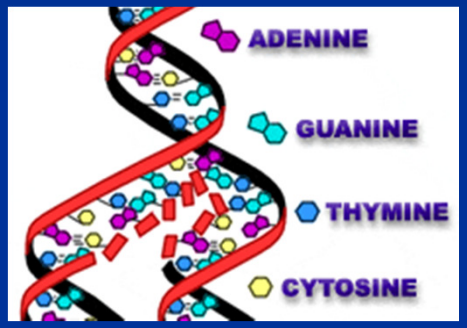
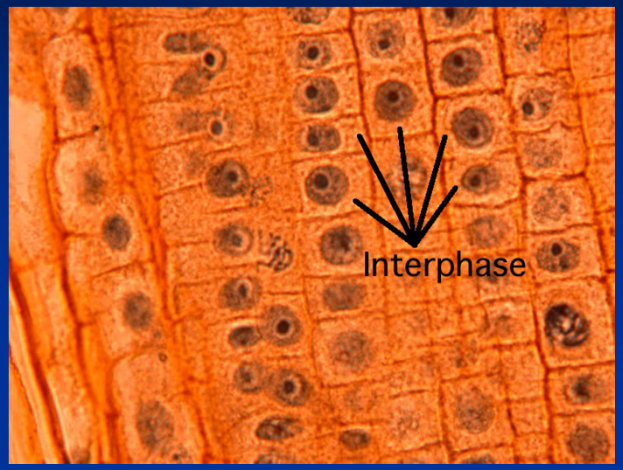
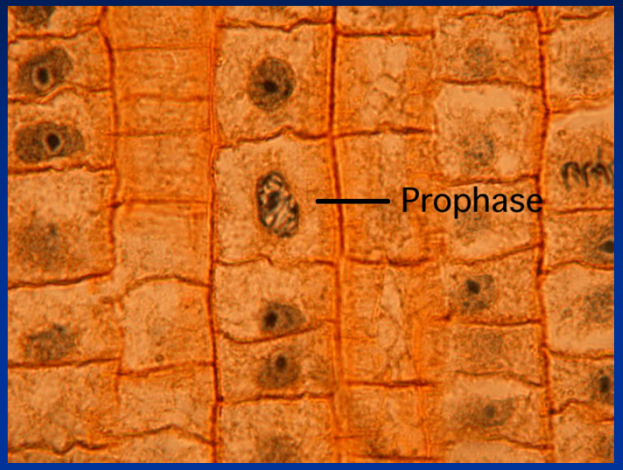
Chromosomes, Mitosis & Meiosis

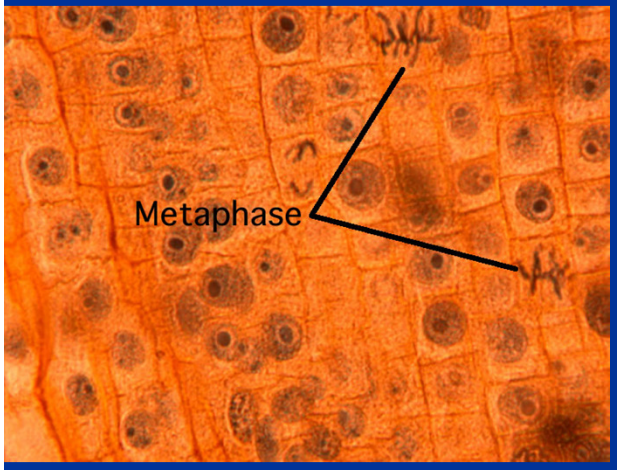


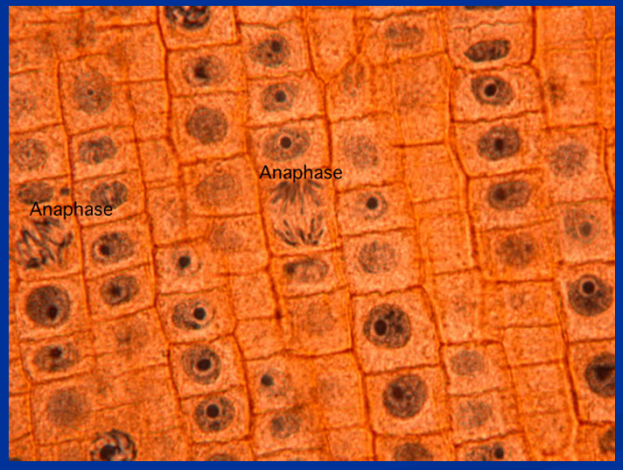
- Chromosome Anatomy
- Cross over (swapping gene)
- Mitosis vs Meiosis

