

# Cell Division

Somatic cells

by

Mitosis

Reproductive cells

by

Meiosis

To be discussed later

Cell Cycle

Interphase  
(Cell is not dividing)

Consist of three phases:  
1- The G1 phase  
2- The S phase  
3- The G2 phase

Mitotic phase  
(Cell is dividing)

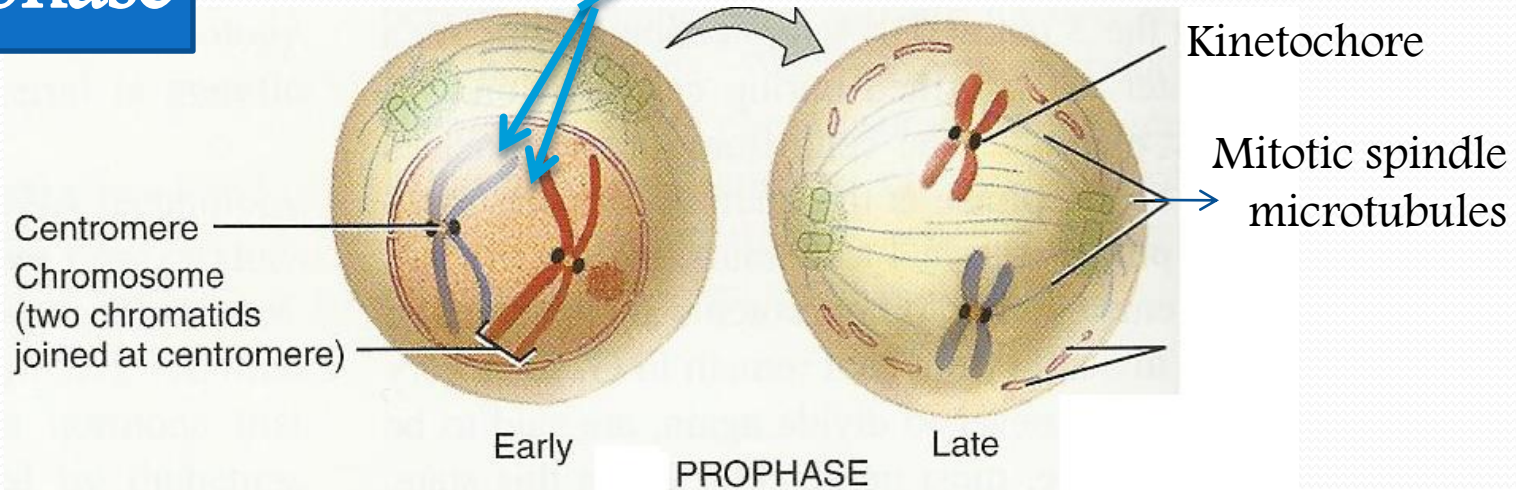
Consists of four stages:

1-Prophase  
2-Metophase  
3-Anaphase  
4-Telophase

# Prophase

2n

it has two sets of  
Chromosomes (two copies)  
One chromosome is  
paternal and the other maternal



Centromere (a constricted region holds the chromatid pair together)

Outside of each centromere is a protein complex called Kinetochore

Later in prophase tubulins in the pericentriolar material of the **centrosomes** start to form the mitotic spindle

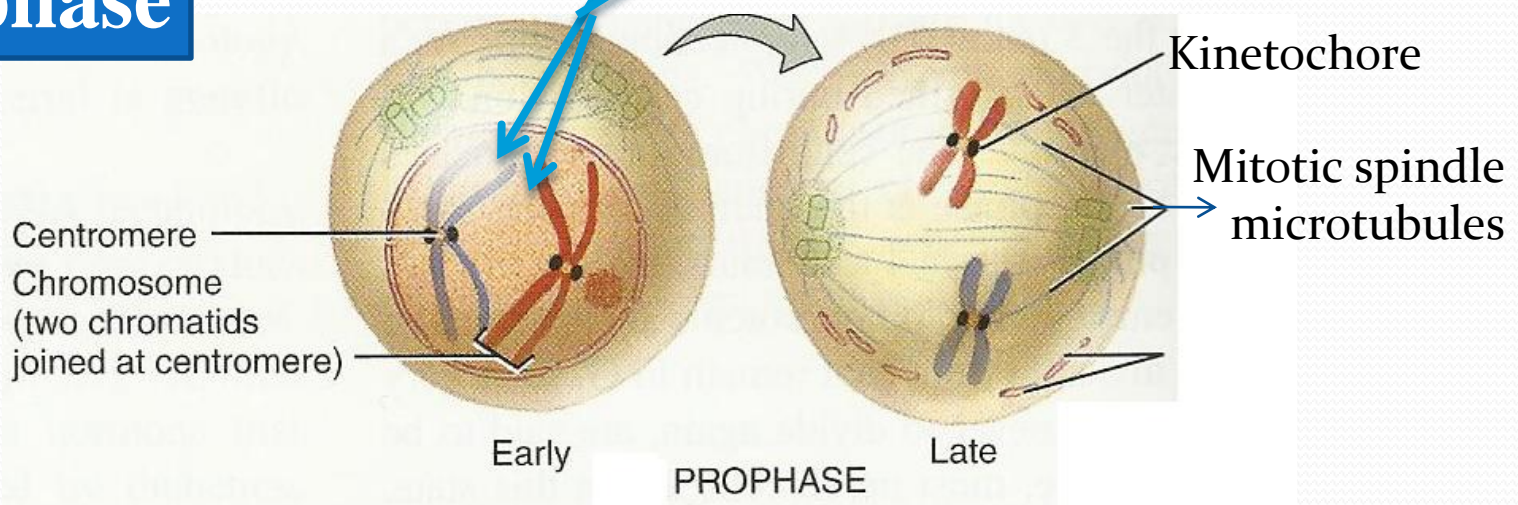
the mitotic spindle **attaches** to the Kinetochore

As the mitotic spindle (microtubules) lengthen they push the centrosomes to the poles

