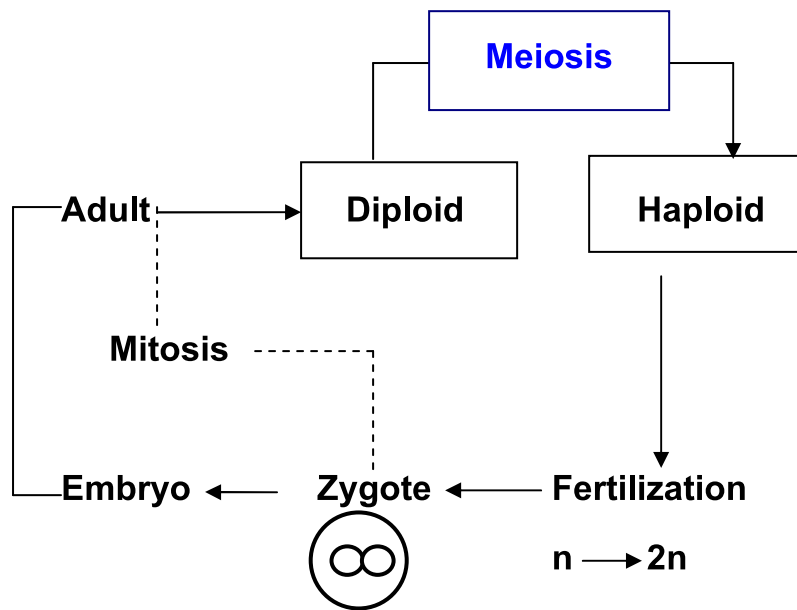




Biology

อ.เกษม ศรีพงษ์

The tutor (Siam Square)

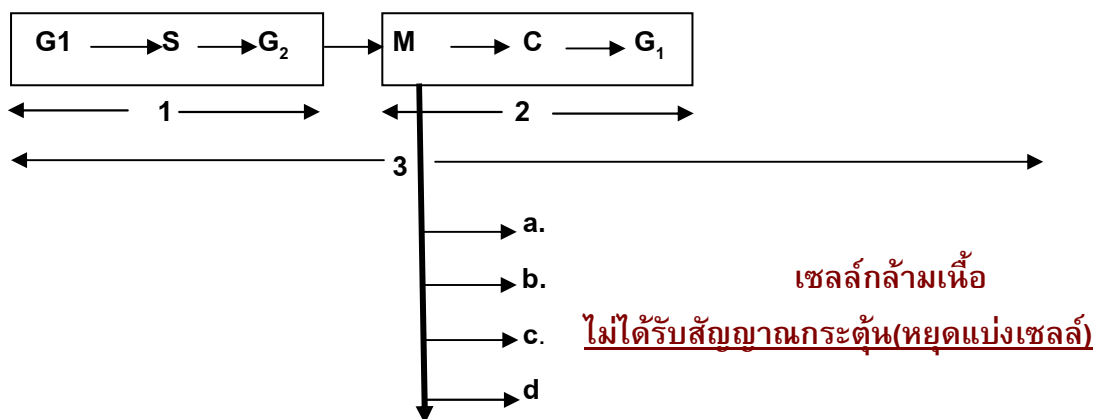


กระบวนการดังกล่าวคืออะไร?

1. $2n \rightarrow n$ = **Meiosis**
2. $2n \rightarrow 2n$ = **Mitosis**
3. $n \rightarrow n$ = **Parthenogenesis**
4. $n \rightarrow 2n$ = **Fertilization**
5. $n, 2n$ = **Life cycle**

(Alternation of generation)

Cell Cycle





Mitosis

$2n \longrightarrow 2n$

$2n \longrightarrow n$

$2n \longrightarrow n$

- (1) Prophase
- (2) Metaphase
- (3) Anaphase
- (4) Telophase

FIGURE 8.3A
Stages of the cell cycle.

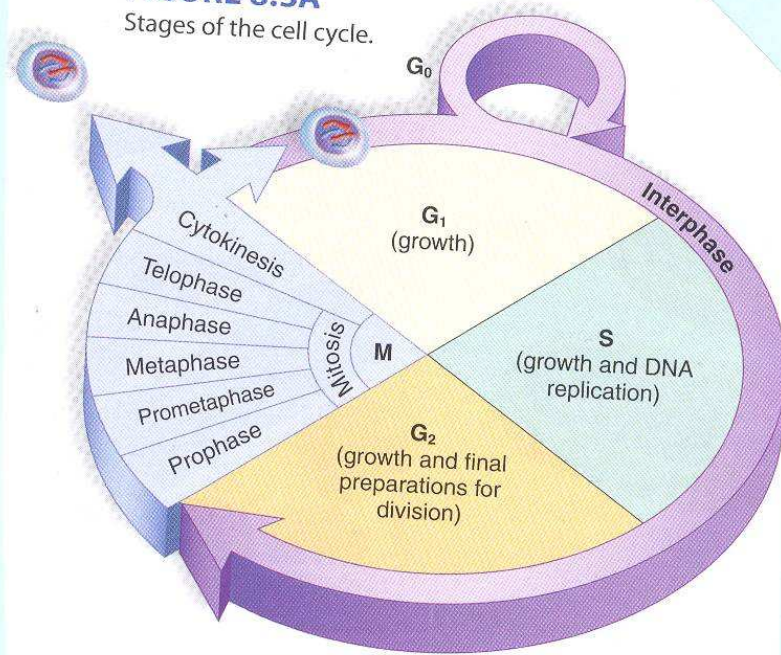
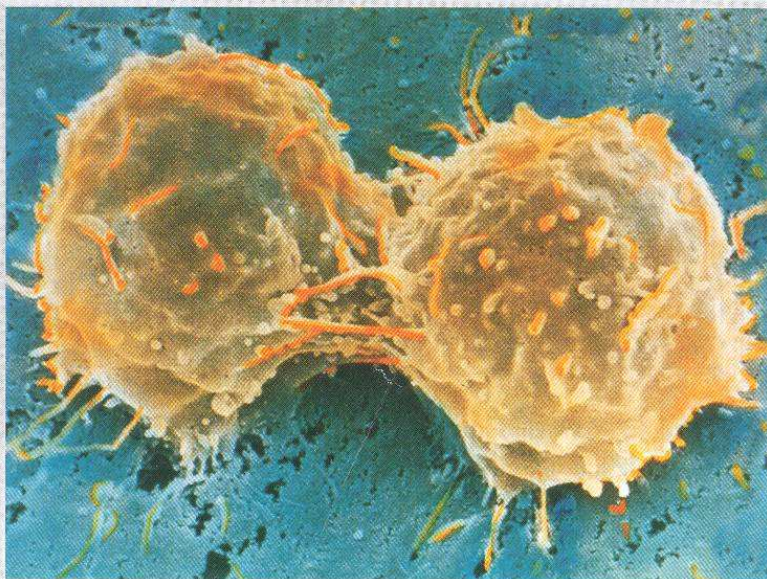


FIGURE 8.3B Cytokinesis (shown here) is a noticeable part of the cell cycle.



