

# Block CSF-103

## Cell Structure and Function

### The CELL CYCLE

Prepared by

Prof. Eman E Abu-Dief

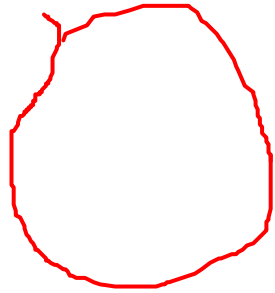
professor of Histology, Sohag, Faculty of zMedicine



**By the end of this lecture, the student should be able to :**

- **Define the cell cycle and recognize the different stages of the cell cycle.**
- **Interpret the events for normal cell development.**
- **Recognize and differentiate between the main types of cell death.**

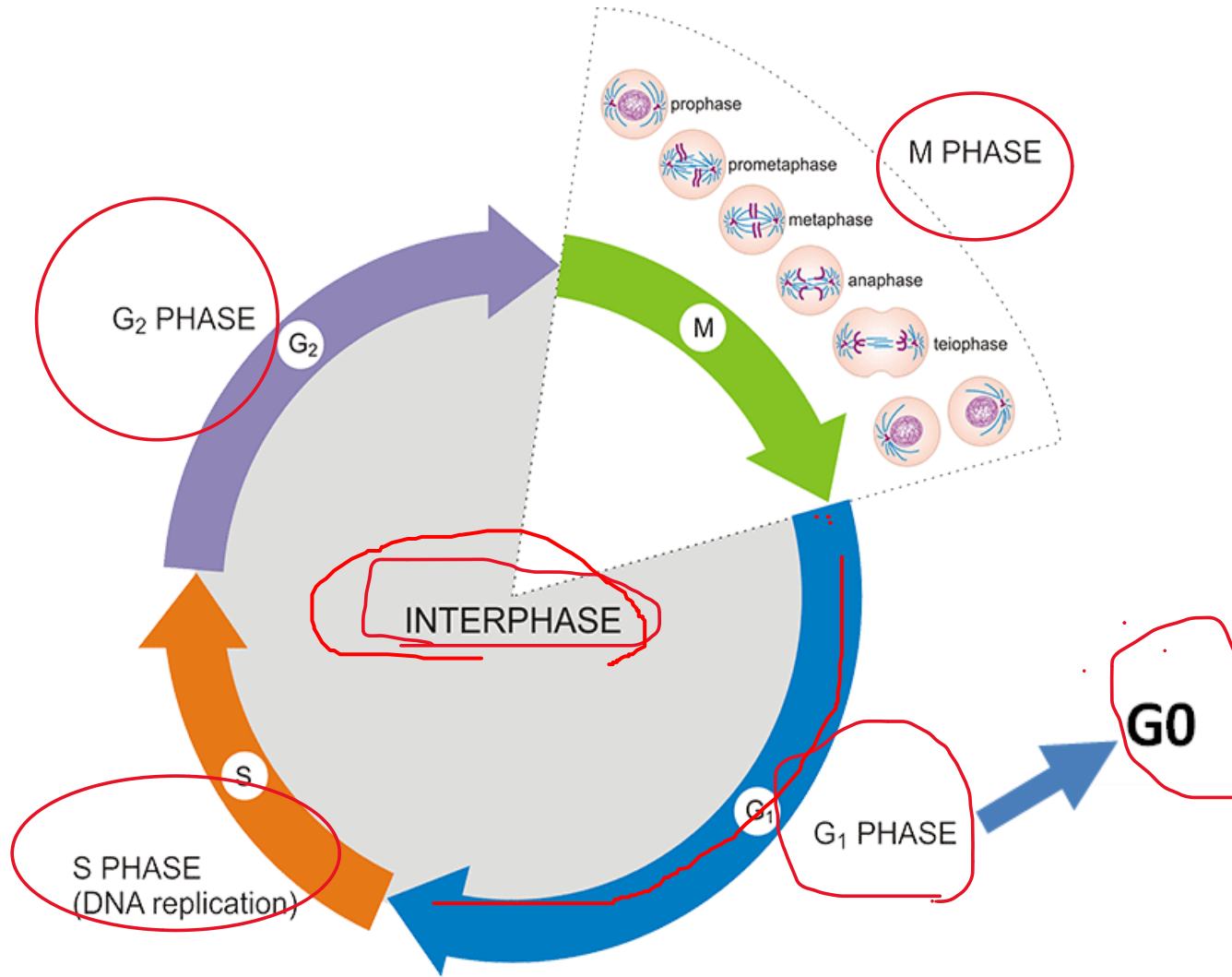
# The cell cycle



**It is the time from the end of mitosis to the end of the following mitosis.**

# The cell cycle: phases

It is formed of 2 phases: interphase and mitosis