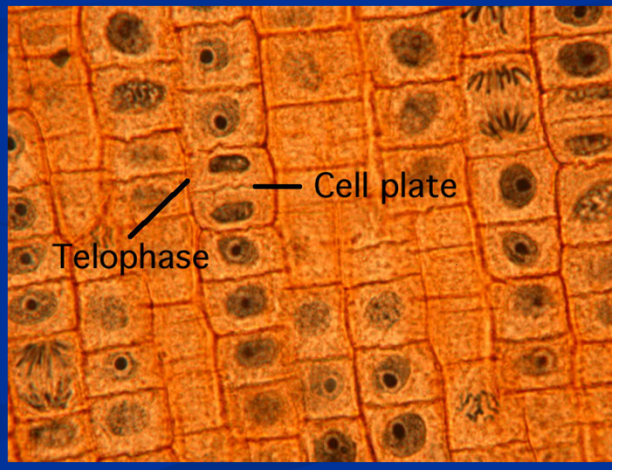
Review of Mitosis







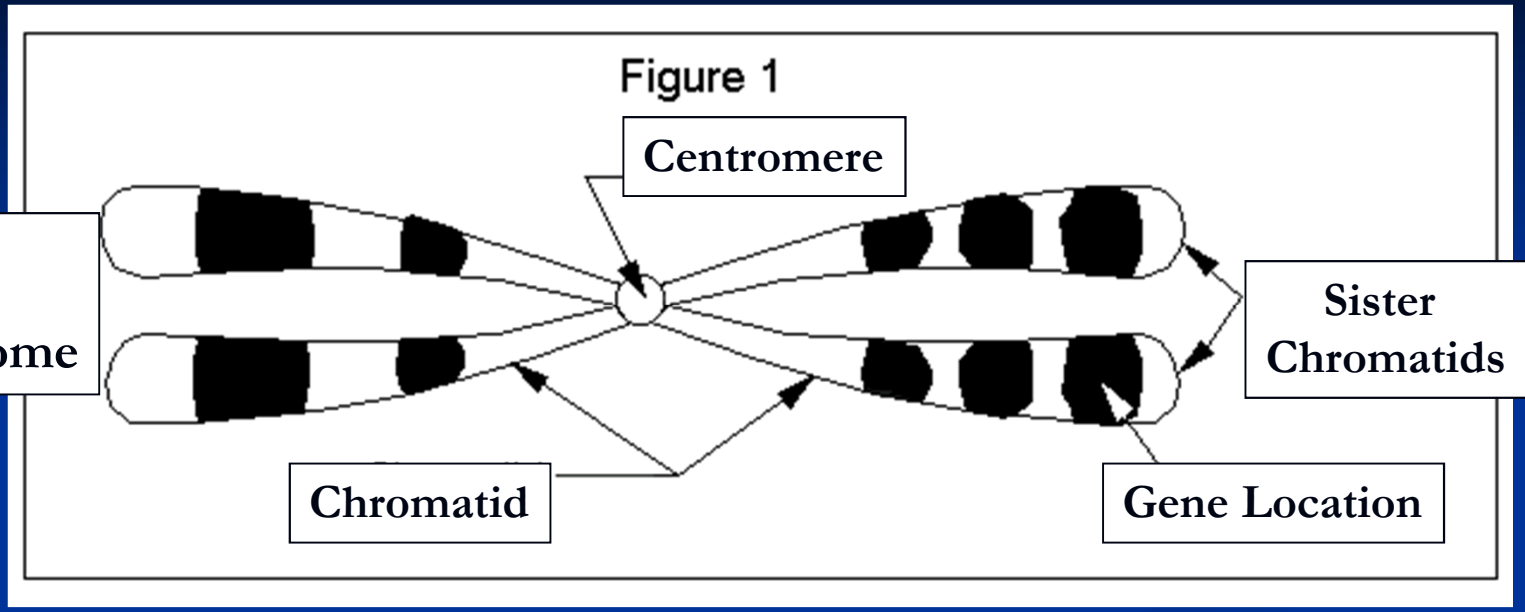




Mitosis Movies

Mitosis Animation

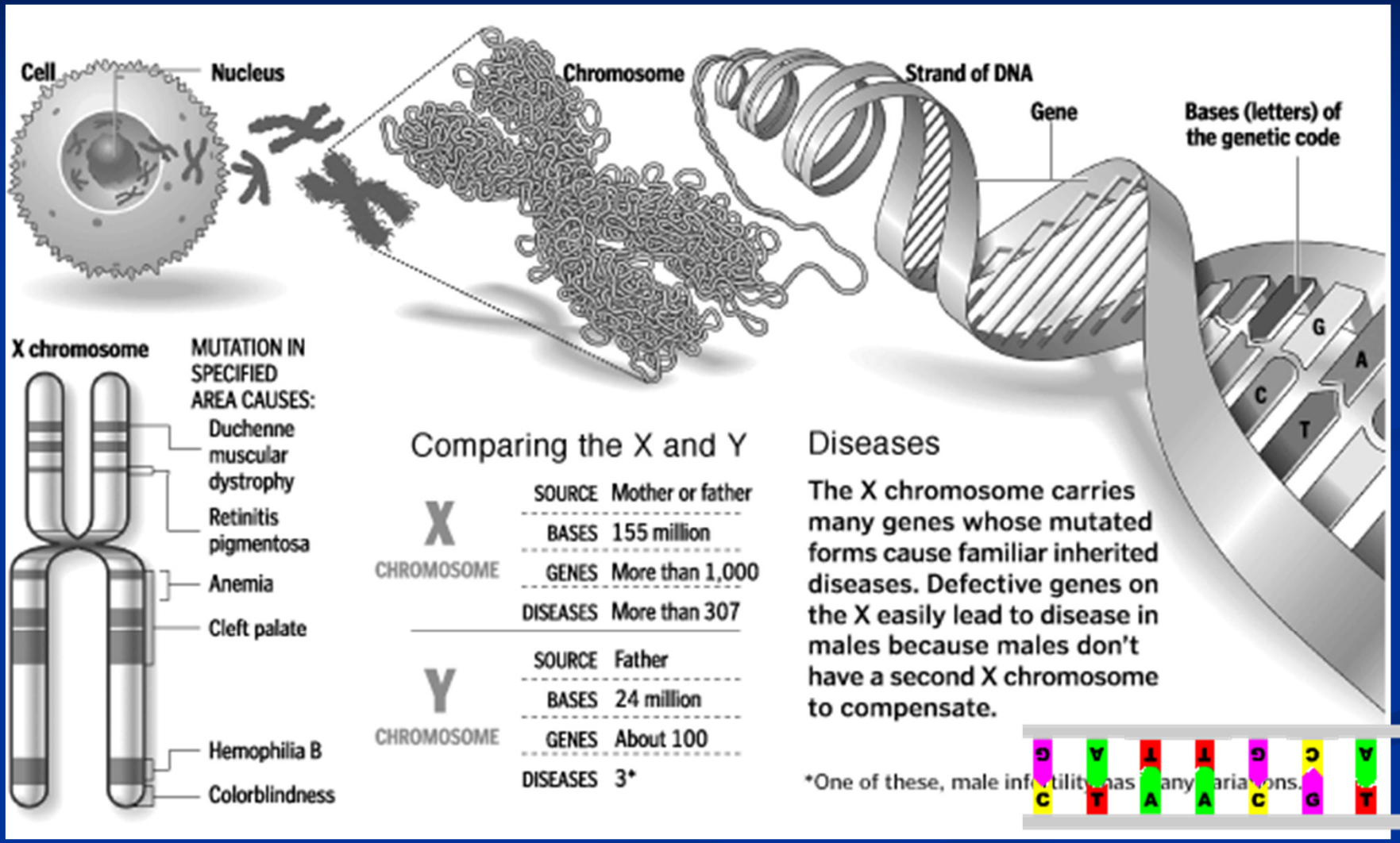
Chromosome Anatomy!



- DNA is found in a long thread called CHROMATIN
- Chromatin is condensed (coiled up) into CHROMOSOMES

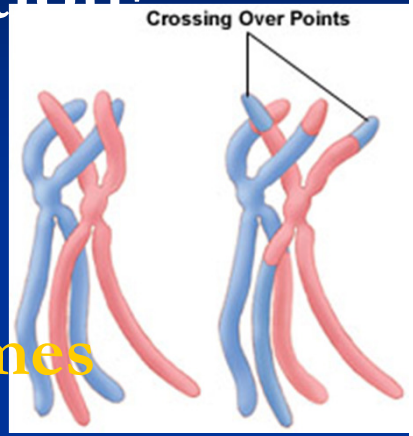
- A Chromosome is made of 2 SISTER CHROMATIDS
- 1 Chromosome is from MOM, the other is from DAD
- The 2 Chromatids are joined by the CENTROMERE

Another View of Chromosomes!