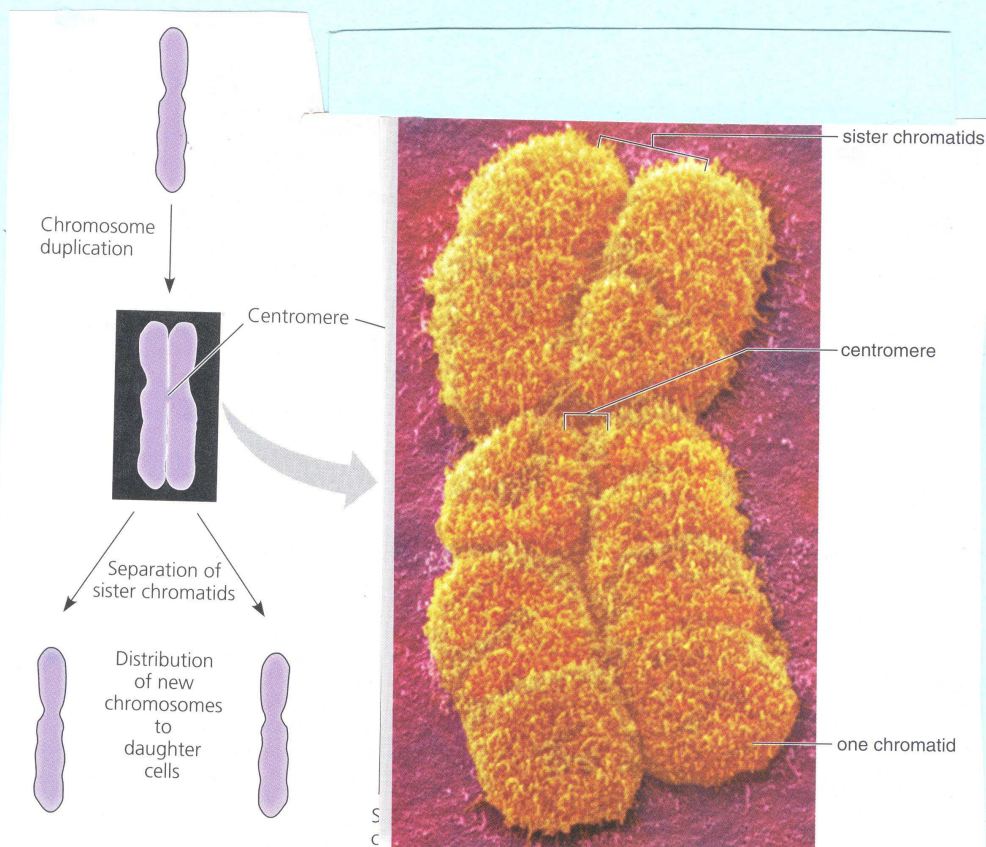
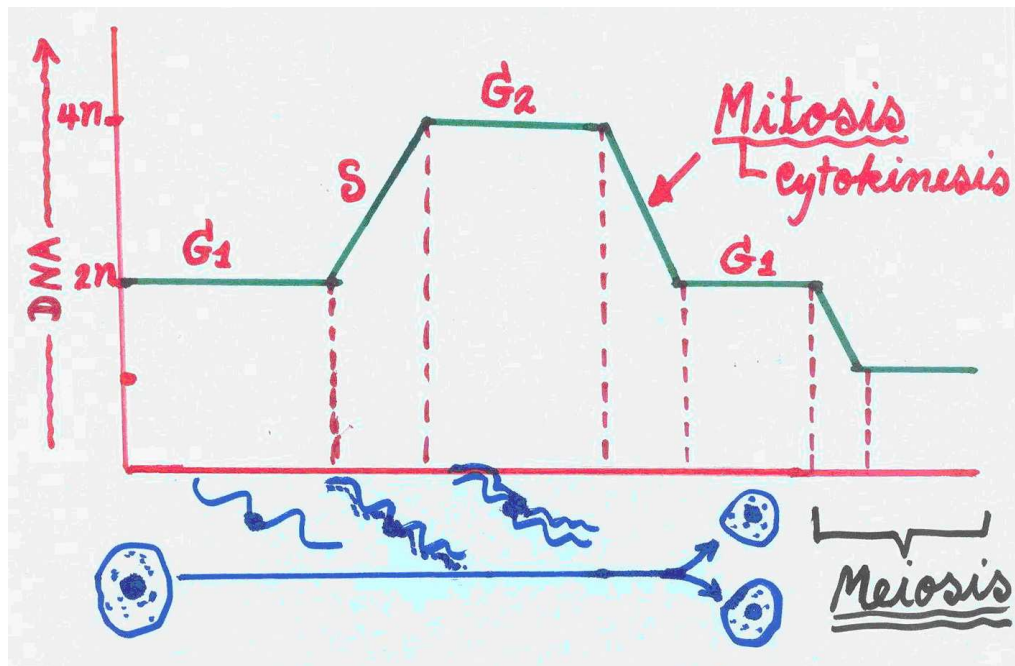
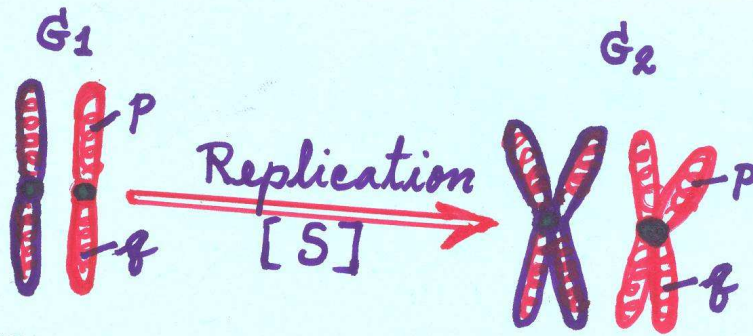


FIGURE 12.3 Chromosome duplication and distribution during mitosis.