# The interphase

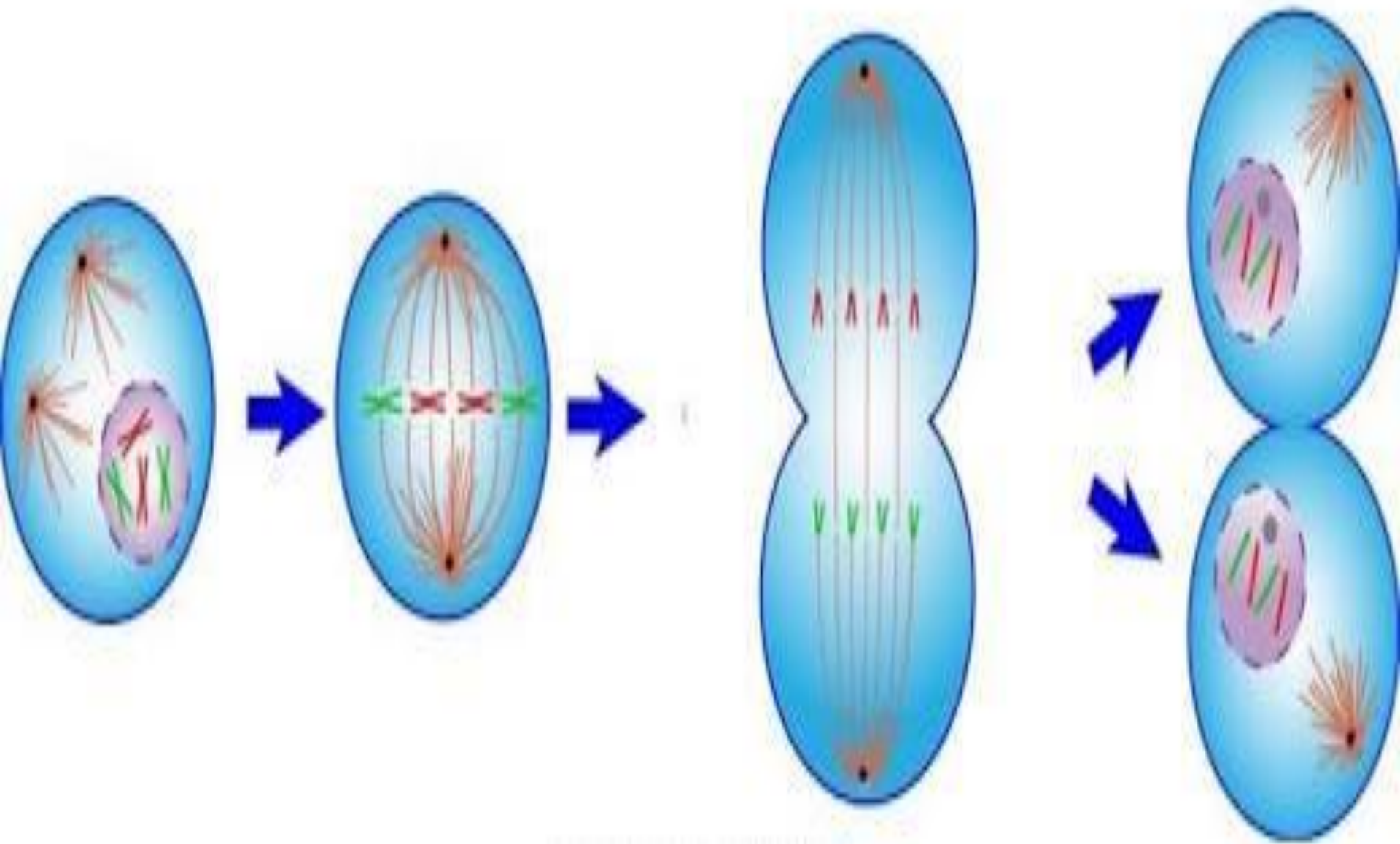
- ✓ **Gap 1 (G1) phase:** during which the chromosomes are formed of single chromatids. The cell may enter **G0 stage (resting stage)** for a long time or for its life span as nerve cells and cardiac muscle.
- ✓ **Synthesis (S) phase:** during which DNA and histones replicate and the chromosomes are formed of double chromatids. Once the cell enters the S- S-phase, it must continue the cycle.
- ✓ **Gap 2 (G2) phase:** during which the cell synthesizes a great amount of cytoplasmic material.