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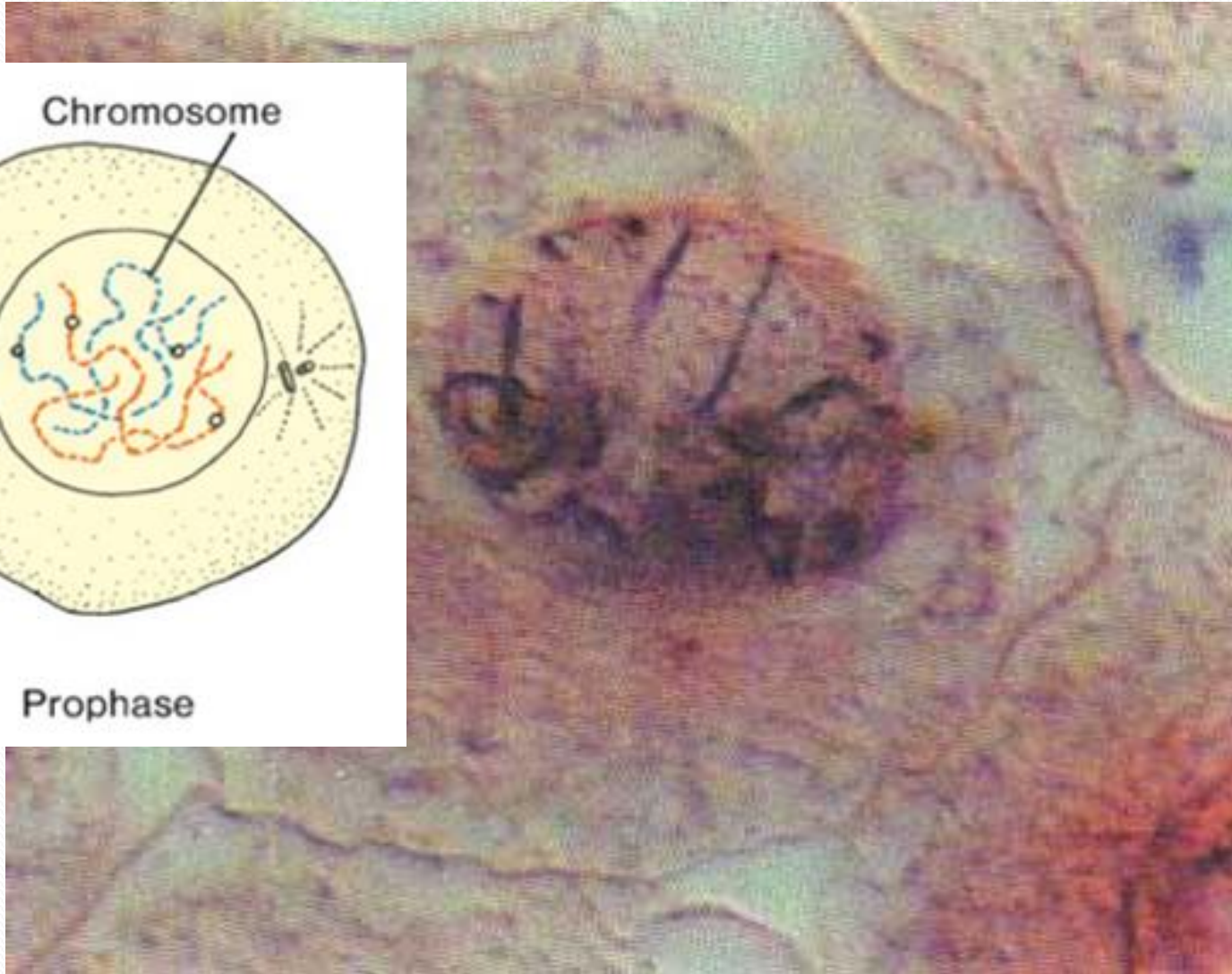
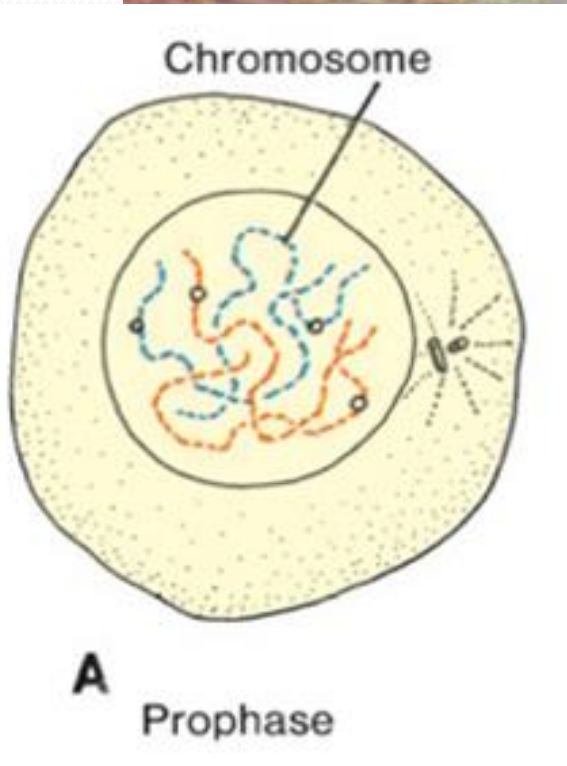


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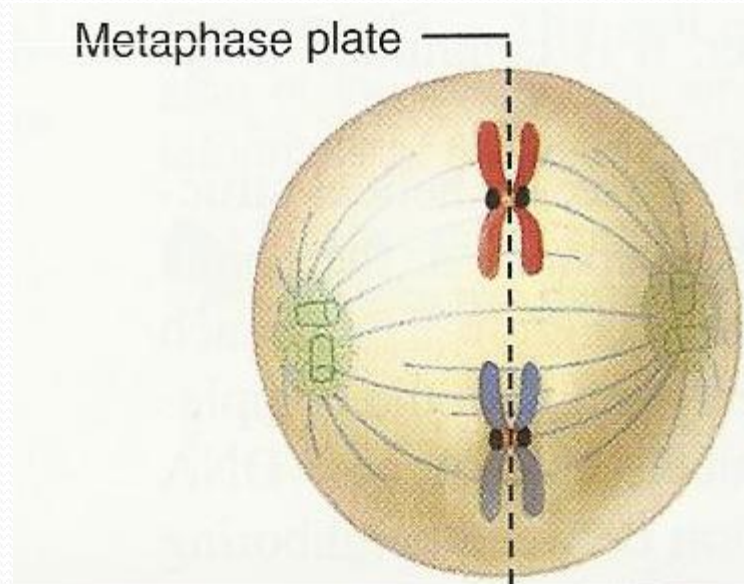