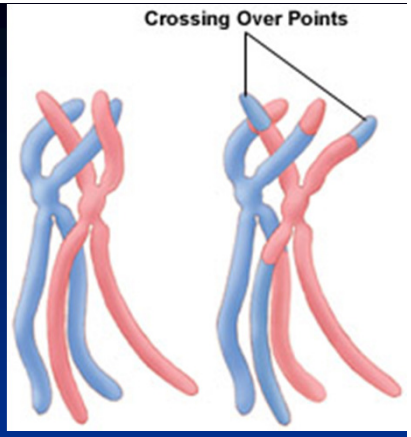
Crossover:

- Name 1 advantage of sexual reproduction?
- Crossover ensures VARIATION!
- Definition:
  - When 2 pairs of Homologous chromosomes line up together & swap genes
  - Occurs during PROPHASE I of MEIOSIS
  - Homologous = similar not identical chromosomes
  - Each chromosome you possess is similar not identical as 1 came from MOM & the other from DAD!



Crossover Process:

1) In S phase (of interphase) each chromosome duplicates itself into 2 sister chromatids!
2) In Prophase 1 crossover occurs as shown:



Homologous pairs:
1 from MOM, other from DAD =
Similar not identical!

Point of Crossover = Synapsis

(a)

(b)

(c)

Centromeres

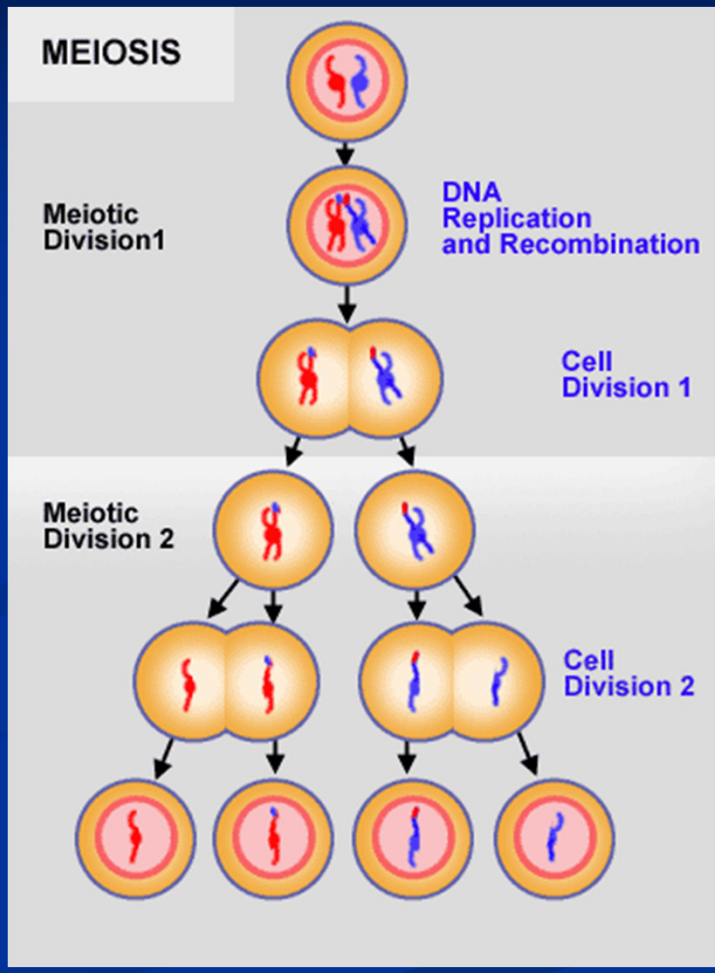
At the end of Meiosis I you get 2 unique haploid cells as shown!

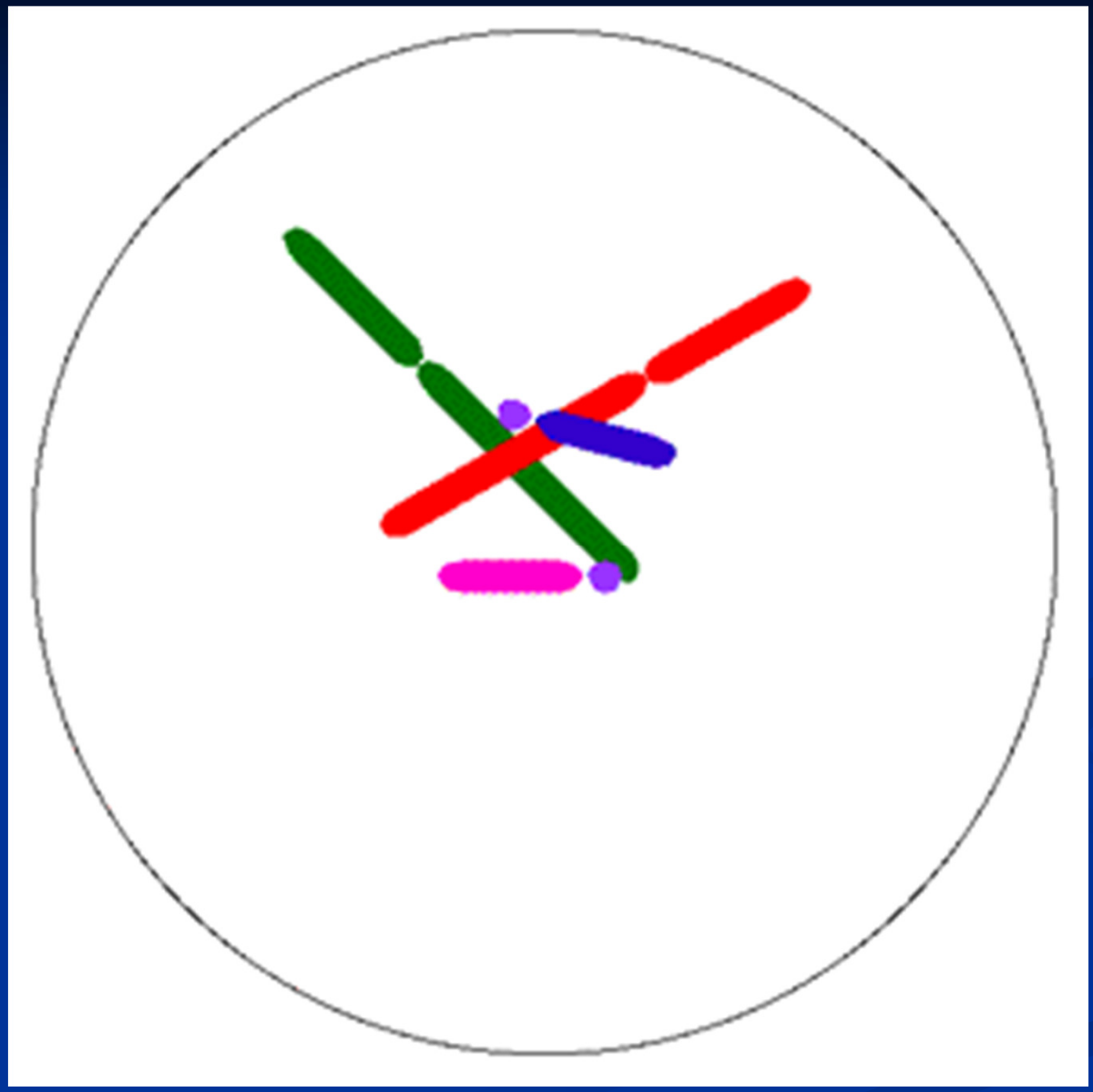
Sister Chromatids:
Exact copies of each other from S phase of cell cycle!