Prophase

Metaphase

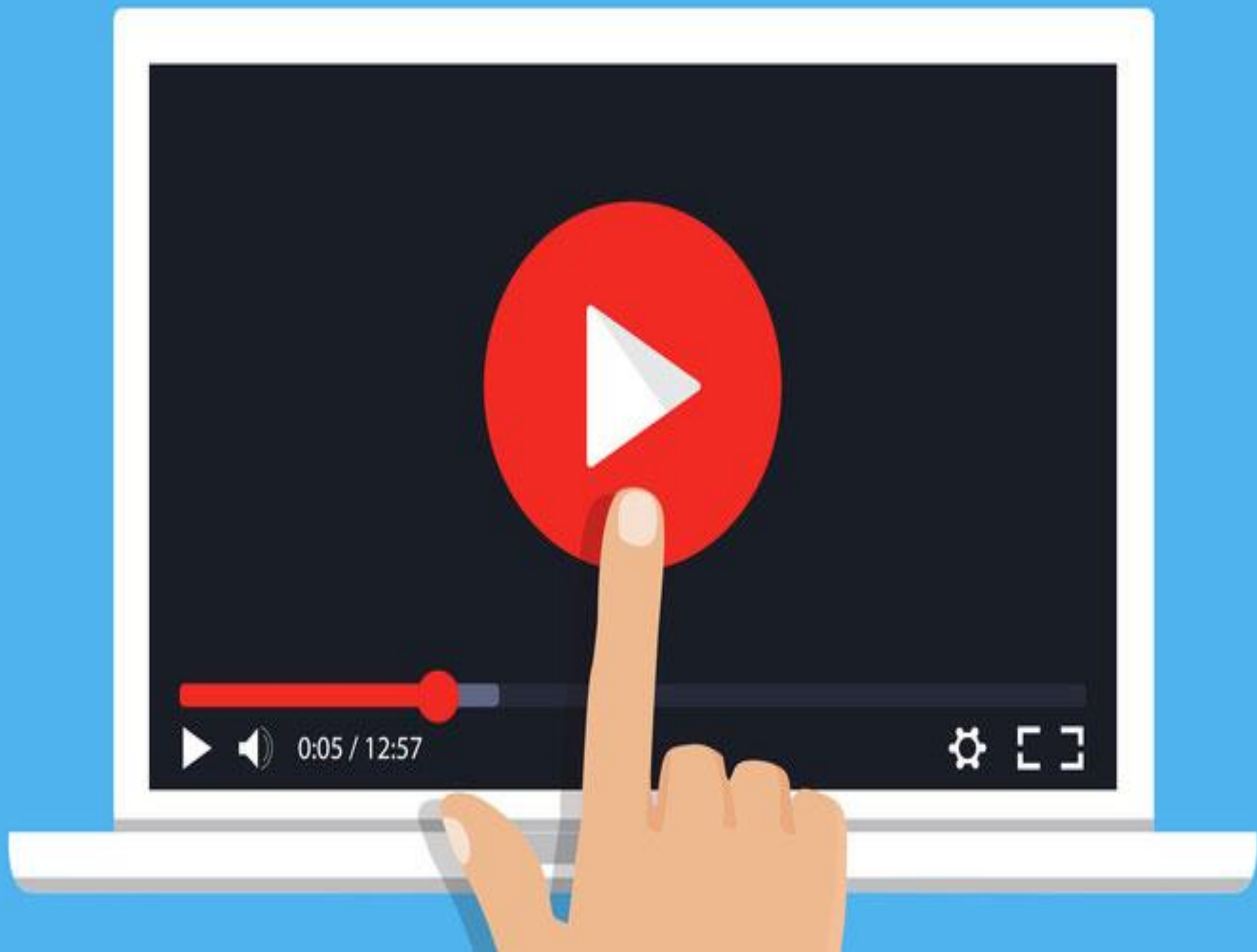
Anaphase

Telophase



# Mitosis On The Run

By: Tom Diab  
Science Department  
Saline High School



# MITOSIS



**1-prophase:** the 2 centrioles migrate to the opposite side. Microtubules arise radially between the 2 centrioles. The nuclear envelope disappears and the chromosomes become short (coiled).

**2-Metaphase:** chromosomes continue to shorten and thicken and align in the equatorial plane of the cell. The microtubules attach to the centromeres from both sides of each chromosome to form the mitotic spindle.

# MITOSIS



**3-Anaphase:** each chromosome splits into two chromatids at the centromere as a result of shortening of the mitotic spindle. Each half of each chromosome moves to the opposite pole of the cell.