1. DNA
2. Chromosome
3. Homologous

DNA
Chromosome
Homologous

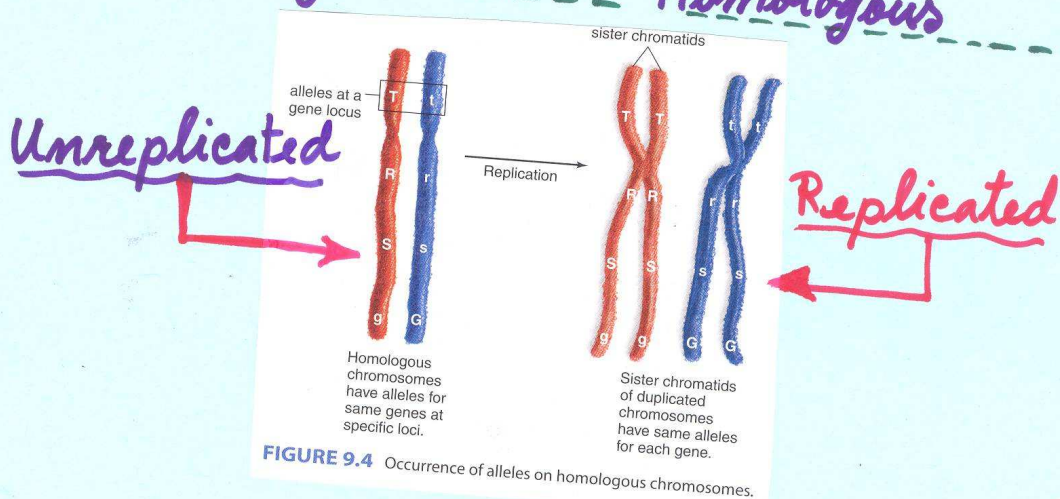
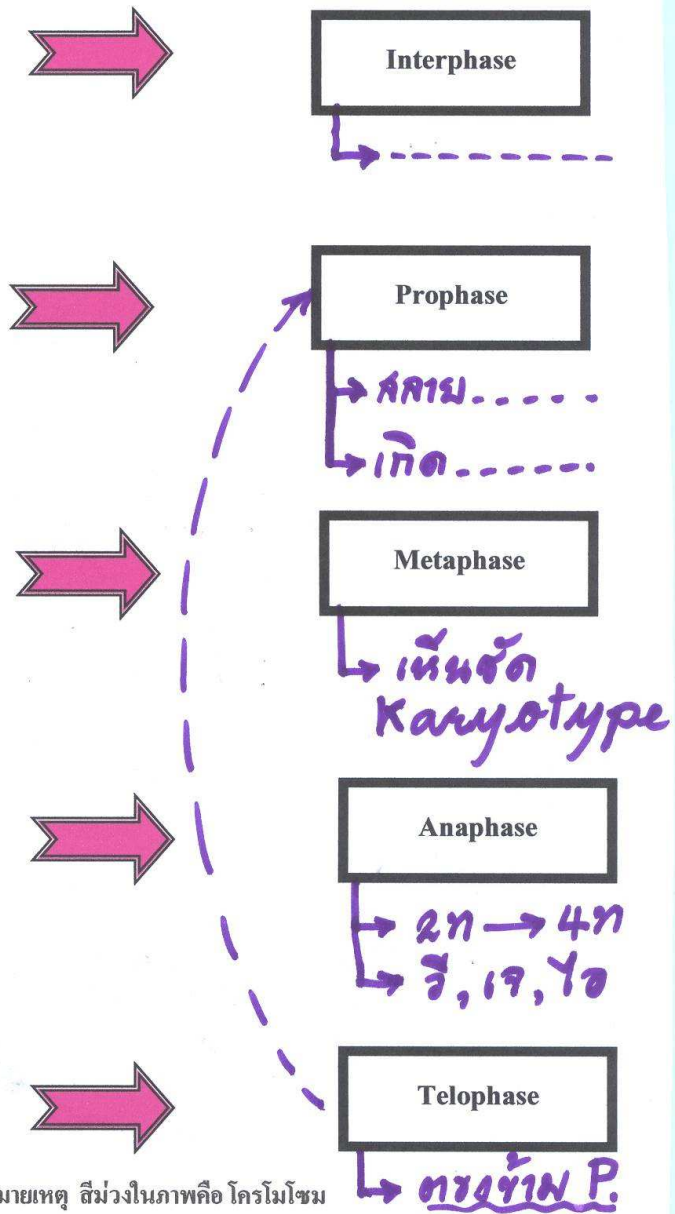
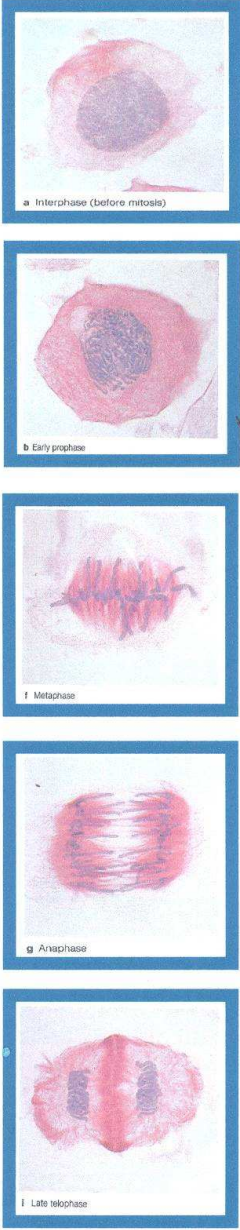