Crossover points occur at random & may occur at multiple spots!

Crossover Animation:

- Meiosis occurs in 2 steps
- Step 1 (variation step) involves Crossover
  - Diploid (2n) to Haploid (n)
  - Crossover occurs during which phase of meiosis?
- Step 2 (reduction step): the 2 unique haploid cells that emerged will reduce replicated copy
  - Replicated haploid (n) to unreplicated Haploid (n).
  - Forming a TETRAD of gametes





Mitosis vs Meiosis

- Produces body cells (**SOMATIC**)
- Occurs all throughout the body
- **Short** Prophase
- 1 nuclear division/cycle (PMAT)
- Chromosome pairs replicate in S-Phase

- Produce sex cells (**GAMETES**)
- Occurs only in the gonads
- **Longer** Prophase because of crossover
- 2 nuclear divisions/cycle (PMAT I & II)
- Chromosome pairs replicate in S-Phase

Mitosis vs Meiosis

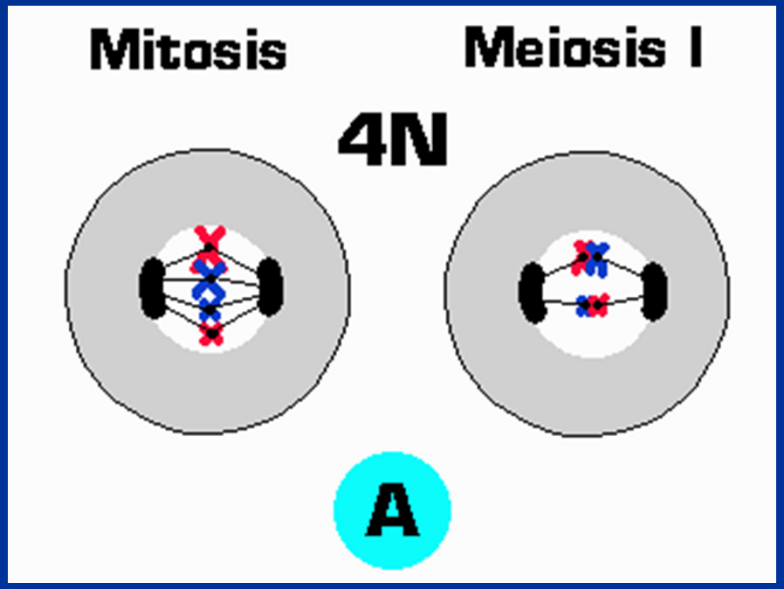
- 2 identical DAUGHTER cells are produced
- Mitotic products **are** capable of further mitotic divisions
- **Genetic content of the Daughters is identical**
- Start with Diploid cells
- **End up with Diploid cells!**
- Products are cells necessary for **growth & repair!**

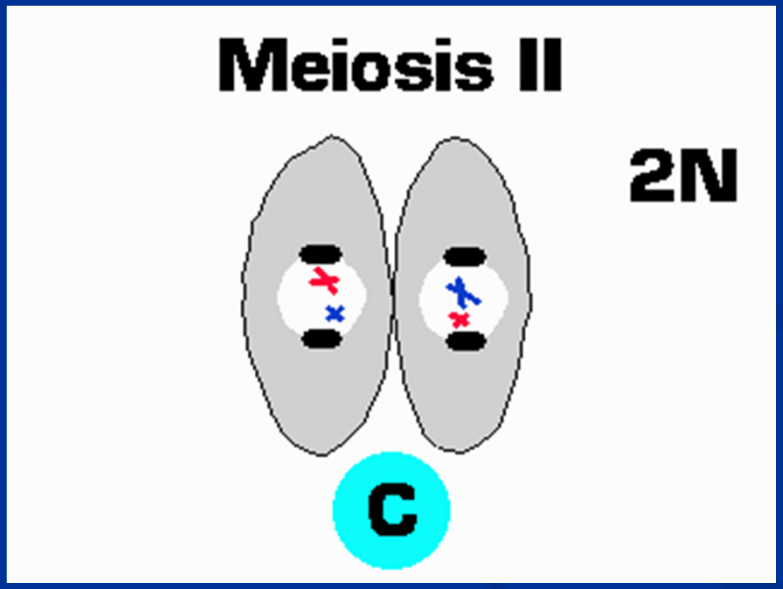
- 4 un-identical **TETRADS** are produced
- Meiotic products are **NOT** capable of further divisions
- **Genetic content of the Tetrads is scrambled due to crossover**
- Start with Diploid cells
- **End up with Haploid cells!**
- Products are necessary for **reproduction**!

The Skinny on Meiosis!