**4-Telophase:** constriction occurs in the equatorial plane which deepens leading to cleavage of the cell into 2 daughter cells. The nuclear envelope is reassembled

# Cell development



## Growth

Increase in all mass  
through an increase in  
their number by cell  
division (mitosis).

# Cell development



## Differentiation



it is the process by  
which new features and  
new functions are  
achieved.

# Cell development



## Integration

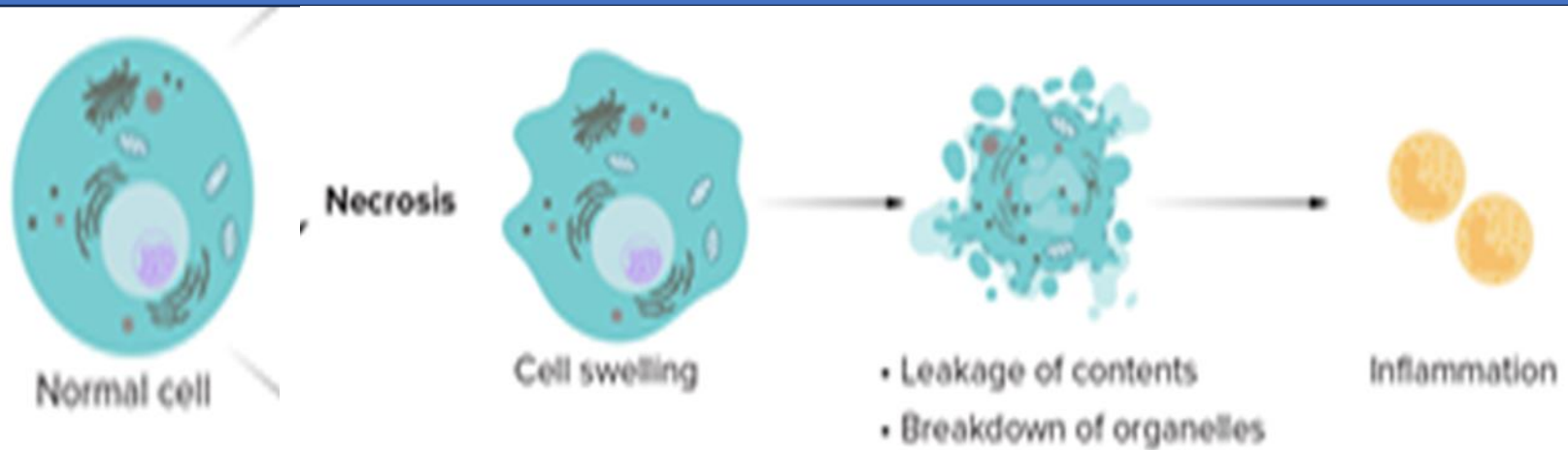


Is the process by which growth and differentiation are kept in harmony resulting in the formation of a normal organism.

