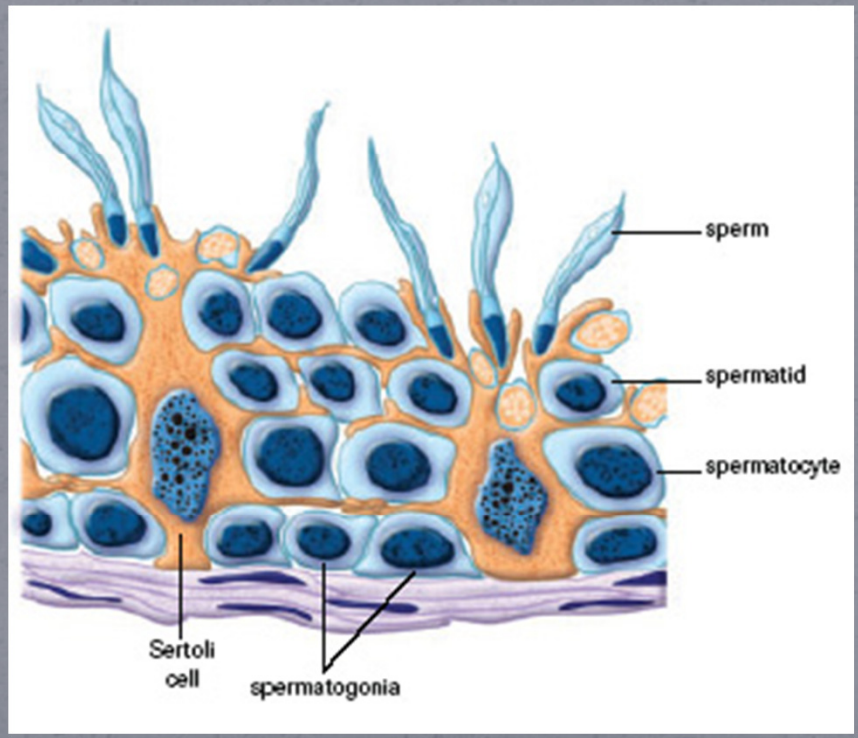