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# Mitosis Prophase



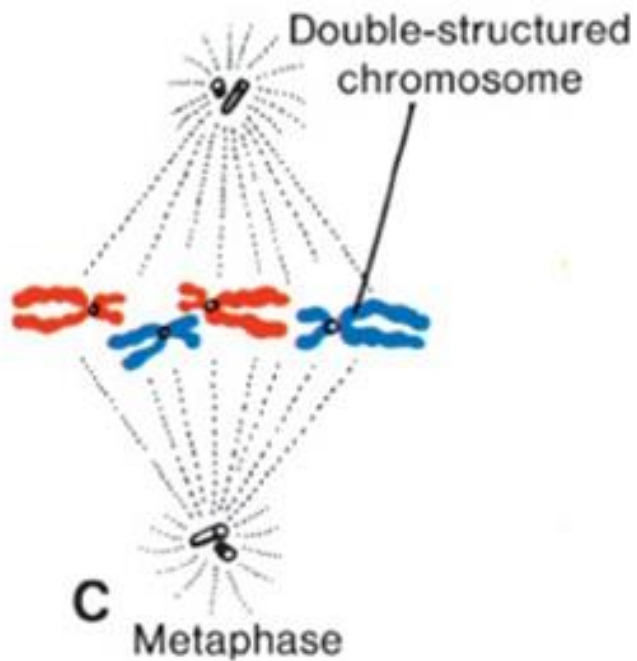
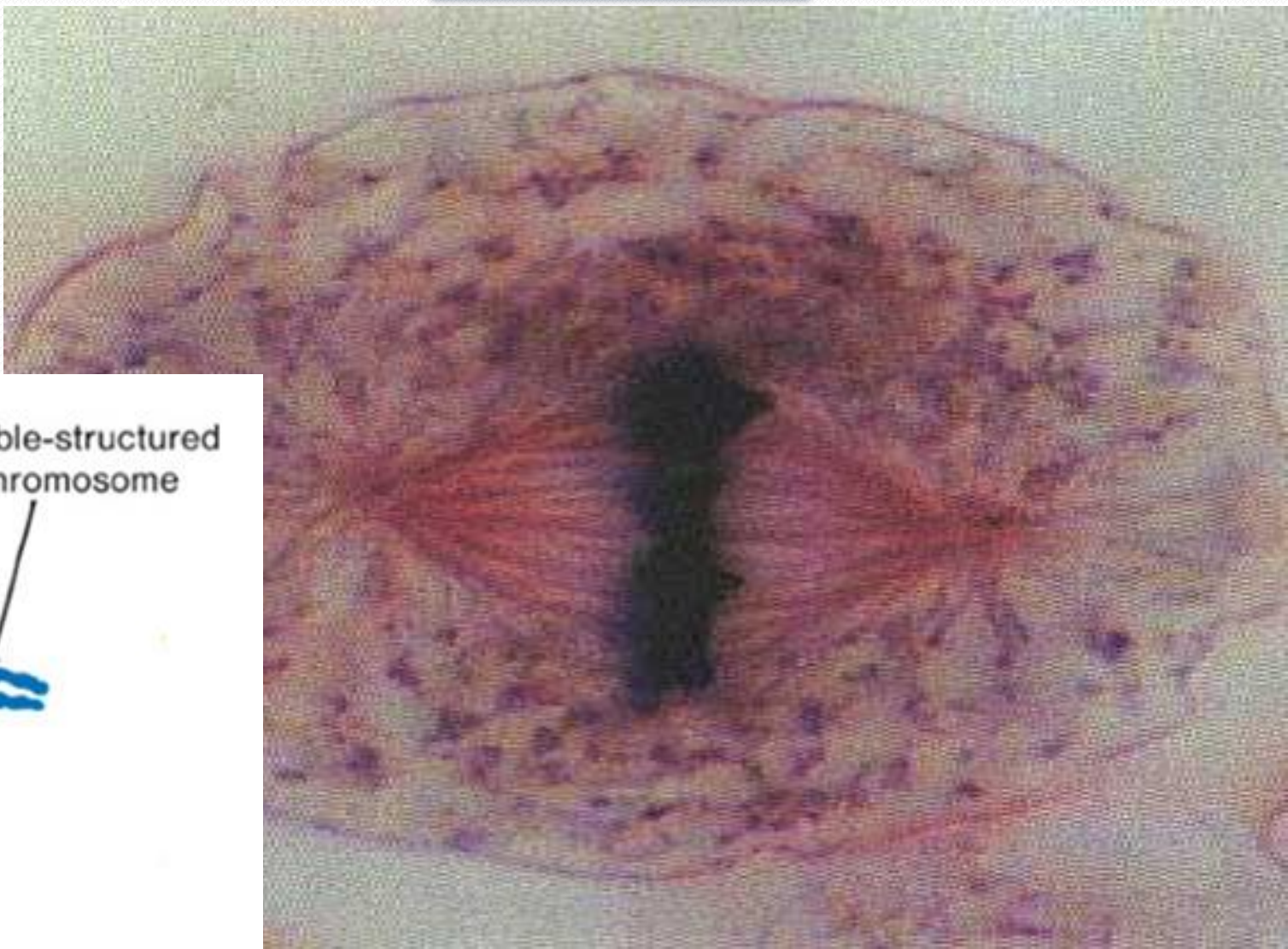
# METAPHASE



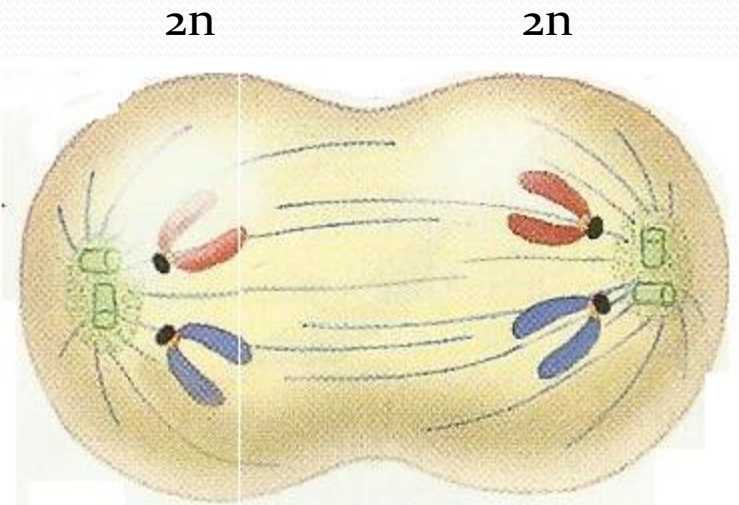
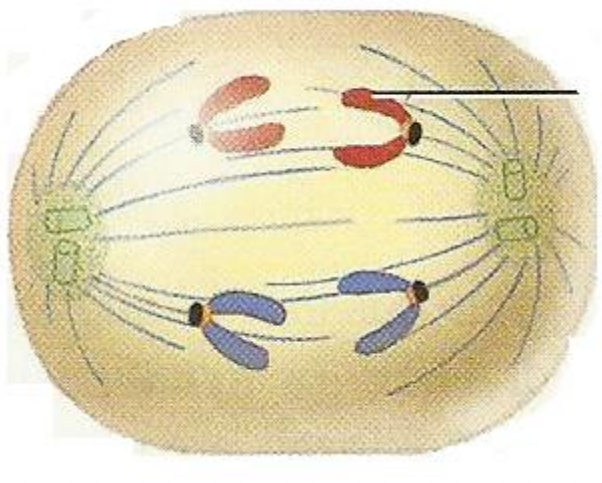
The Kinetochore microtubules align the centromeres at the exact center of the mitotic spindle