# Cell death

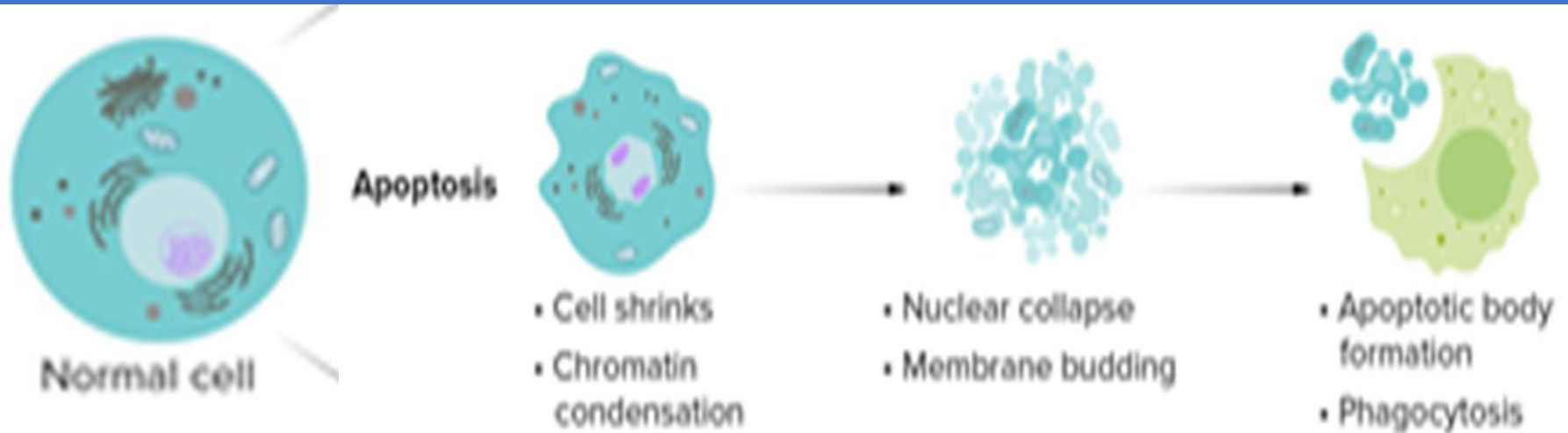


# NECROSIS



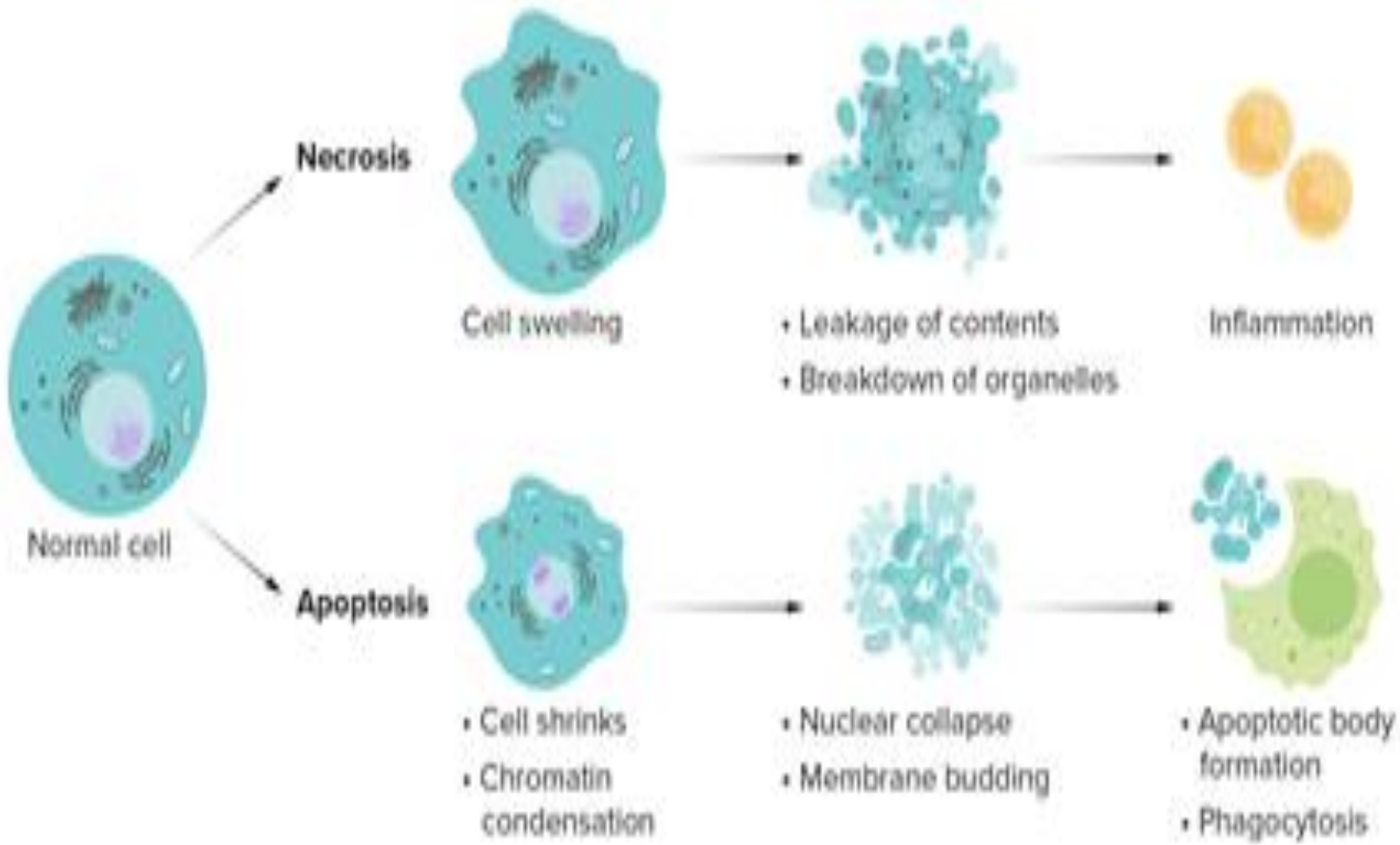
- Due to exogenous factor
- The cell swells, the chromatin is clumped and the cytoplasm becomes weakly stained.
- The organelles are destroyed.
- The cell bursts and scattered fragments are removed by phagocytosis.

