

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

وَأَنْ لَّيْسَ لِلْإِنْسَانِ إِلَّا مَا سَعَى وَأَنَّ سَعْيَهُ سَوْفَ يُرَى ثُمَّ يُجْزَاهُ

الْجَزَاءَ الْأَوْفَى ﴿٣٩-٤٠﴾

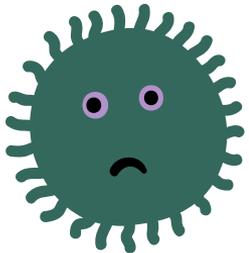
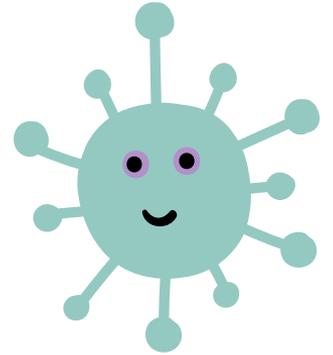
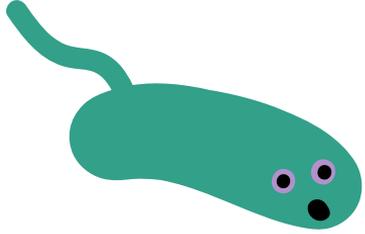
صدق الله العلي العظيم

سورة النجم الآية ﴿٣٩-٤٠﴾



# Third Lecture Cell cycle

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## Cell cycle

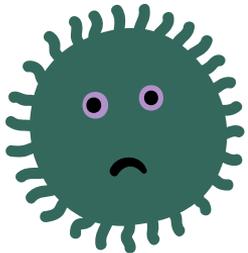
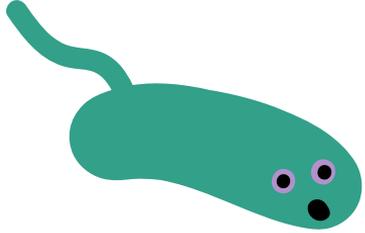
Why do cells divide?

There are many reasons for this

1-Growth

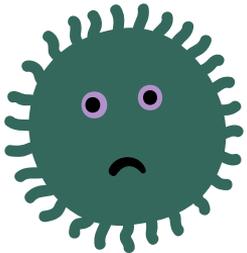
2-repair

3-reproduction





**growth.** Humans begin as a single cell and grow to over 10 trillion cells by adulthood. This increase in cell count also enables certain of those cells to be specialized for different purposes.





**Repair:** Mitosis is the cause of this. Repair is crucial in cases when tissue injury occurs. Certain organisms may even grow back missing limbs, including arms or tails. This is significant to humans because it can replace dead cells and restore bones, blood vessels, and skin.





**Reproduction:** This is a result of mitosis or meiosis, depending on the type of reproduction. There are two types of reproduction. The first type is asexual reproduction, and this is when there is only one parent. This results from normal cell division. This occurs in bacteria, protists, fungi, some plants and some animals. The offspring are genetically identical to that of the parent. The other type of reproduction is sexual reproduction.

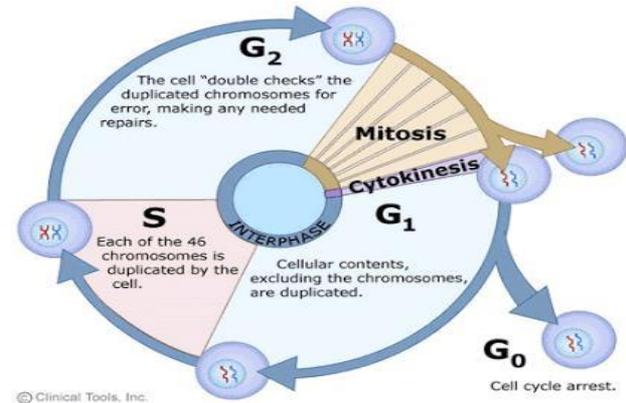


## There are three stages in interphase.

G1 (or gap 1)

S (or synthesis )

G2 (or gap 2)





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## G1

this is the period where the cell grows and develops. Since some cells divide more actively than others, the time spent in the G1 phase will vary. There is no division that takes place in this phase. Just growth and development