This midpoint region called **metaphase plate**

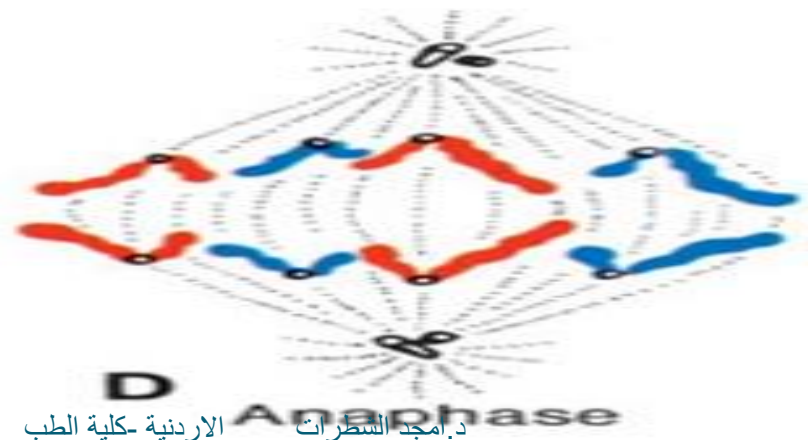
# Mitosis Metaphase



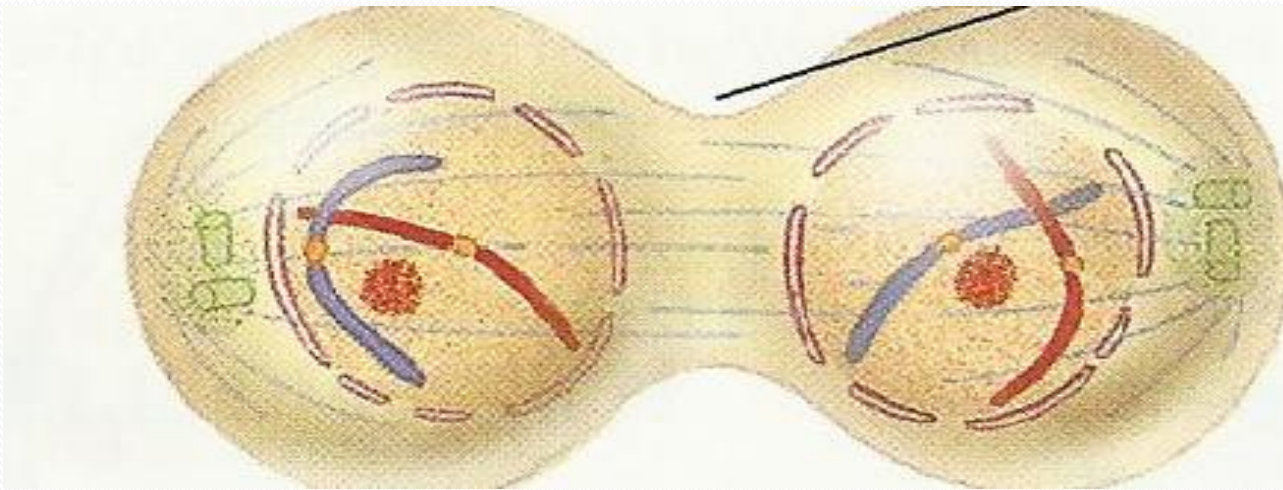
# ANAPHASE



The **centromeres split** leading to the **separation** of the two members of the chromatid pair  
once separated the chromatids are termed chromosomes