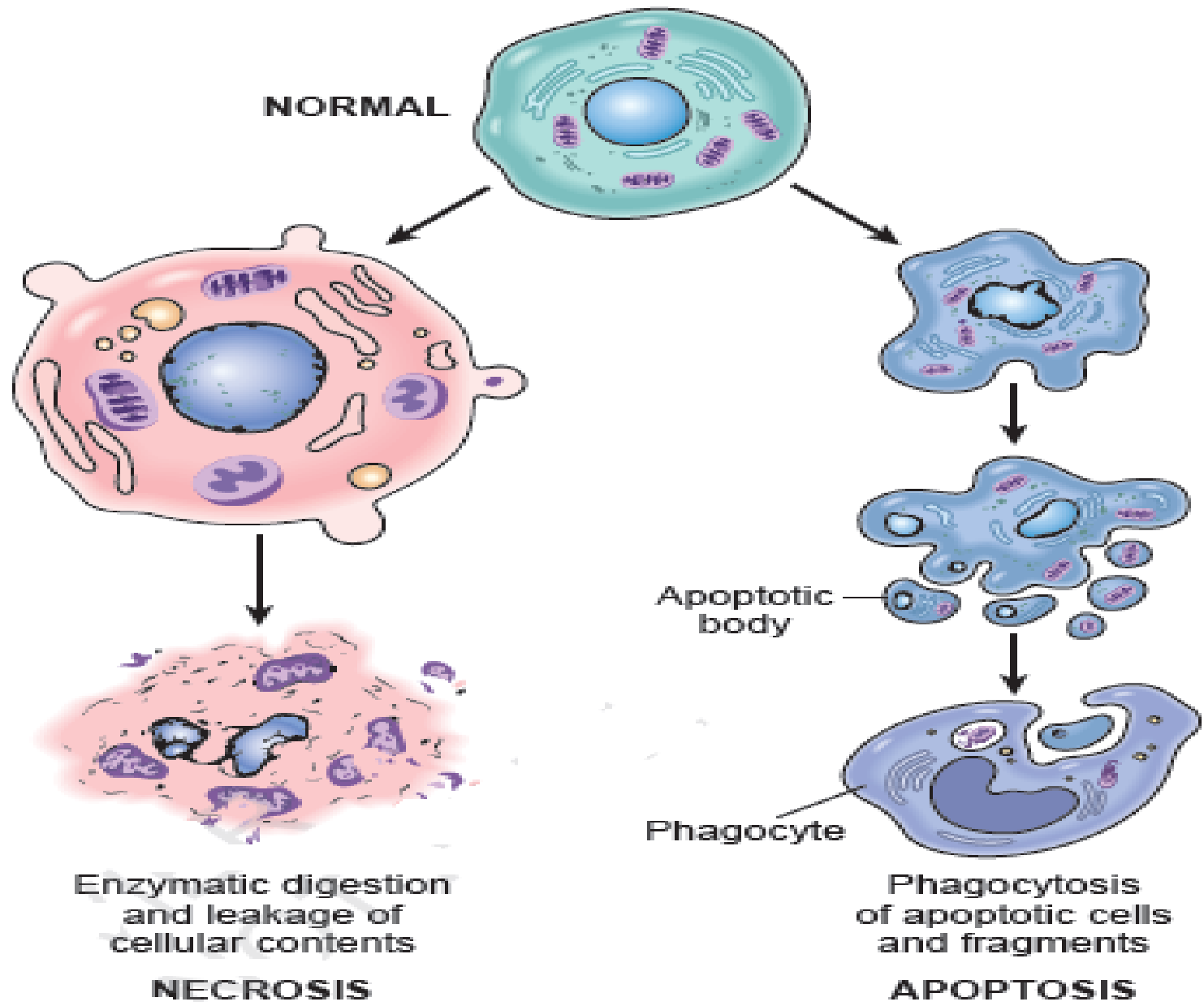
# Apoptosis (programmed cell death)



- Due to endogenous factor which is the activation of certain genes.
- The cell shrinks, the chromatin condenses and fragments.
- The organelles are intact.
- The cell fragmented into apoptotic bodies that are phagocytized by neighboring cells.

# Necrosis and apoptosis compared





# By the end of this lecture, the student should be able to :

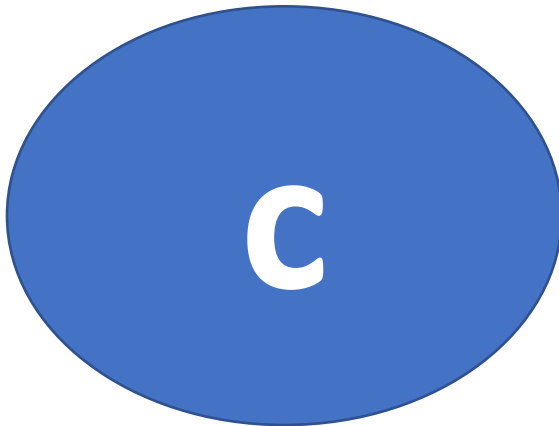
- Define and recognize the different stages of the cell cycle.
- Interpret the events for normal cell development.
- Recognize and differentiate between the main types of cell death.

QWERTZ!



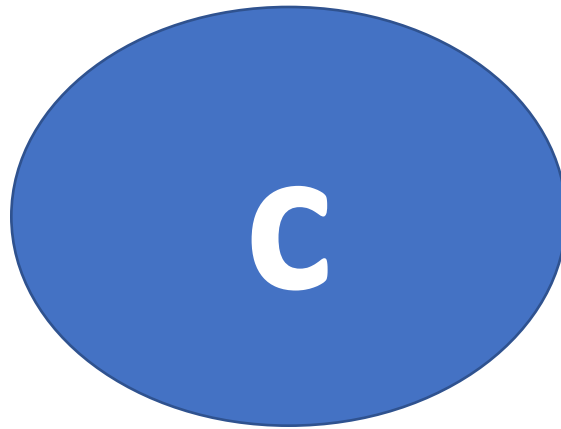
# 1- The mitotic spindle is composed mostly of:

- a) Golgi flattened sacs
- b) Smooth-surfaced endoplasmic reticulum.
- c) Microtubules.
- d) Intermediate filaments.