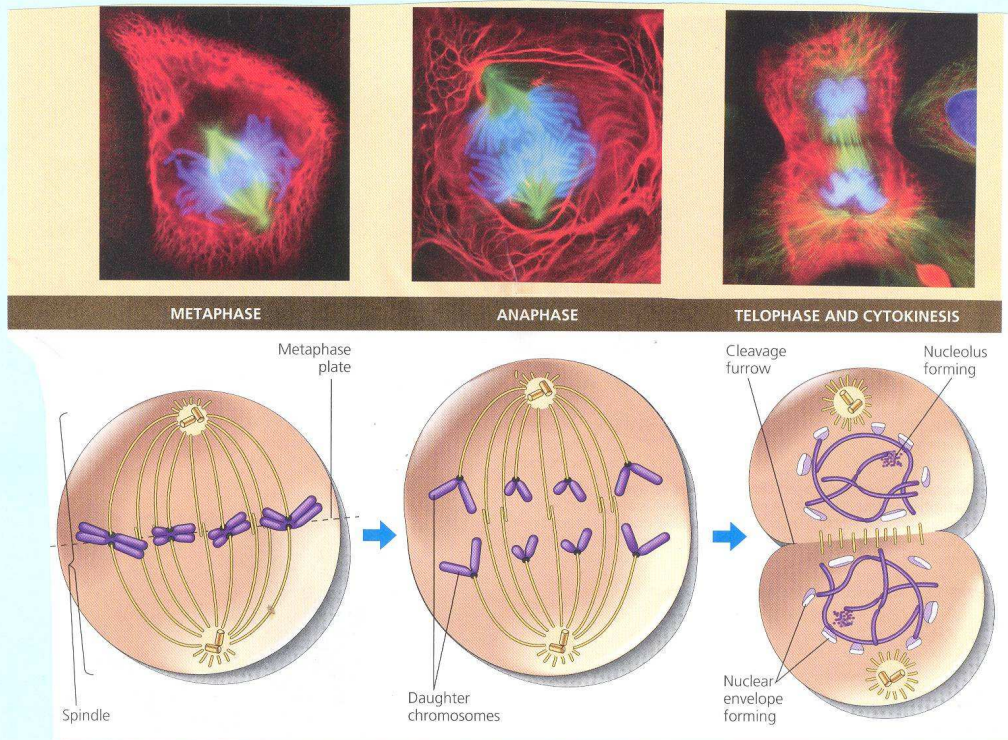
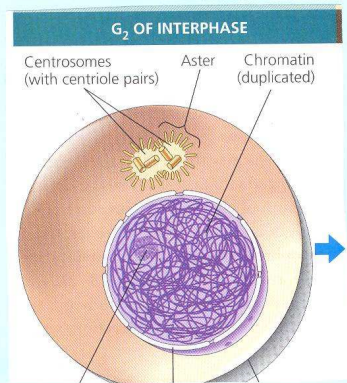
FIGURE 9.4 Occurrence of alleles on homologous chromosomes.

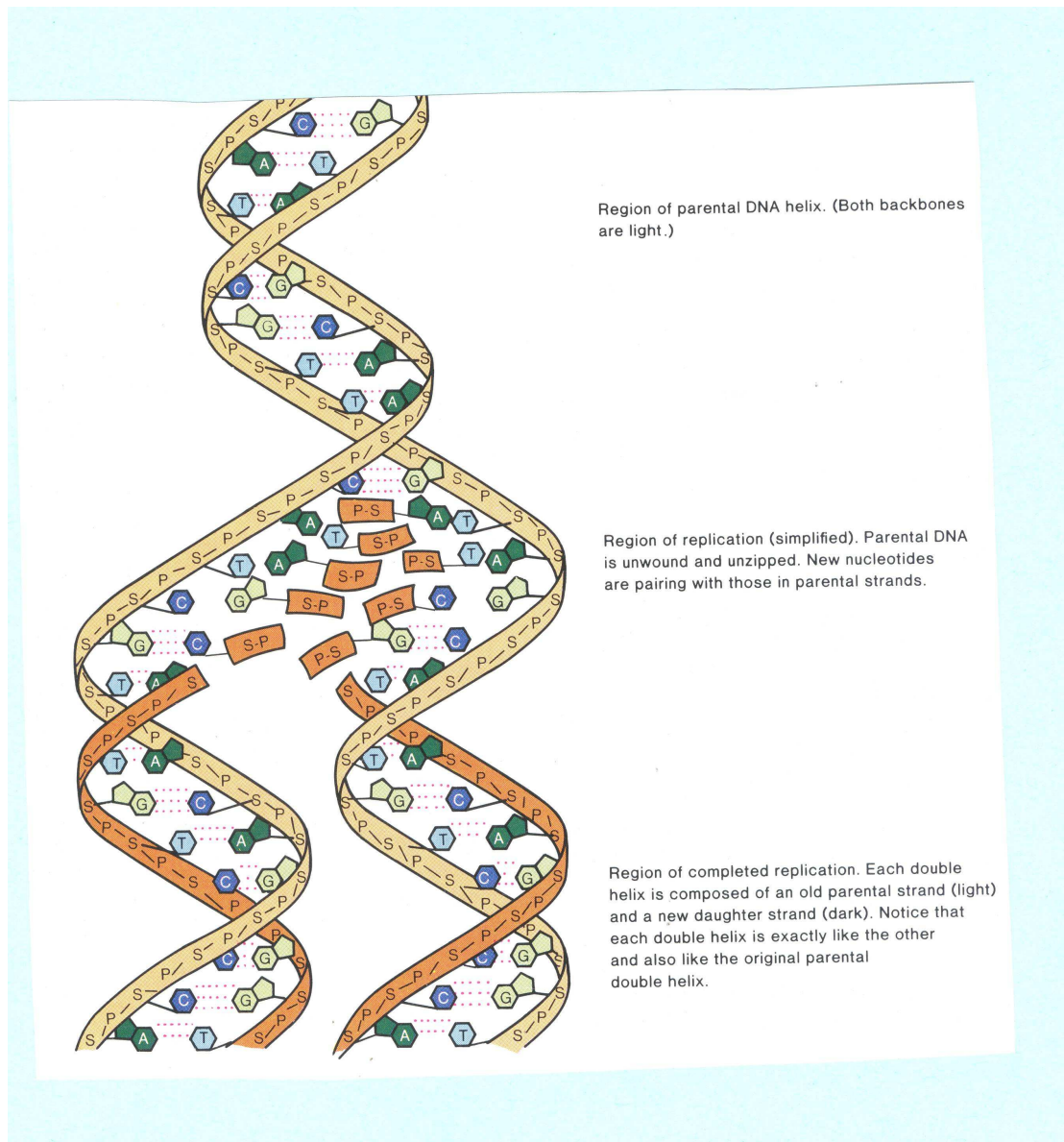
- Sister chromatid - - - - -
- Nonsister chromatid - - - - -