# TELOPHASE



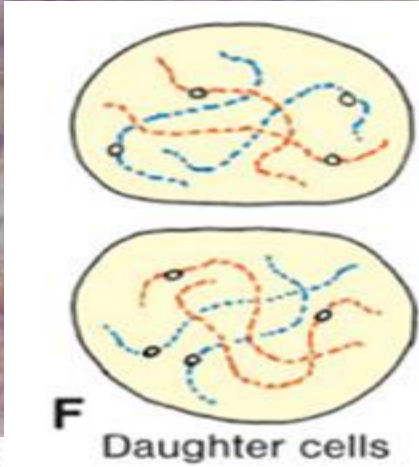
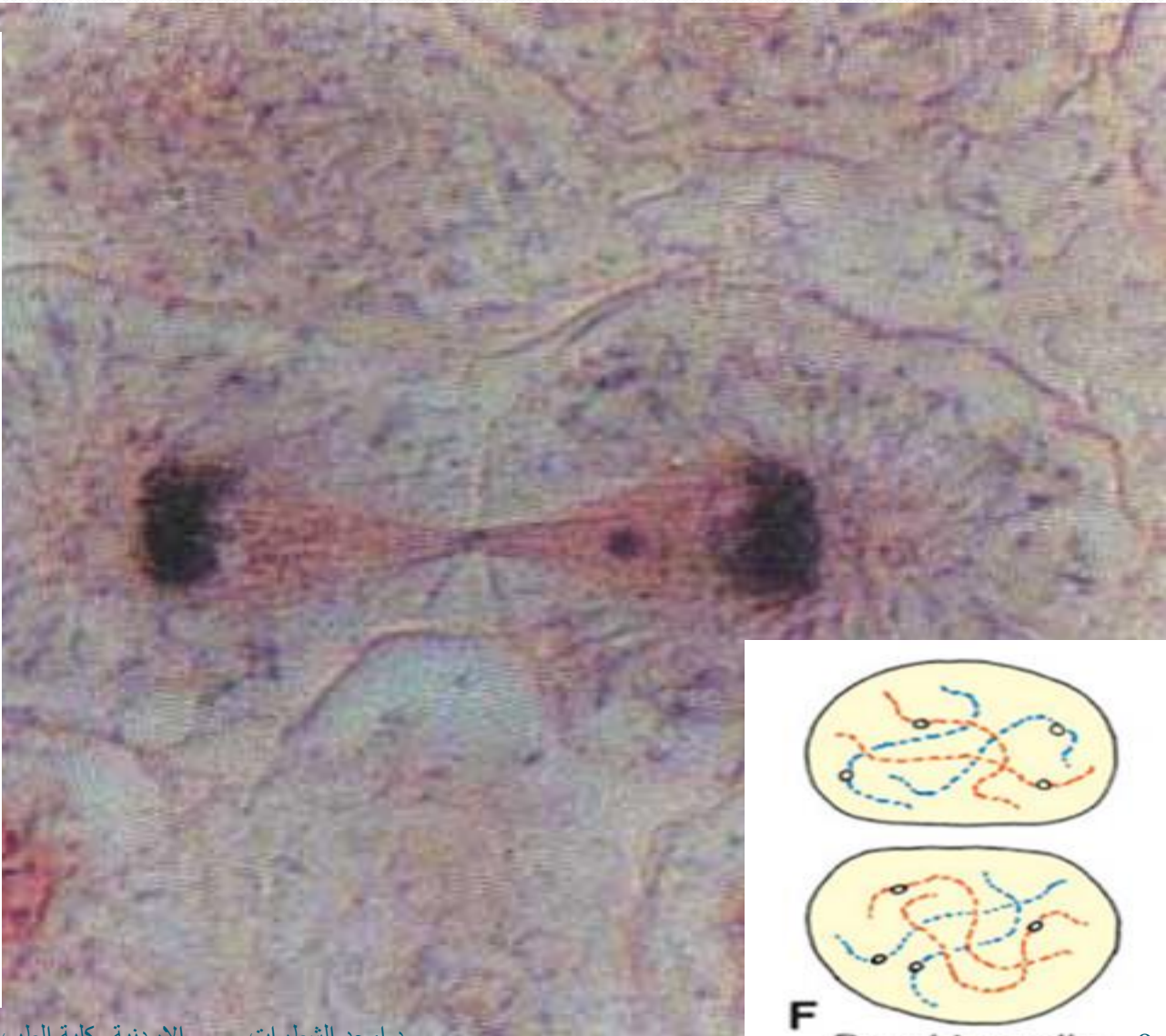
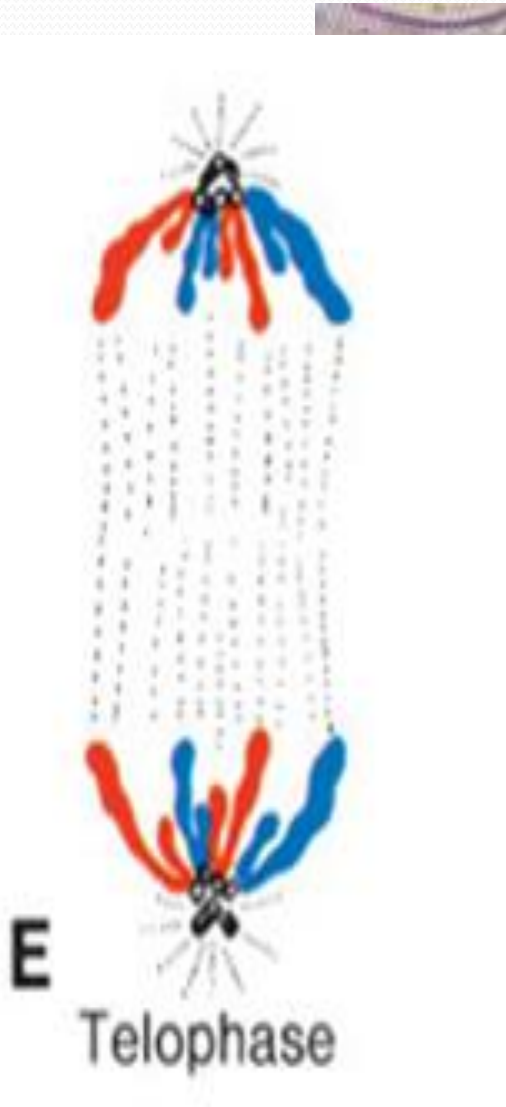
The identical sets of chromosomes now at apposite poles of the cell