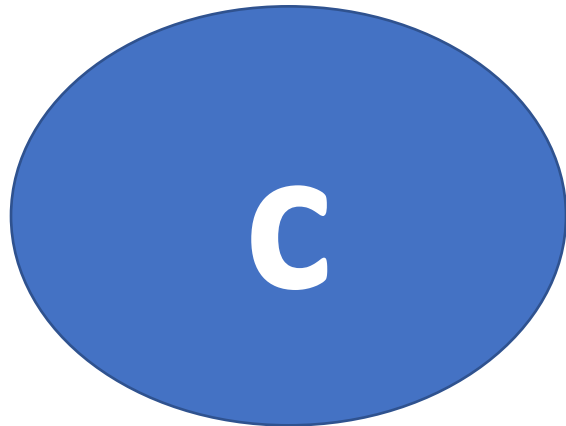
## 2- Cell differentiation means :

- a) increase in the number of cells.
- b) increase in the size of the cells.
- c) acquiring of new features and functions.
- d) all of the above.



### 3- DNA is replicated during :

- a) Prophase.
- b)  $G_1$  of interphase
- c) S of interphase
- d)  $G_2$  of interphase



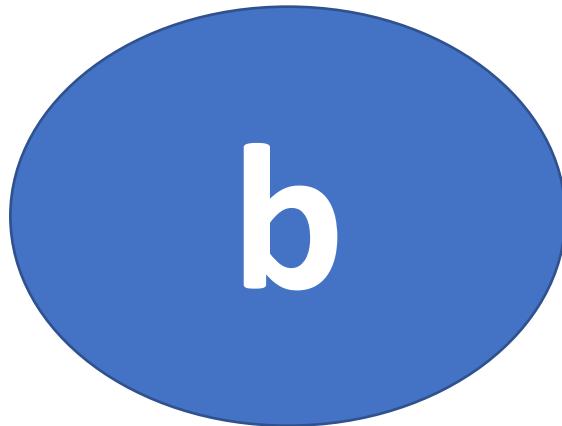
## **4- The cell cycle is the period between :**

**a- prophase and telophase.**

**b- end of mitosis to the end of the successive mitosis.**

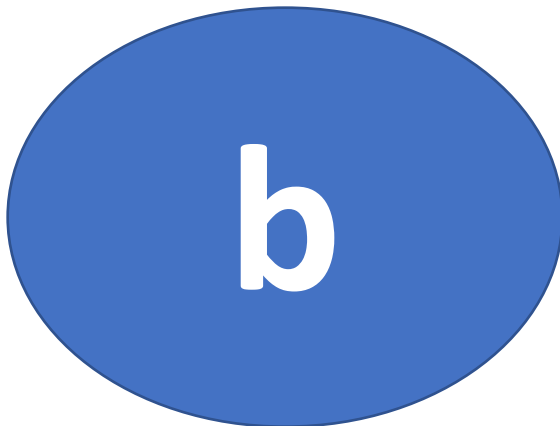
**c- Interphase and metaphase.**

**d- G1 and G2.**



## **5-What is the primary morphological difference between apoptosis and necrosis?**

- a) Apoptosis causes cell swelling; necrosis causes cell shrinkage**
- b) Apoptosis maintains plasma membrane integrity; necrosis causes membrane rupture**
- c) Apoptosis induces inflammation; necrosis does not**
- d) Apoptosis occurs due to injury; necrosis is programmed**



# Answer the following short questions:

1- Enumerate in order the 4 stages of the cell cycle.

2- Define cell differentiation.

3- What type of cell death is caused by endogenous factors?

4- Describe the primary cellular changes that occur during necrosis.

5- Compare apoptosis and necrosis. ( 3 points).

6- Describe the primary cellular changes that occur during apoptosis.

Thank  
You!