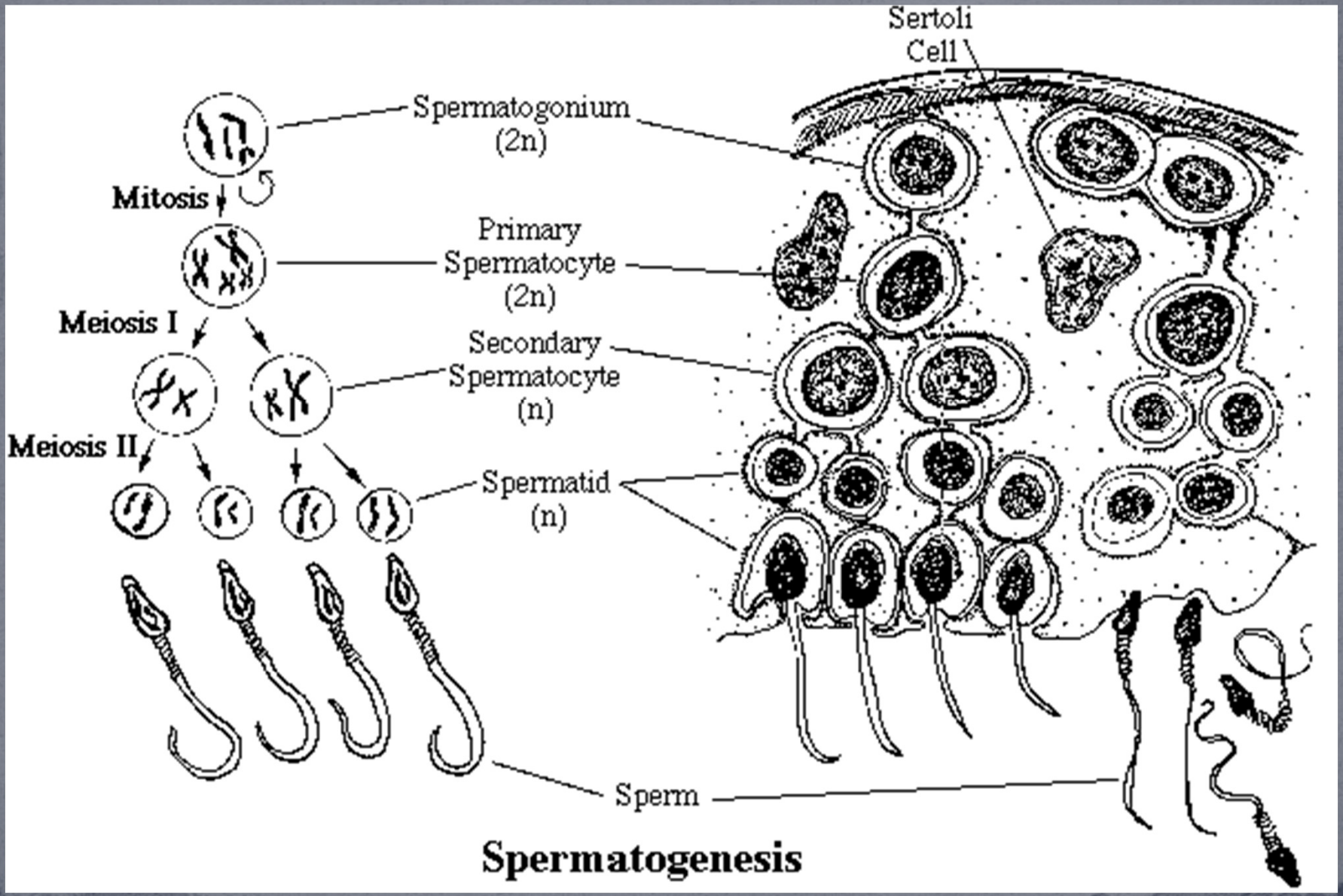


Spermatogenesis:

Results in 4 haploids sperm from each diploid cell that undergoes meiosis



Spermatogenesis



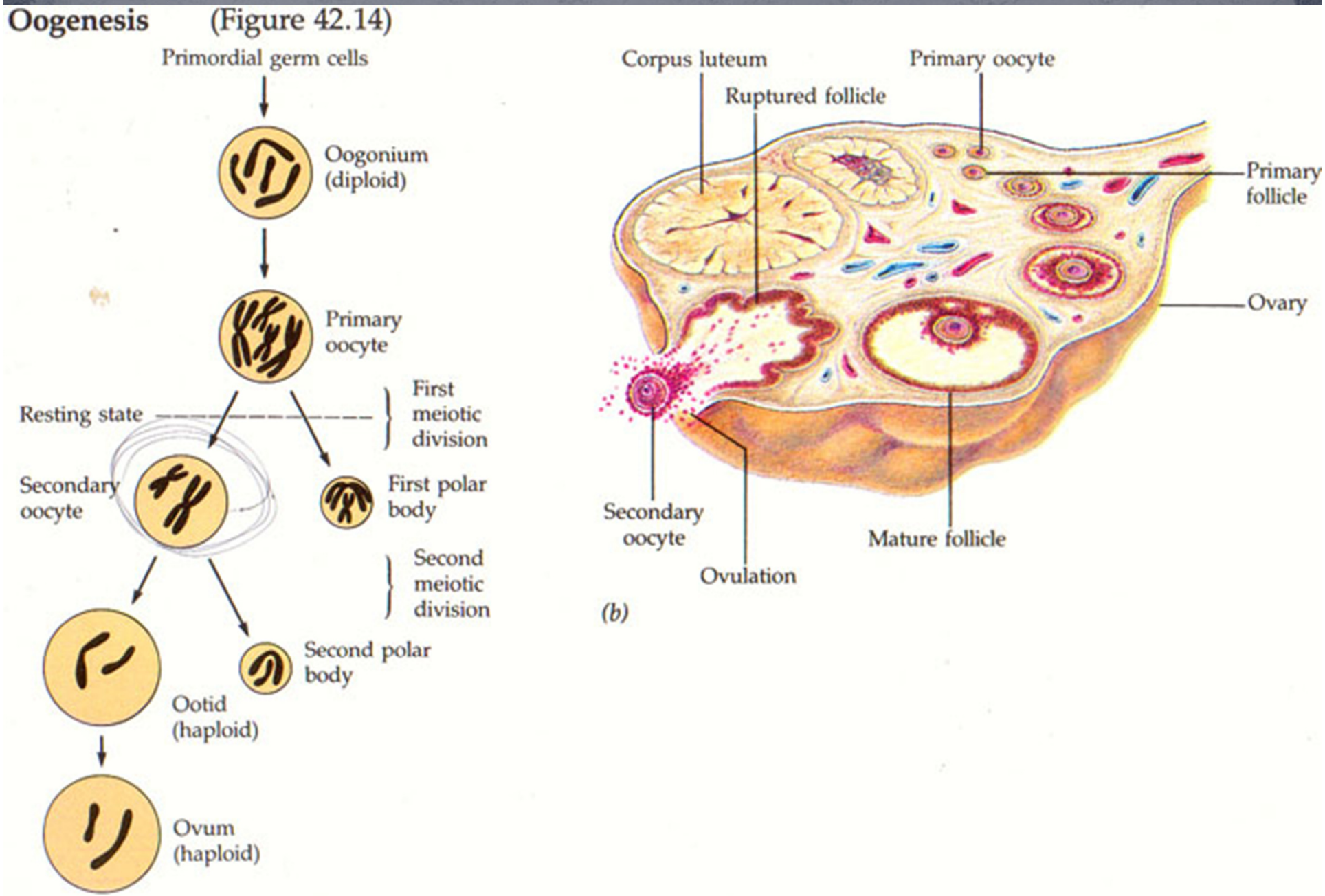
Oogenesis:

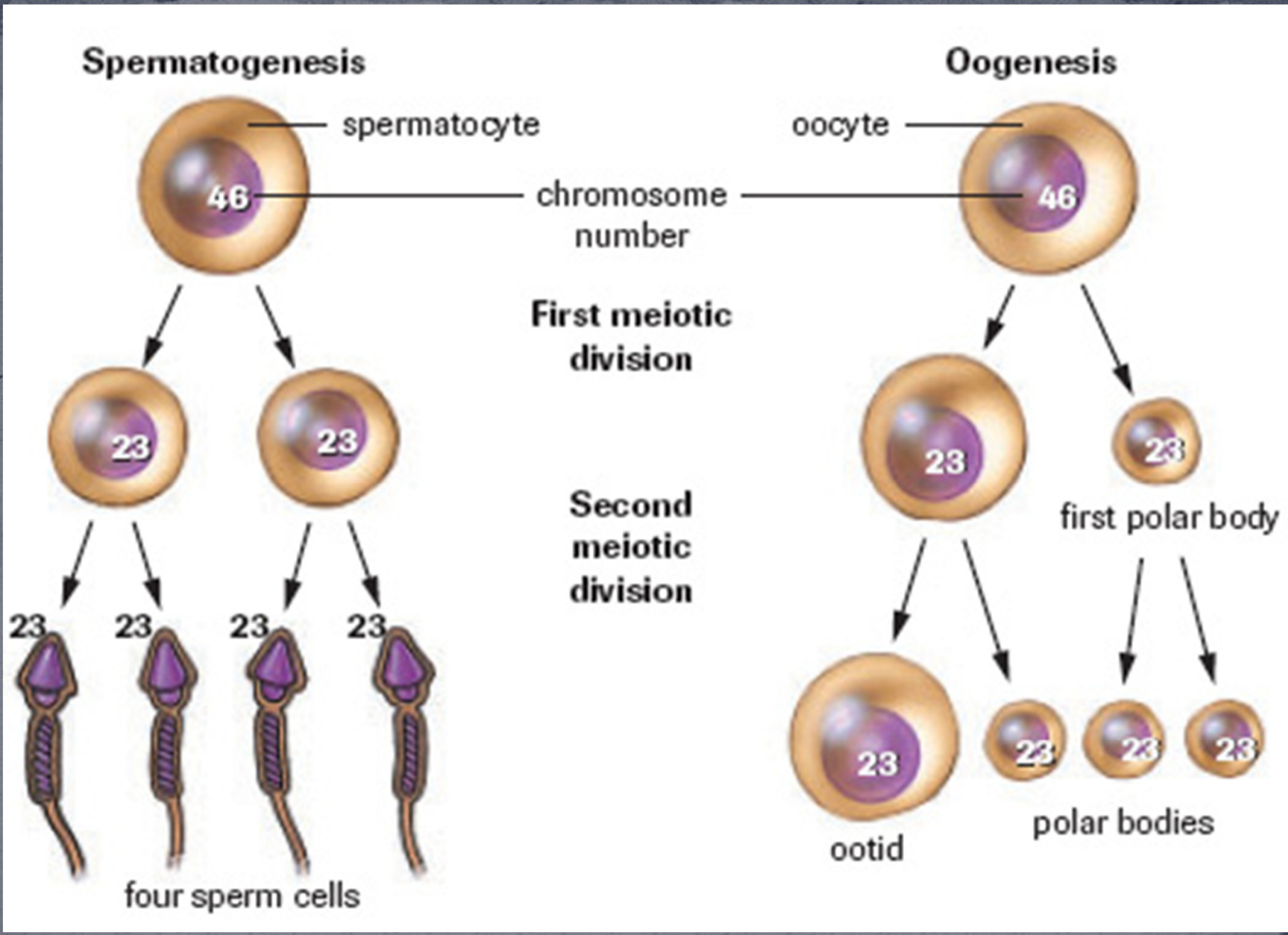
- A normal baby girl has about 2 million primary oocytes in her ovaries
- By 7 years old about 300 000 remain, her body reabsorbed the rest (only about 400 to 500 oocytes will be released during her reproductive years)

Oogenesis:

- **Pimary oocytes** have entered meiosis I
- Meiosis resumes one oocyte at a time, starting with the first menstrual cycle
- Stimulation by hormones completes meiosis I, resulting in the formation of a **secondary oocyte** and the first of 3 polar bodies
- Ovulation occurs
- Penetration of the sperm induces the secondary oocyte and 1st polar body to complete meiosis II
  - There are now three polar bodies and one mature egg or ovum

Oogenesis


Oogenesis (Figure 42.14)
Primordial germ cells
Oogonium (diploid)
Primary oocyte
Resting state
First meiotic division
Secondary oocyte
First polar body
Second meiotic division
Second polar body
Ootid (haploid)
Ovum (haploid)
Corpus luteum
Ruptured follicle
Primary oocyte
Primary follicle
Ovary
Secondary oocyte
Ovulation
Mature follicle
(b)


Spermatogenesis
Oogenesis
spermatocyte
oocyte
46
chromosome number
46
First meiotic division
23
23
23
23
Second meiotic division
first polar body
23
23
23
23
23
23
23
23
four sperm cells
ootid
polar bodies

To Do:

1) Textbook Q's pg. 581 #4, 6, 8, 9 (due Monday)
2) "Reading Notes" – fill in using textbook
   - Needs to be done before the chapter test
   - You are responsible for this information