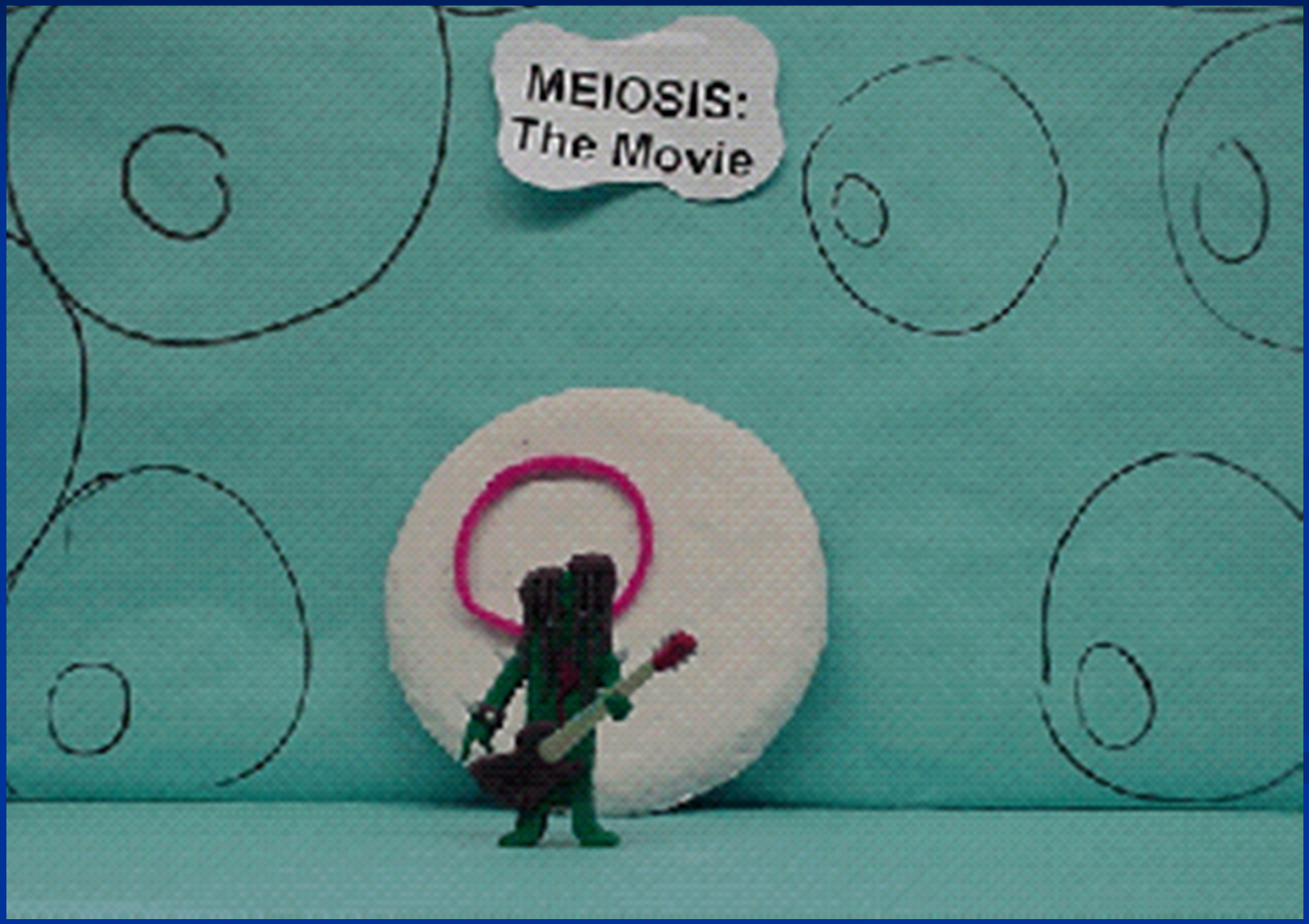
- **Mitosis**: ensures that the daughter cells have the same number of chromosomes as the parent cells!
- **Meiosis**: ensures that the daughter cells have ½ (1n) the number of chromosomes as the parent cells (2n)!
  - This is not normal, however it is necessary for reproduction
  - When fertilization occurs, the ***SPERM*** & ***EGG*** combine their chromosomes to make a 2n cell

Meiosis vs Mitosis Animations

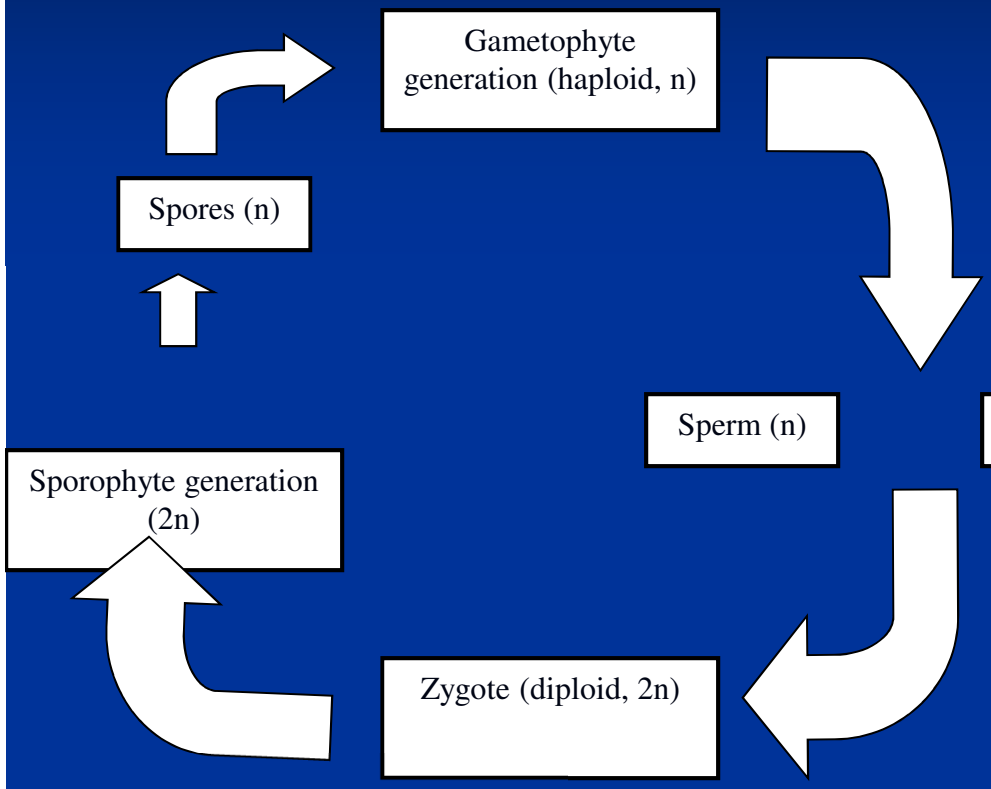


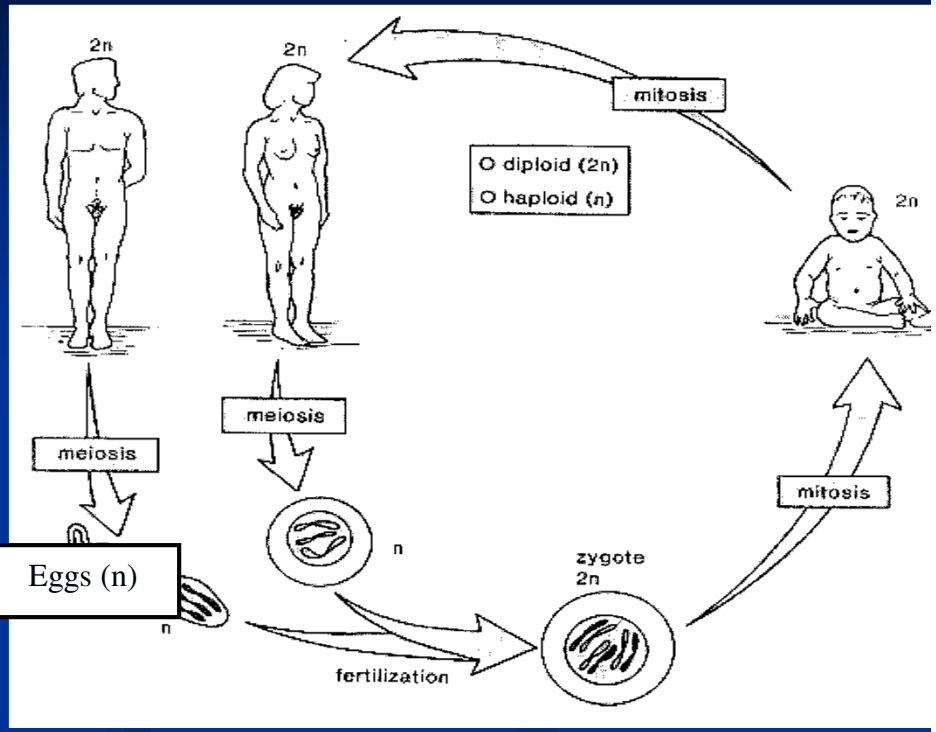


Meiosis: The Movie!