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This is where the cell is committed to cell division. Inside the nucleus, the chromosomes (including the DNA) begin to replicate, the material makes a copy of itself (more on chromosomes in a minute). This results in two identical copies of chromosomes, called sister chromatids. The two sister chromatids are attached to each other at a point called the centromere. This replication is important, because it allows there to be two full sets of DNA in each of the new cells, at the end of the division



## G2

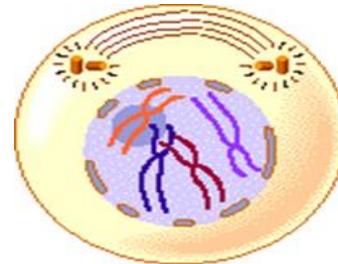
Organelles and other material required for cell division are replicated or formed. For example, the centrioles in animal cells replicate themselves, to form 2 pairs.

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**There are 4 main phases in mitosis.**

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**Prophase** : this is the first stage of mitosis. In this stage the sister chromatids also condense to a visible form. The nuclear envelope also breaks up, exposing the chromosomes. The spindle fibers begin to form, extending from the centrioles. These are made up of microtubules and attach to the centromere of the sister chromatids. The centrioles slowly migrate to opposite sides of the cell

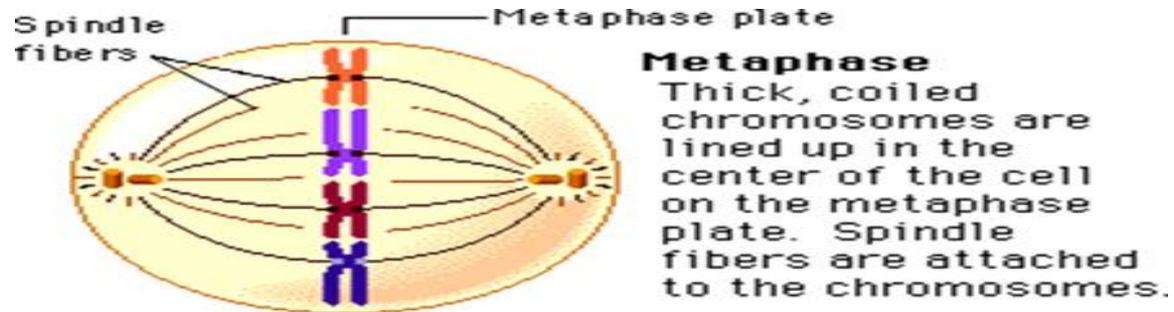


**Prophase**

The chromosomes appear condensed, and the nuclear envelope is not apparent.

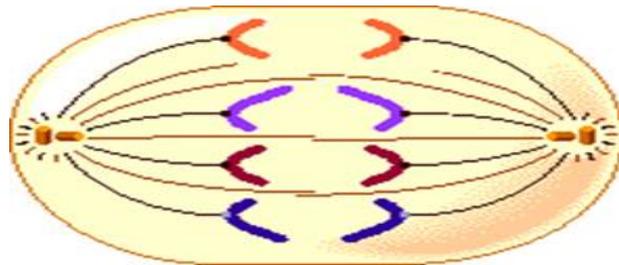
# Metaphase

this is when the chromosomes are lined up along the metaphase or equatorial plate, an imaginary line in the center of the cell. The chromosomes are moved here with the help of the spindle fibers and the centrioles.



# Anaphase

The centromere of each chromosome are pulled apart by the spindle fibers, causing the sister chromatids to separate, creating two daughter chromosomes. One of the daughter chromosomes is pulled to one side of the cell, while the other is pulled to the opposite pole .this process is critical, because it ensures that the soon to be daughter cells will each have full, identical sets of chromosomes, also being identical to the parent cell



**Anaphase**  
The chromosomes have separated and are moving toward the poles.

# Telophase

The new nuclei begin to form around the new sets of chromosomes, at each end of the cell. The chromosomes also begin to unravel, back into their loose form. By the end of this phase, the spindle fibers are also disassembled. At the same time, cytokinesis begins, and the cell is “pinched” into two new cells.