A nuclear envelope forms around each chromatin mass

The mitotic spindle disappears



# Mitosis **Telophase**

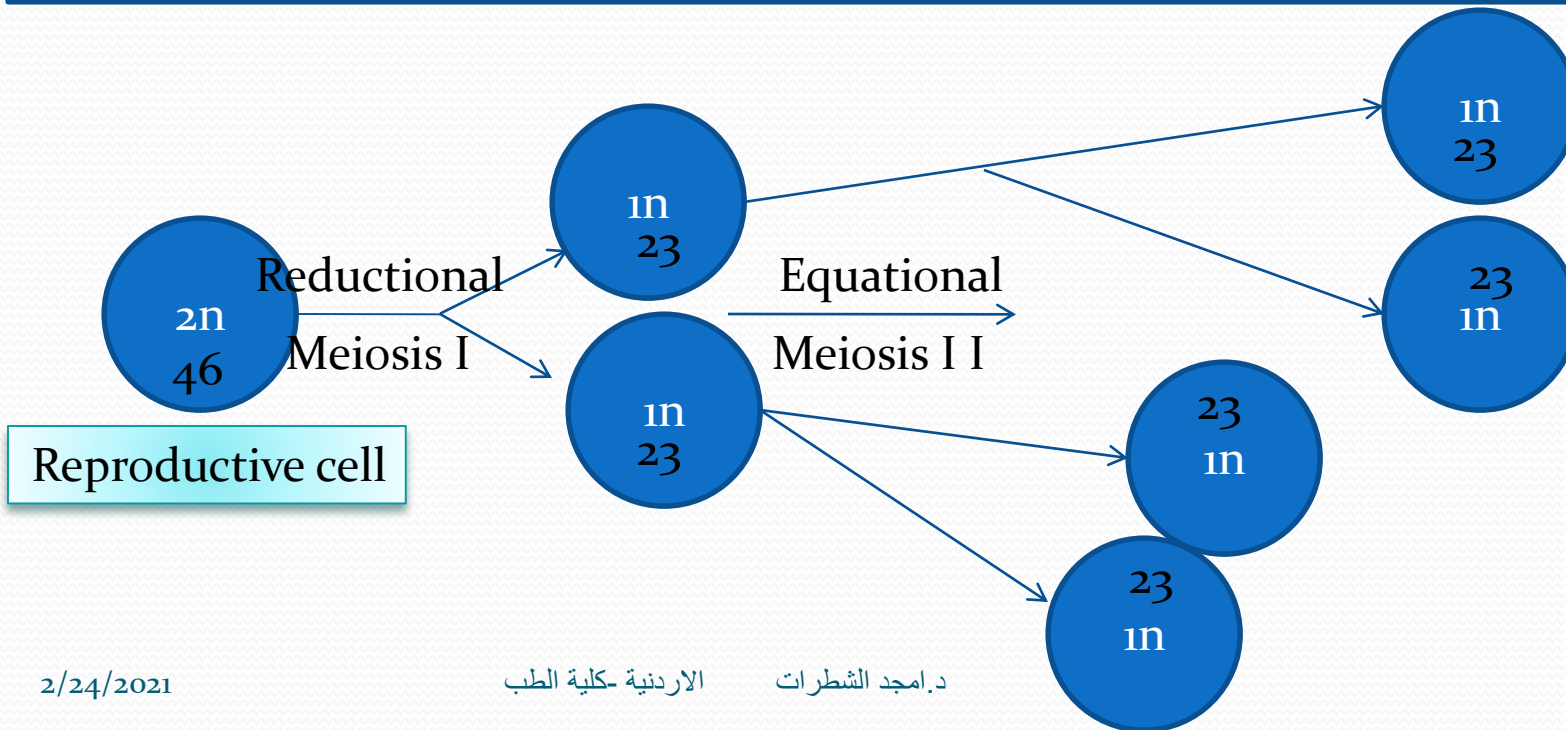


# Meiosis

Meiosis occurs in two successive stages :

Meiosis I (also known as reductional meiosis) which deals with the number of chromosomes it halves the number of chromosomes

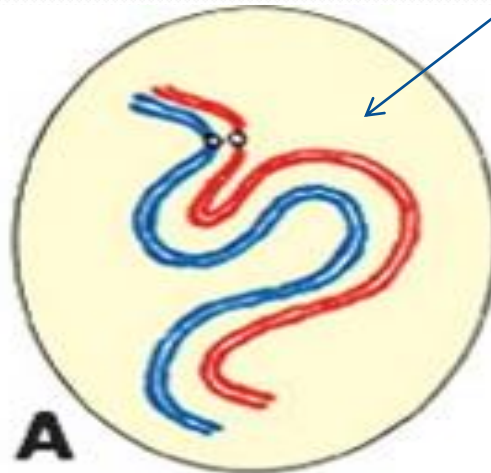
Meiosis II (also known as equational meiosis) which deals with the conditions of chromosomes



Meiosis I is generally divided into four stages:

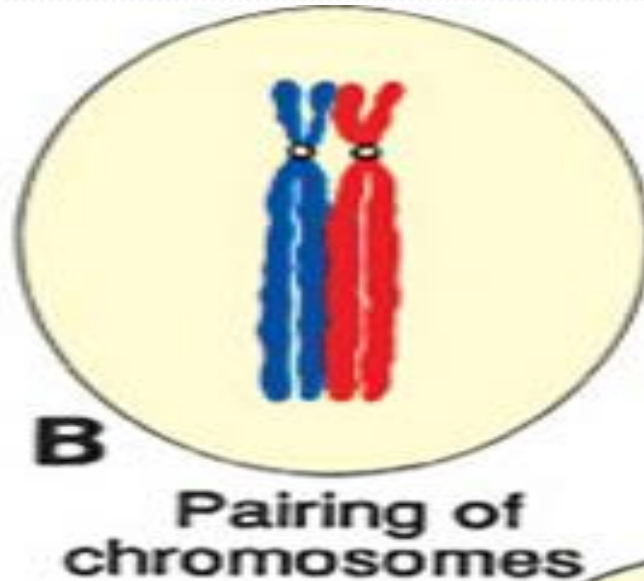
*1-Prophase*  
*2-metaphase*  
*3-*  
*Anaphase*

*1-Prophase is running into stages*  
*A- **LEPTOTEN** stage, (lepto means long)*  
*In this stage chromosomes are elongated*  
*and extended and become gradually visible*



**B- ZYGOTEN** stage, (*zygo* means joined)

*In this stage identical chromosomes pair up together (synapsis)*



**C- PACHYTENE** stage, (*pachy* means short)

*In this stage chromosomes become shorter and more condensed*

***D- DIPLLOTENE stage,***

***Chromosomes come together and cross each other by certain segments of their bodies***

***forming what we called **CHIASMATA: X- shaped structure*****

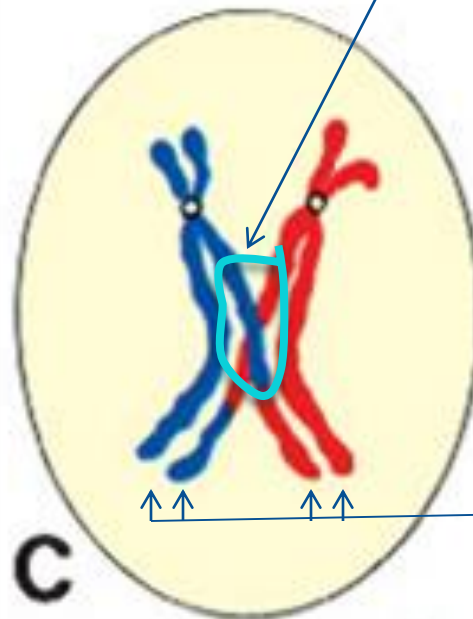
***Formed by the junction of two chromatids of the for chromatids (**tetrad**)***

**In Prophase I**

**Crossing over of non-sister chromatids**

**During prophase I, non-sister chromatids can undergo synapsis, in which the chromatids line up side-by-side & exchange genetic information between them**