Alternation of Generations & Ploidy Number

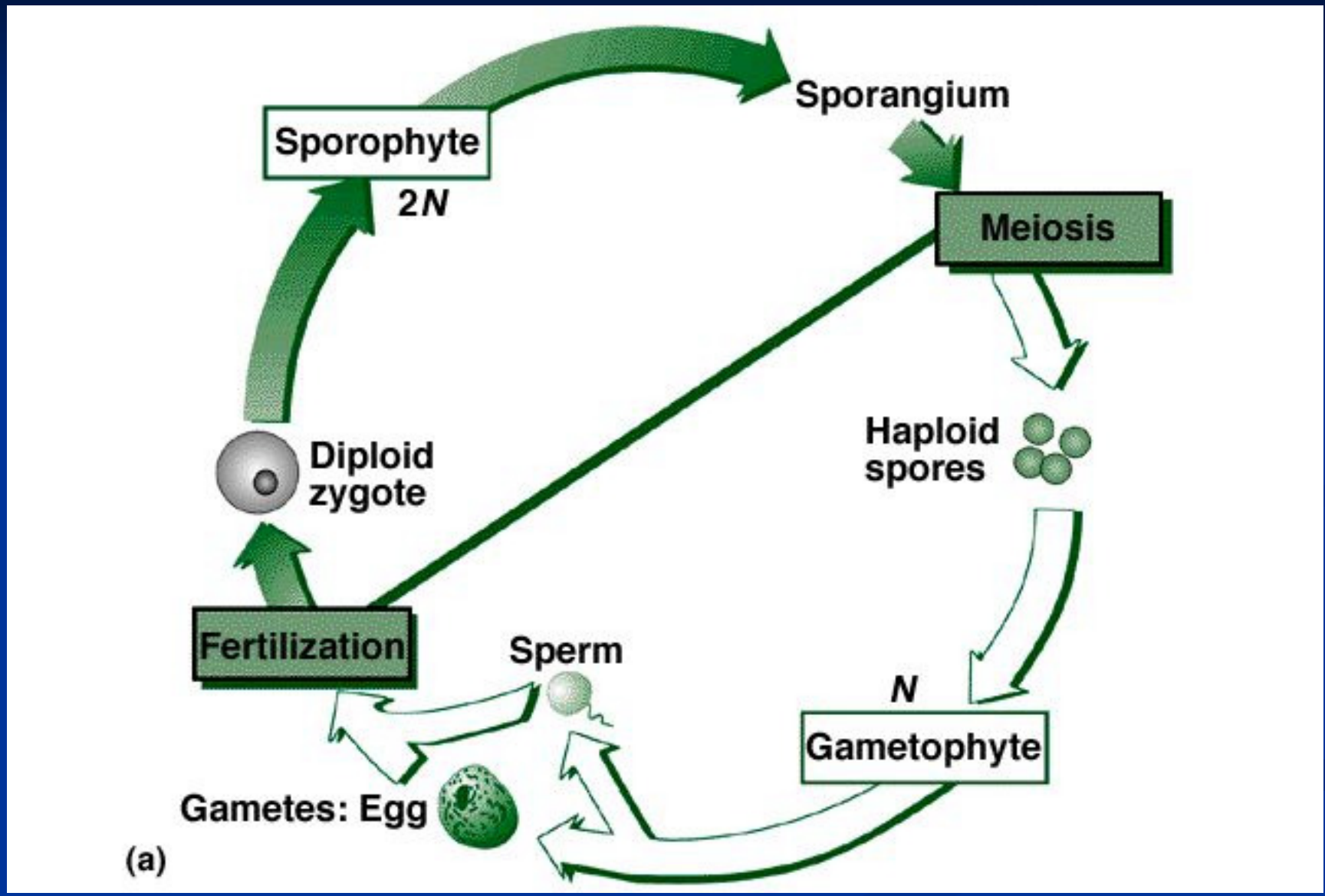


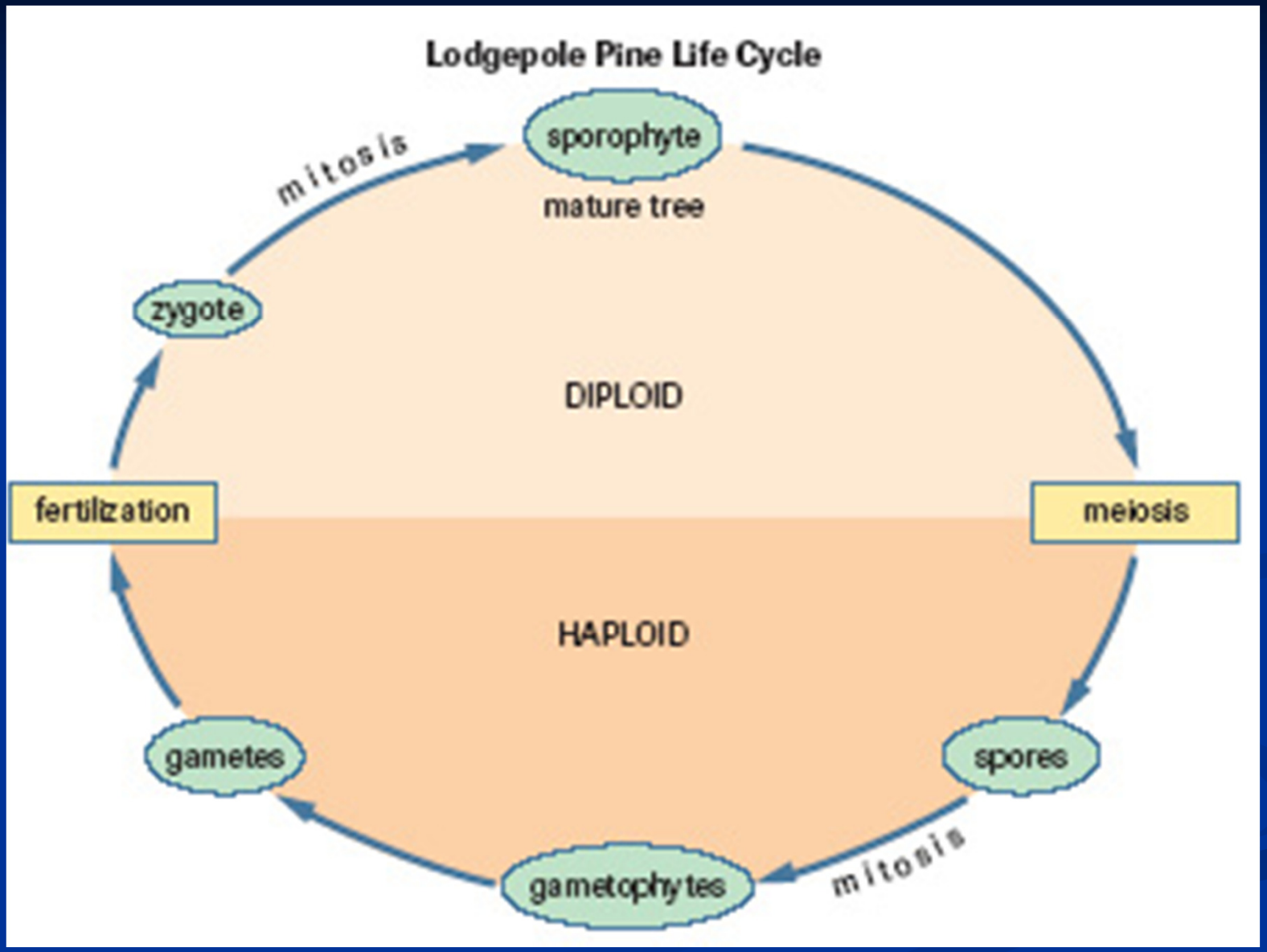