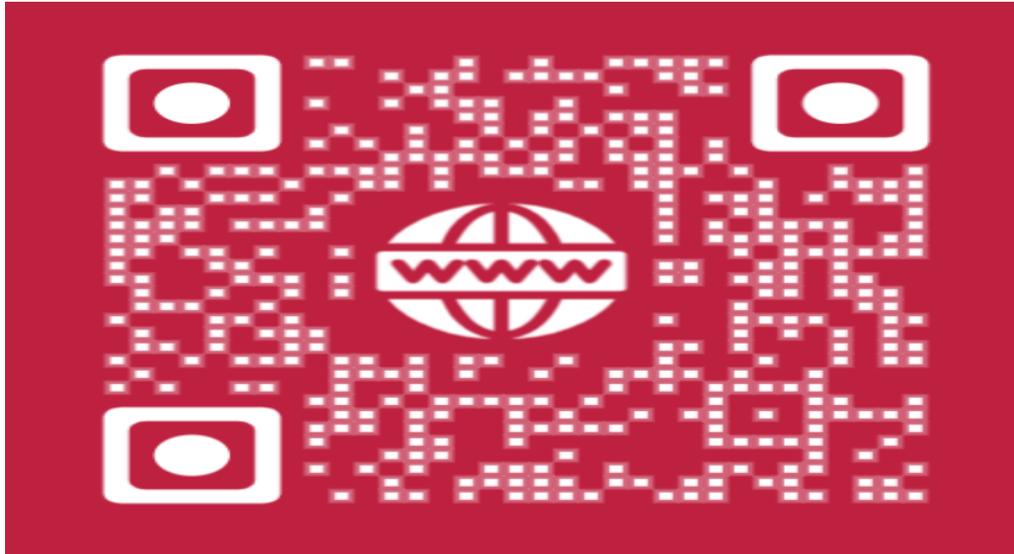
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## Group activity

**Draw the main stages of mitosis**

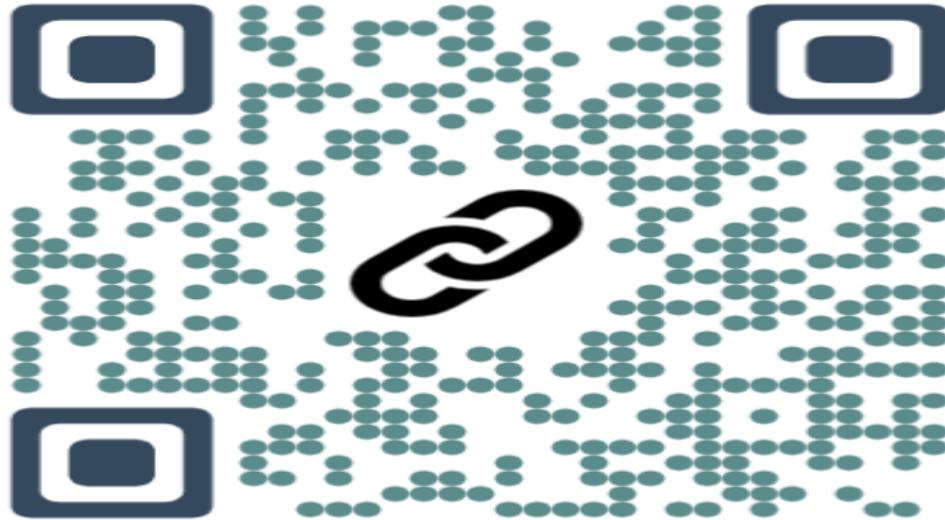
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## Short Video about mitosis

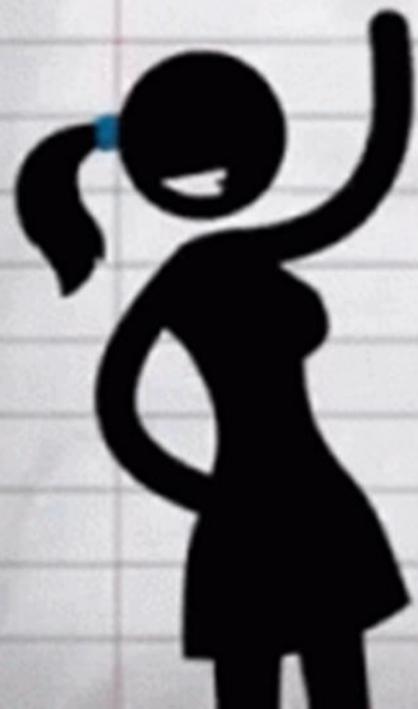


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# Video about mitosis



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