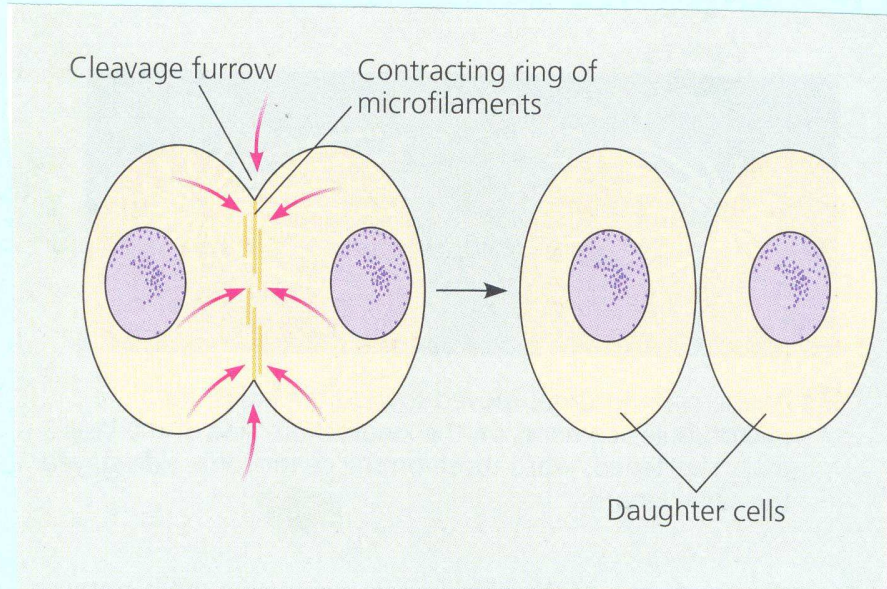
ภาพ ที่ 2.2 แสดงการแบ่งเซลล์แบบไมโทซิสระยะต่างๆ