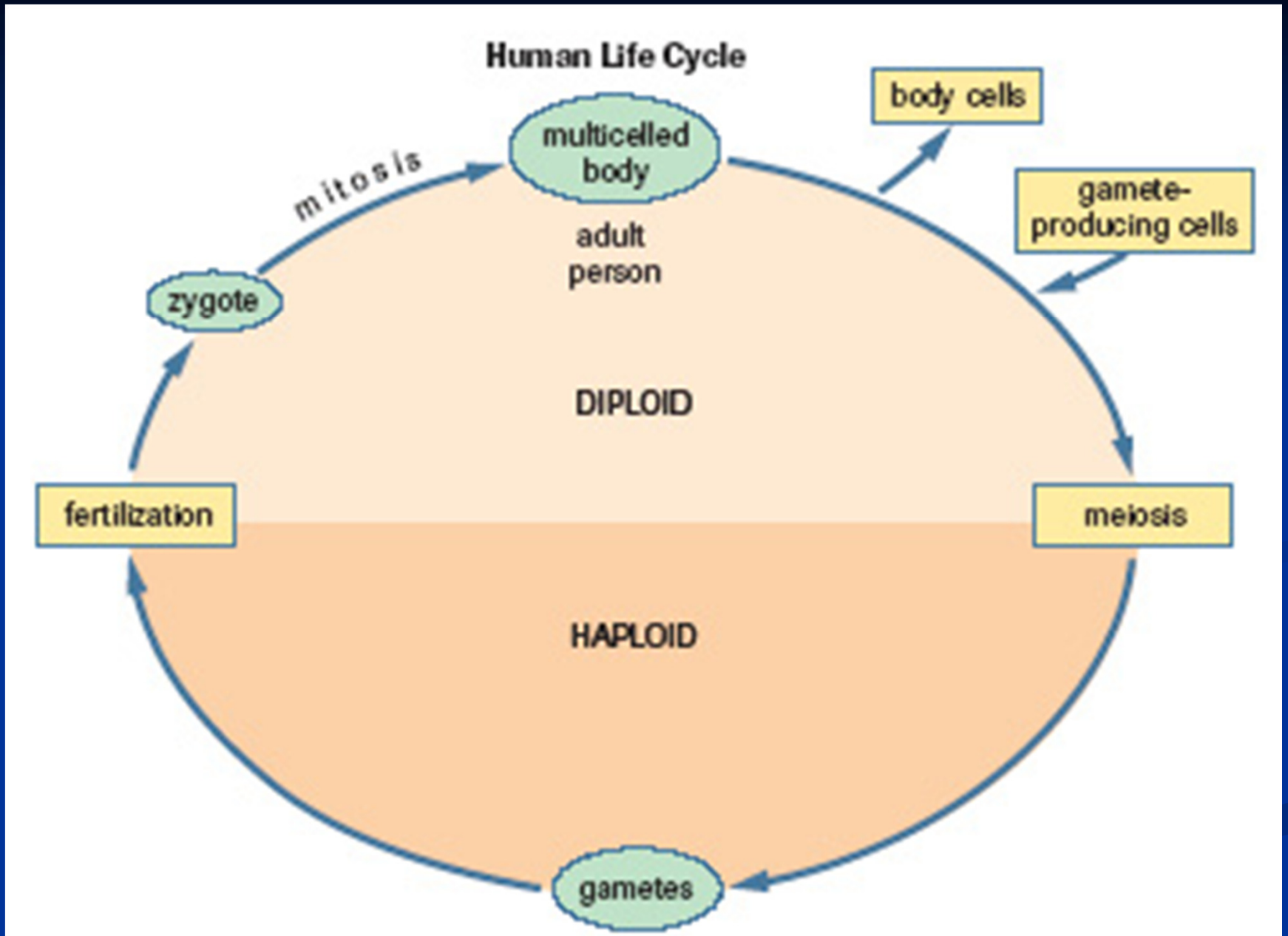
Unlike Humans, some organisms spend a significant portion of their lives in the HAPLOID (n) form.

Things to Remember:

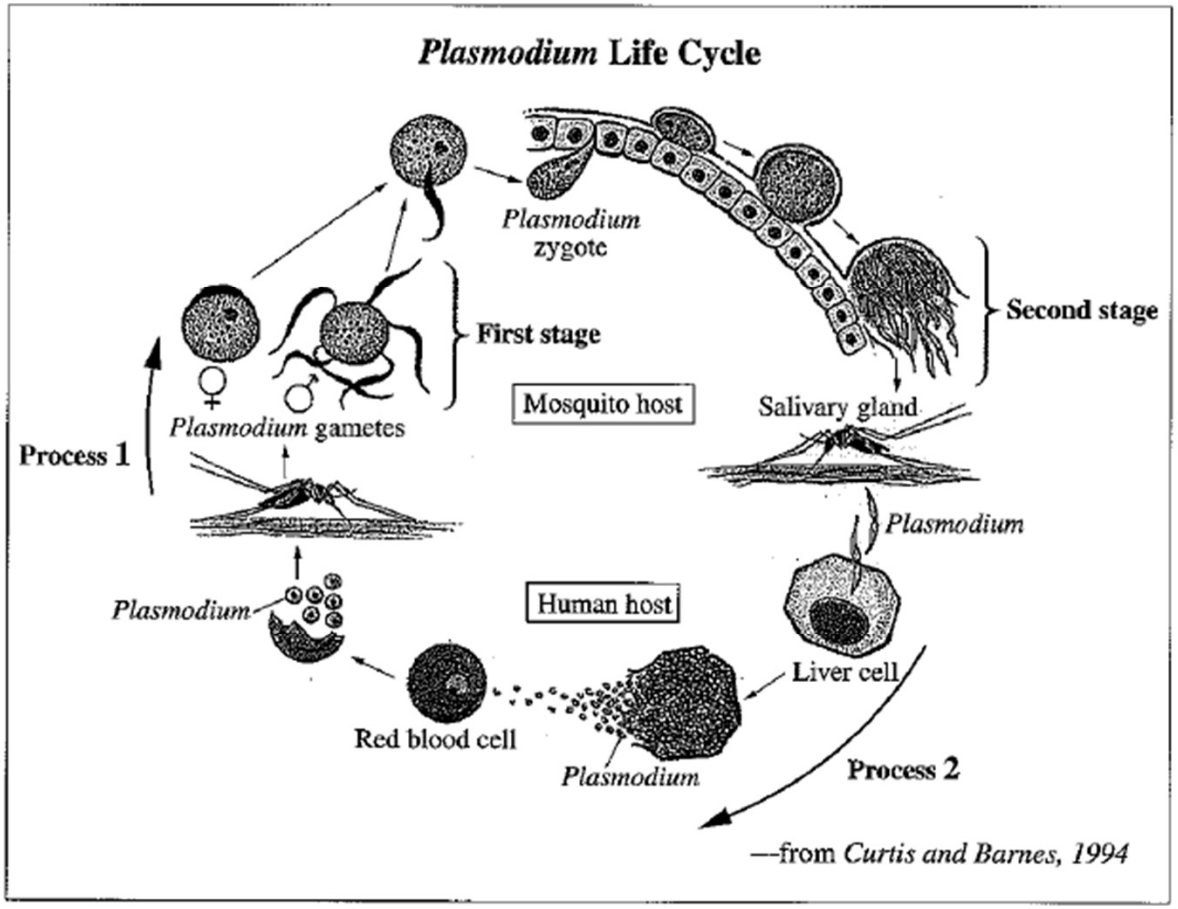
- Important Processes:
  - Fertilization = n + n → 2n
  - Meiosis = 2n → n
  - Mitosis (maintains chromosome #)
    - 2n → 2n or n → n


Sporophyte
2N
Sporangium
Meiosis
Haploid
spores
Diploid
zygote
Fertilization
Sperm
N
Gametophyte
Gametes: Egg
(a)


Lodgepole Pine Life Cycle
sporophyte
mature tree
mitosis
zygote
DIPLOID
fertilization
meiosis
HAPLOID
gametes
spores
gametophytes
mitosis


Human Life Cycle
multicelled body
body cells
gamete-producing cells
adult person
mitosis
zygote
DIPLOID
fertilization
meiosis
HAPLOID
gametes

Use the following additional information to answer the next two questions.



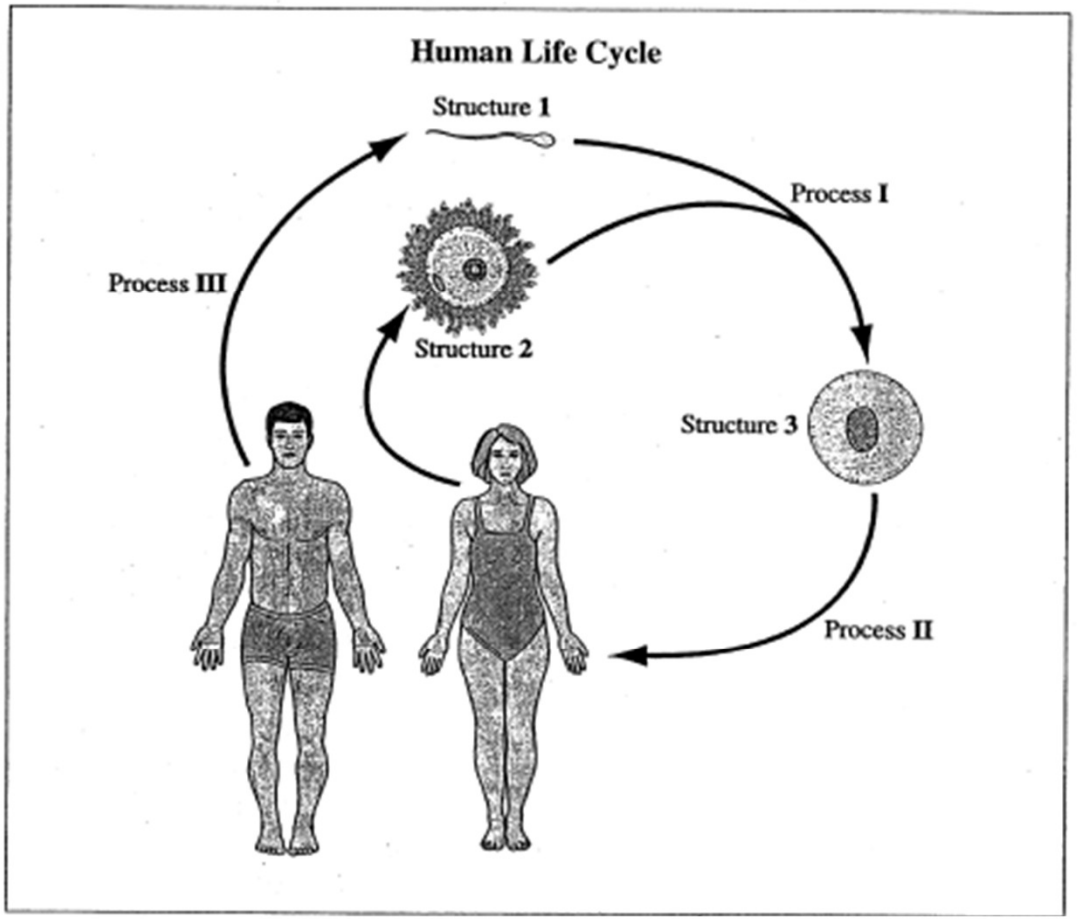
37. The row below that identifies process 1 and process 2 is

Row	Process 1	Process 2
A.	mitosis	meiosis
B.	mitosis	mitosis
C.	meiosis	mitosis
D.	meiosis	meiosis

38. The row below that identifies the chromosome number at the first stage and the chromosome number at the second stage is

Row	First stage	Second stage
A.	diploid	haploid
B.	diploid	diploid
C.	haploid	diploid
D.	haploid	haploid

Use the following diagram to answer the next two questions.



10. The chromosome content of structures 1, 2, and 3 in the diagram above is, respectively,

A. n, n, and $2n$
B. $2n$, $2n$, and n
C. n, $2n$, and $2n$
D. $2n$, $2n$, and $2n$

Chapter 17 Review Assignment

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