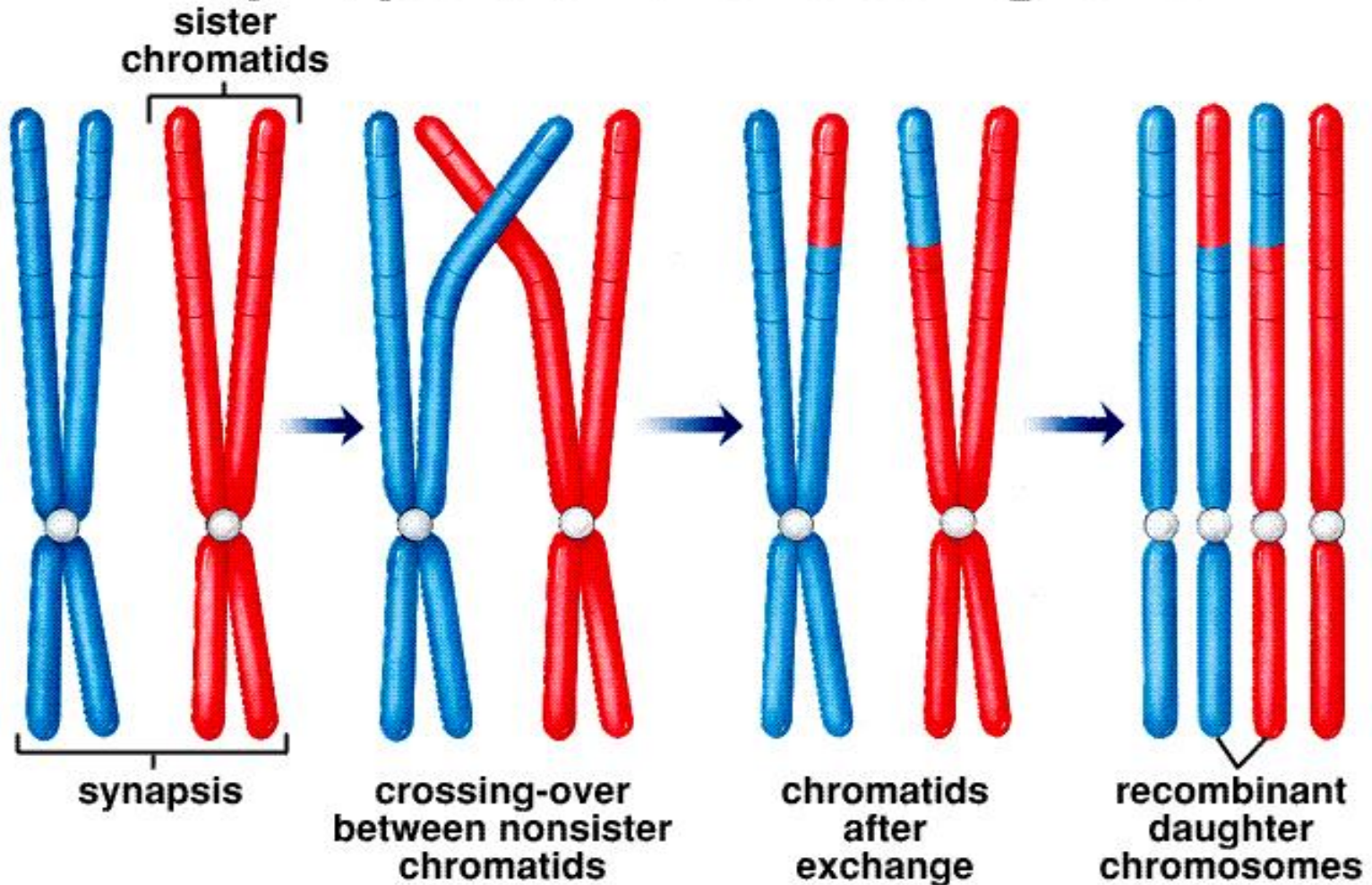
**This allows new combination of genetic material which will become part of a new offspring**



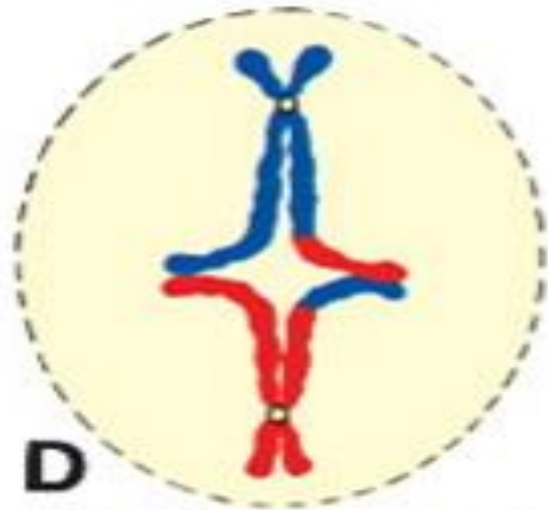
**Chiasma formation**

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# Synapsis and Crossing-over