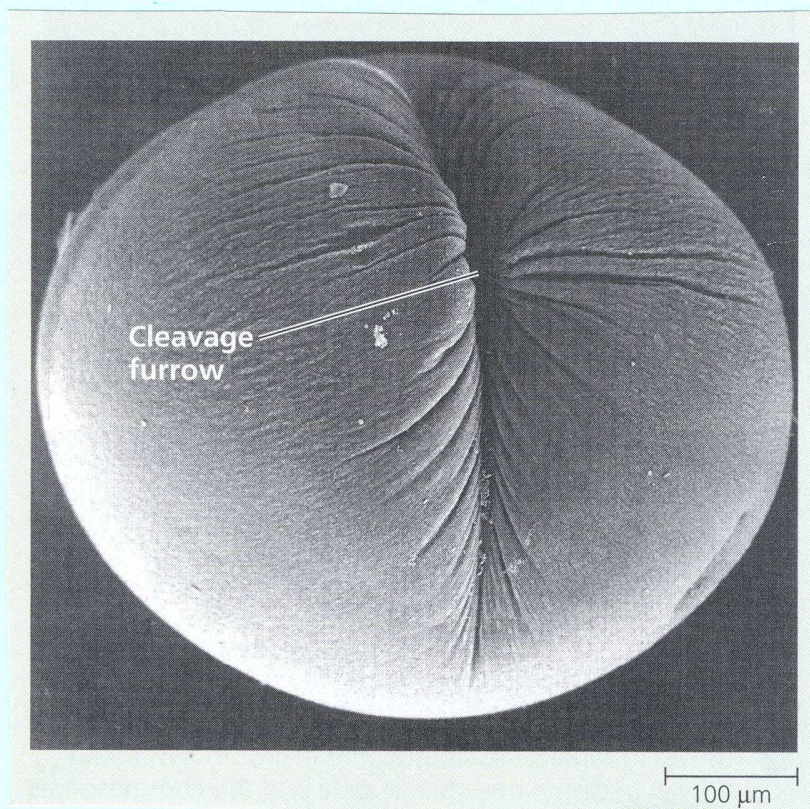
* หมายถึง สีม่วงในภาพคือ โครโมโซม

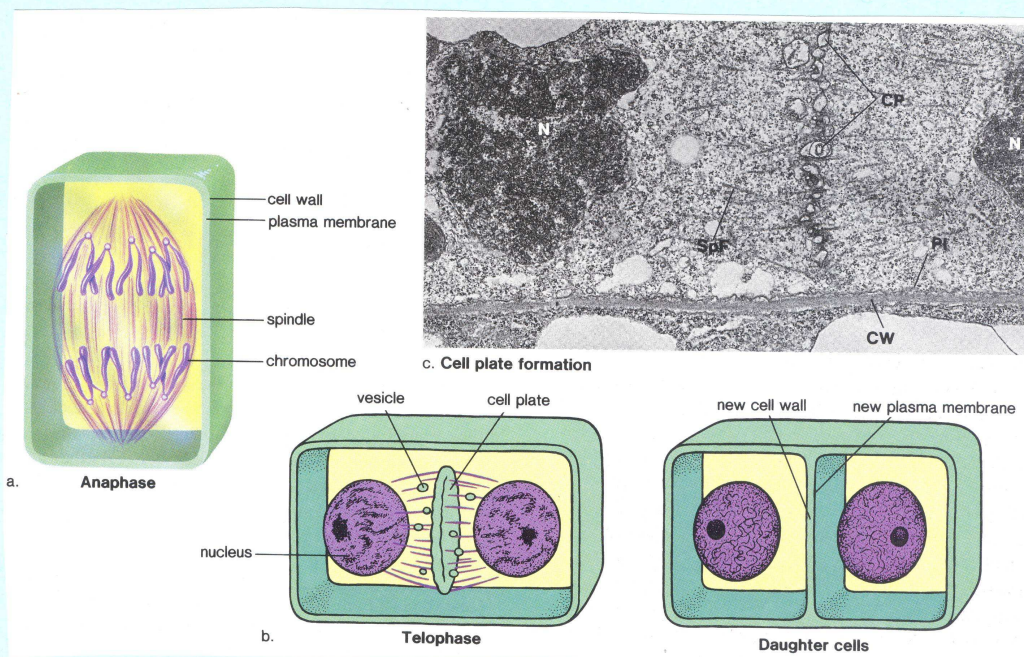




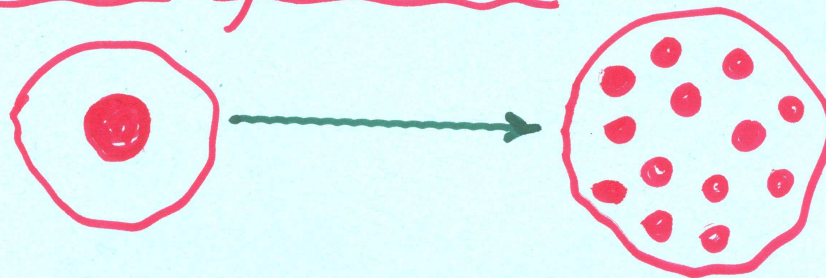


(a) Cleavage of an animal cell.





เซลล์ใหม่ *Cytokinesis*



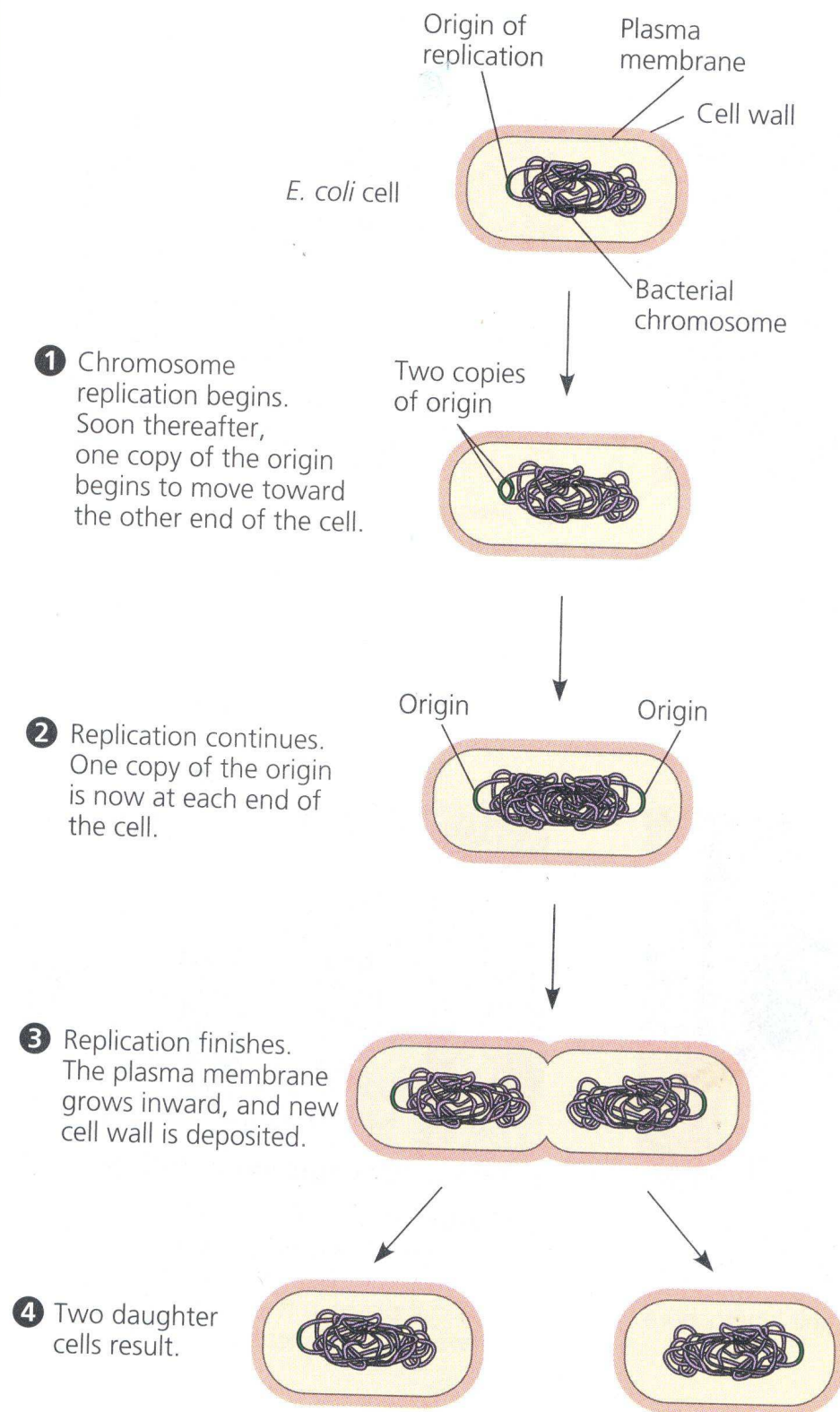
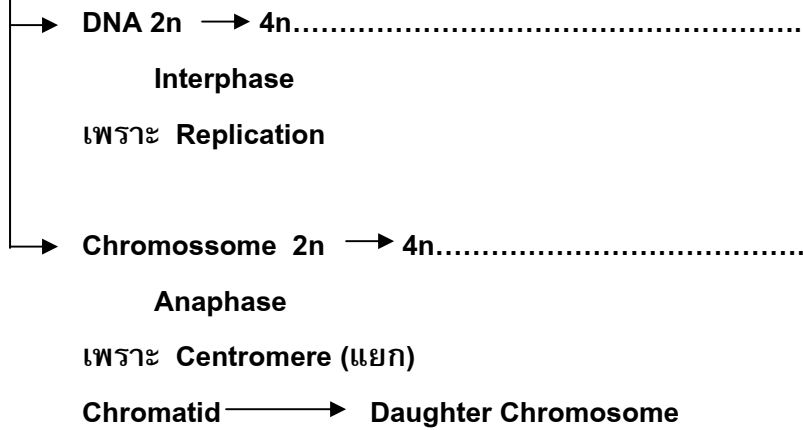


FIGURE 12.10 Bacterial cell division (binary fission).

ระยะใด

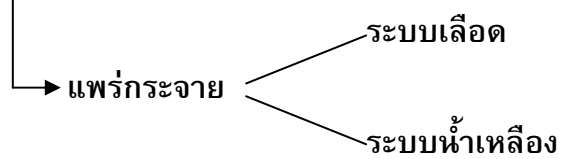


Mitosis (ผิดปกติ) $n \rightarrow n$

→ Tumor (เหืองอก)

1. Benign tumor (ไม่เป็นอันตราย)

2. Malignant tumor {Cancer}



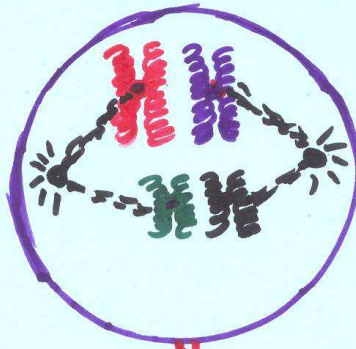
MITOSIS

ระยะ	DNA	Chromosome
1. Interphase	4n ↑	2n
2. Prophase	4n	2n
3. Metaphase	4n	2n
4. Anaphase	4n ← →	4n ↑
5. TeloPhase5	2n ↓	2n ↓

$2n = 4$

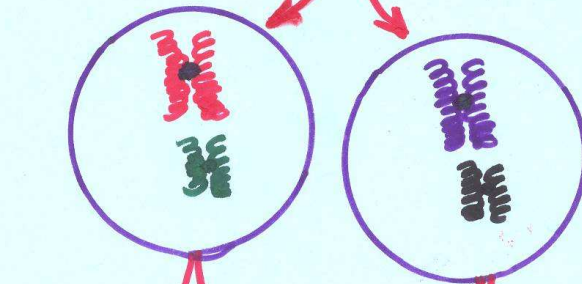
Meiosis

- Chromosomes - 4 -
- DNA - 8 -



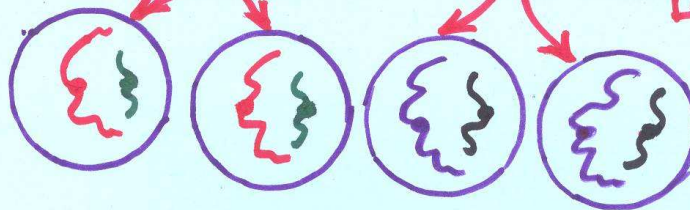
Meiosis I

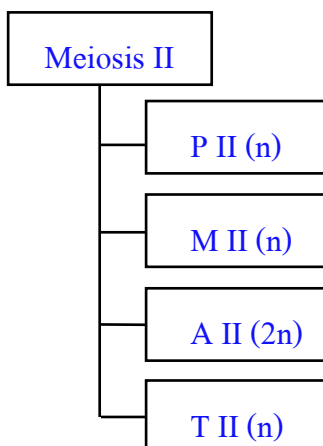
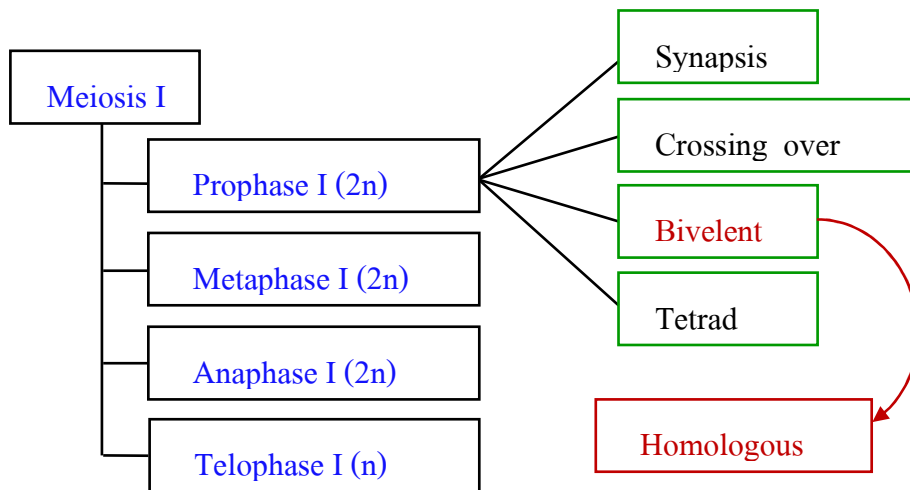
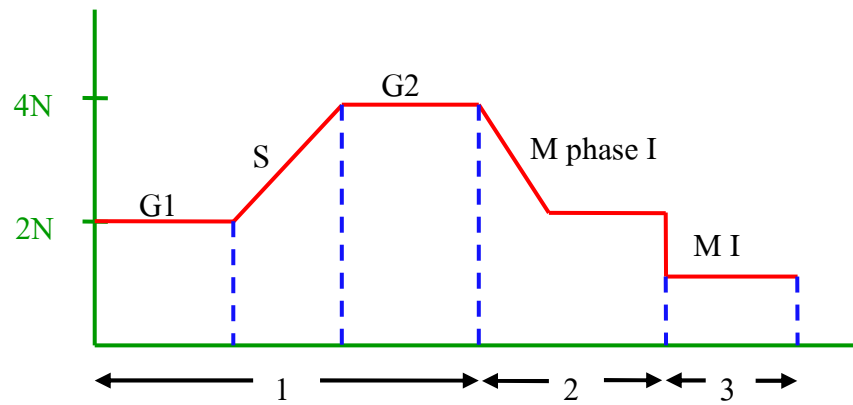
- Telophase I
- Chromosomes - 2 -
 - DNA - 4 -



Meiosis II

- Telophase I
- Chromosomes - 2 -
 - DNA - 2 -





Meiosis I	Meiosis II
P I ($2n$)	P II (n)
M I ($2n$)	M II (n)
* A I ($2n$)	A II ($2n$)
* T I (n)	T II (n)