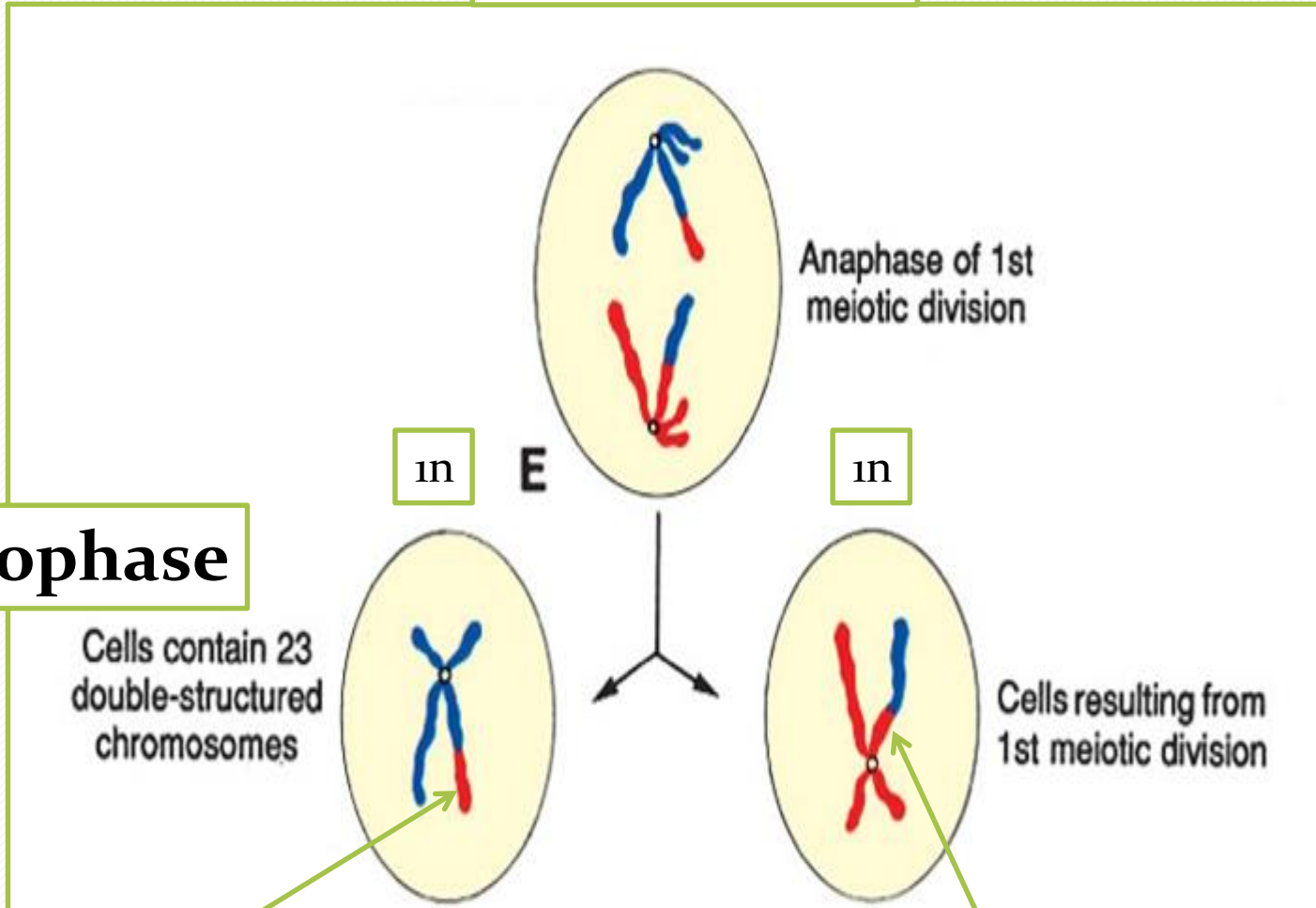
## *2-Metaphase*



**D**

Pulling apart of  
double-structured  
chromosomes

### *3-Anaphase*

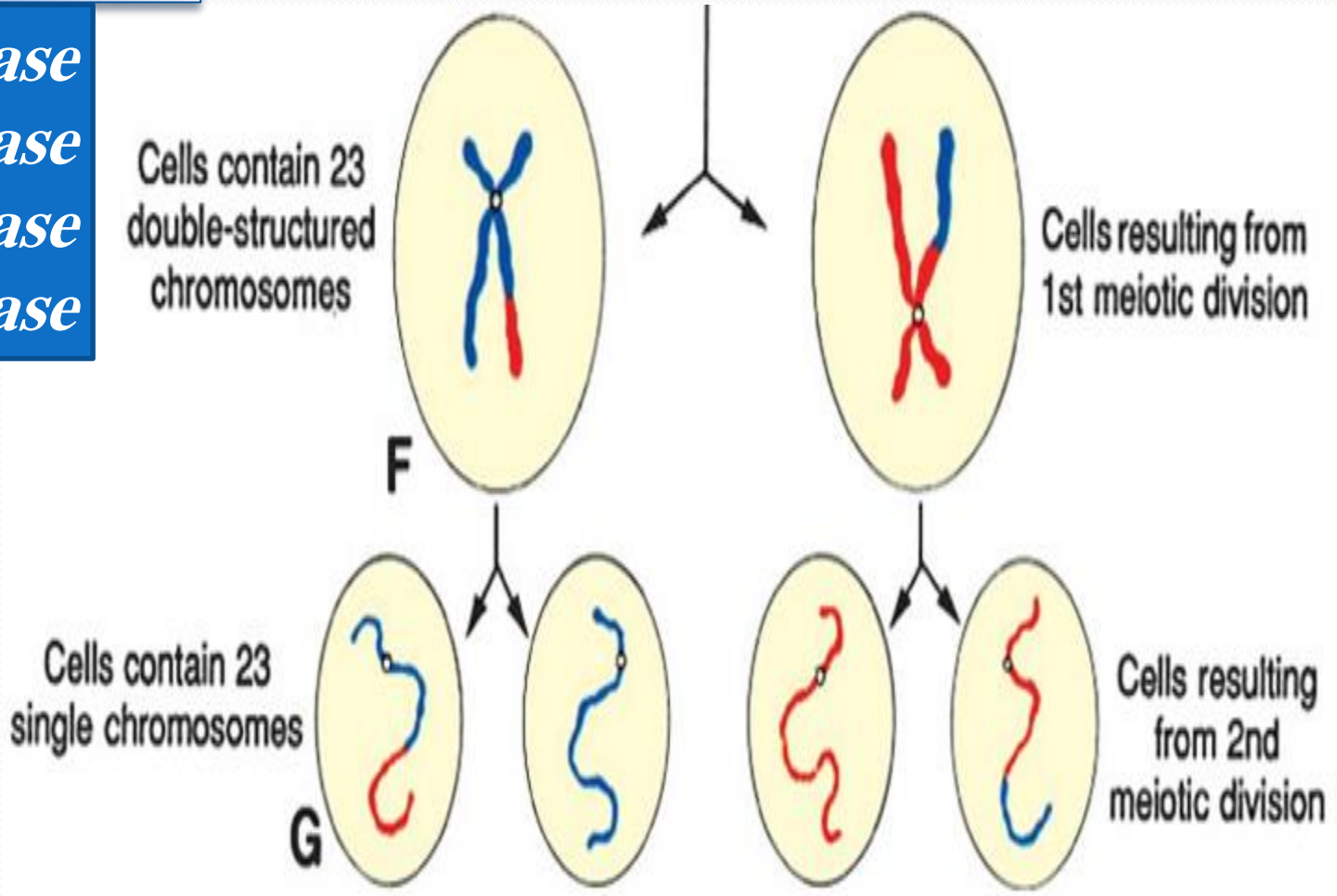


Notice that daughter cells after meiosis 1 are different from the original cell, the chromosomes are of a new combination



Meiosis II runs into 4 stages:

- 1-Prophase*
- 2-Metophase*
- 3-Anaphase*
- 4-Telophase*



**Meiosis I**  
Pairing of chromosomes  
Homologous chromosomes separate  
Daughter cells are haploid

**Mitosis**  
No pairing  
Sister chromatids separate,  
Daughter cells are diploid

Thank you