Meiosis(จำนวนโครโมโซม)

Meiosis I

- $I_I = 2n$
- $P_I = 2n$
- $M_I =$
- $A_I = 2n$
- $T_I = n = I_{II}$

Bivalent

Tetrad

Crossing over

Meiosis II

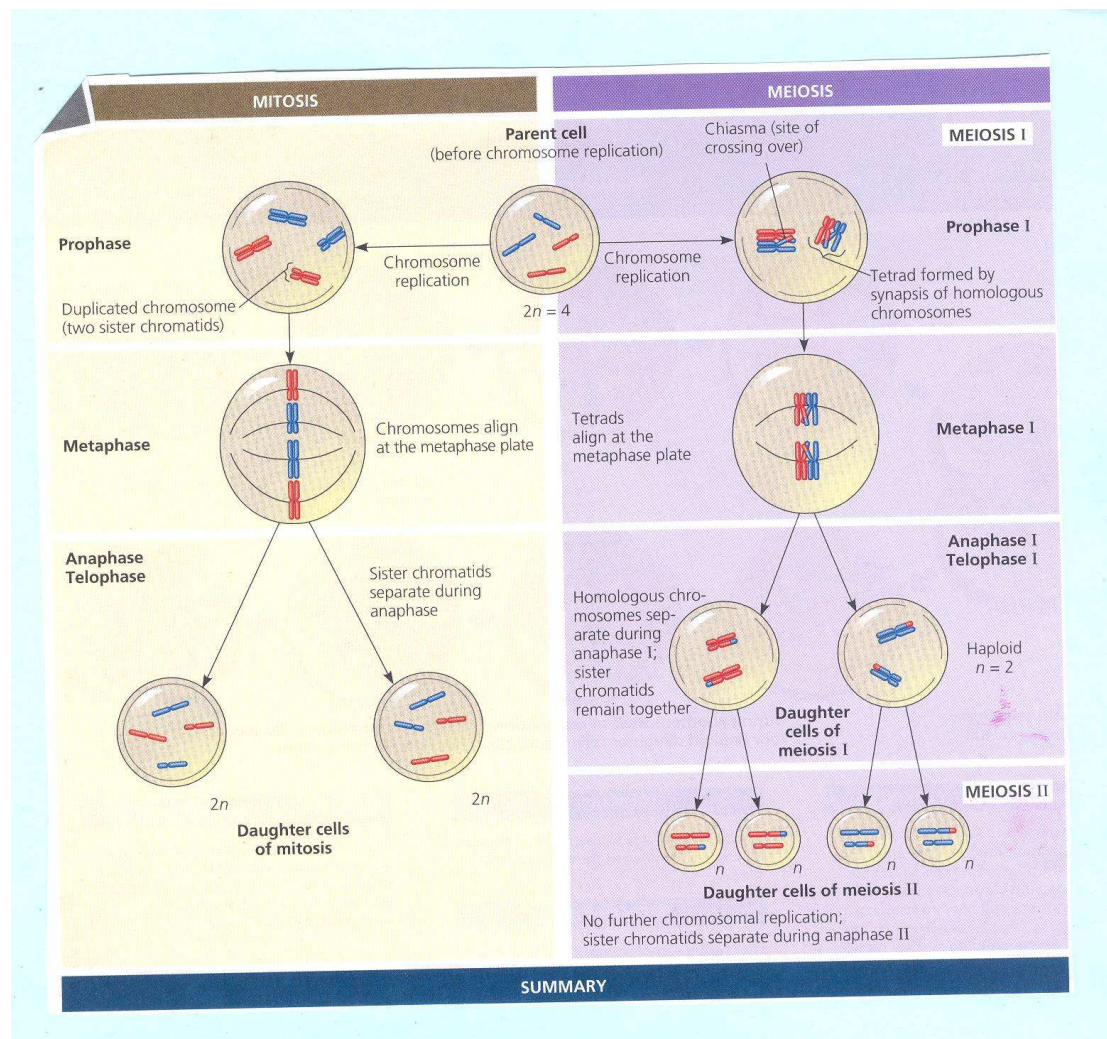
- $P_{II} = n$
- $M_{II} = n$
- $A_{II} = 2n$
- $T_{II} = n$

Synapsis

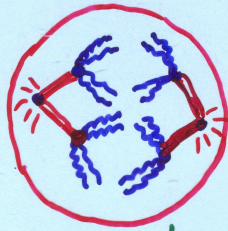
Chiasma

Variation

Prophase I



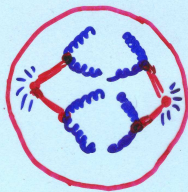
$$2n = 4$$



ภาพที่ 1.

แบ่งตัวแบบใด... Meiosis
 ระยะใด... Anaphase 1.

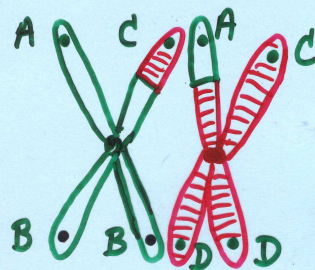
$$2n = 2$$



ภาพที่ 3

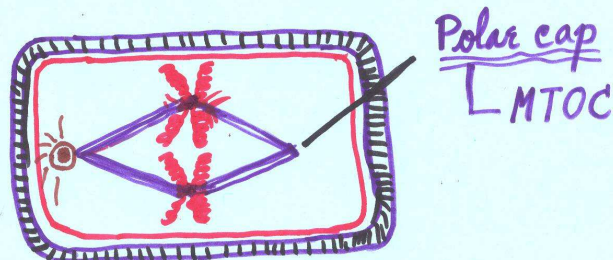
- แบ่งตัวแบบใด... Mitosis
- ระยะใด... Anaphase

ดิกอนาภาพ



- C กับ D จะแยกจากกันระยะใด... PI
- A กับ B จะแยกจากกันระยะใด... PI
- A กับ C จะแยกจากกันระยะใด... AI
- B กับ D จะแยกจากกันระยะใด... AI

Plant cell



MTOC

↳ Microtubule organizing center



Centrosome

