



**CELL CYCLE AND
CELL DIVISION L-1**
XI BIOLOGY
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Questions We Have

- How do cells divide?
- What controls cell division?
- What's binary fission anyhow?
- What happens when things go wrong?

All living things are made up of cells and the products formed by cells

So, why do cells divide?

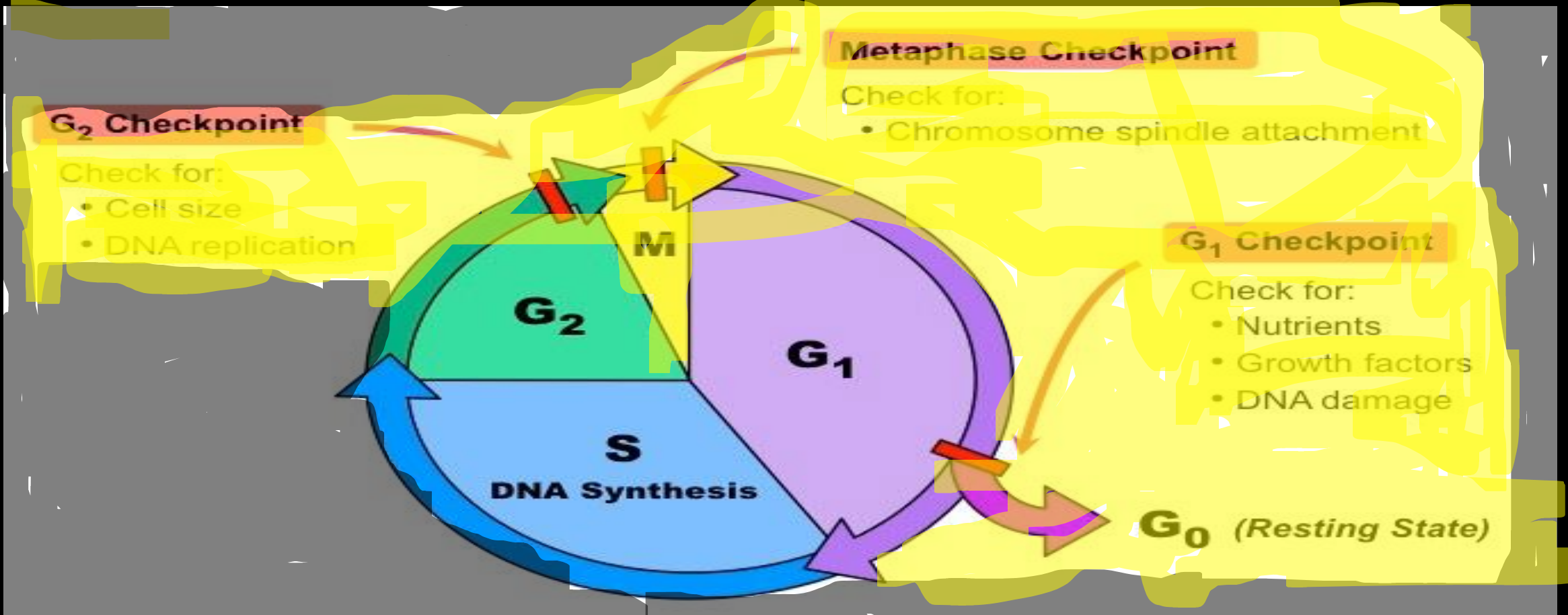
- Growth – adding more cells
- Renewal – replace old, worn out cells
- Repair – fixing things that are broken
- Reproduction – creating sperm and egg

A few terms we need to know

- **Genome** – A cell's endowment of DNA. All of its genes
- **Chromosomes** – Discrete molecules of DNA and any associated proteins called histones.
- **Somatic Cells** – Body cells containing pairs of chromosomes (diploid, $2n$ number = 46 in humans).
- **Gametes** – Reproductive cells: sperm & egg containing $\frac{1}{2}$ the chromosome number (haploid, $n = 23$)
- **Sister chromatids** – Duplicate chromosomes held together by a centromere which contains a kinetochore for spindle fiber attachment.
- **Karyokinesis** – The division of the nucleus in eukaryotic cells.
- **Cytokinesis** – The division of the cytoplasm creating two daughter cells.

CELL CYCLE

The sequence of events by which a cell duplicates its genome, synthesises the other constituents of the cell and divides into two daughter cells is termed cell cycle



Regulation of the Cell Cycle

- The frequency of cell division varies with the kind of cell.
- Regulation occurs at the molecular level.
- Regulation by both external and internal controls occurs at *checkpoints*.
- *Cell division stops at checkpoints until overridden by go-ahead signals.*
- G₁ checkpoint called “restriction point” in mammalian cells.
- Cells that do not divide further exit G₁ phase to enter an inactive stage called quiescent stage (G₀) EX- HEART CELL

EXTERNAL SIGNAL

- Chemical and physical factors.
- Growth factors like PDGF (platelet-derived growth factor).
- Density-dependent inhibition.

INTERNAL SIGNAL

- Cell surface to volume ratio
- Cell age
- Chromosome number and position

Phases of Cell cycle: Human cell- 24 hrs, Yeast –90 minutes

-Interphase(Rest phase) -phase between two successive M phases. It take 98% of total duration of cell cycle

-M Phase (Mitosis phase) -only one hour of 24 hrs

Interphase (preparing period)

Divided into 3 phases –

–G₁ phase (gap 1 phase)-Cell is metabolically active.

-Cell grows continuously.

-Does not replicate its DNA

–S phase (synthesis phase)-DNA synthesis occurs.

-Amount of DNA per cell doubles.

-**Chromosome number does not increase.**

–G₂ phase (gap 2 phase)-No synthesis of DNA.

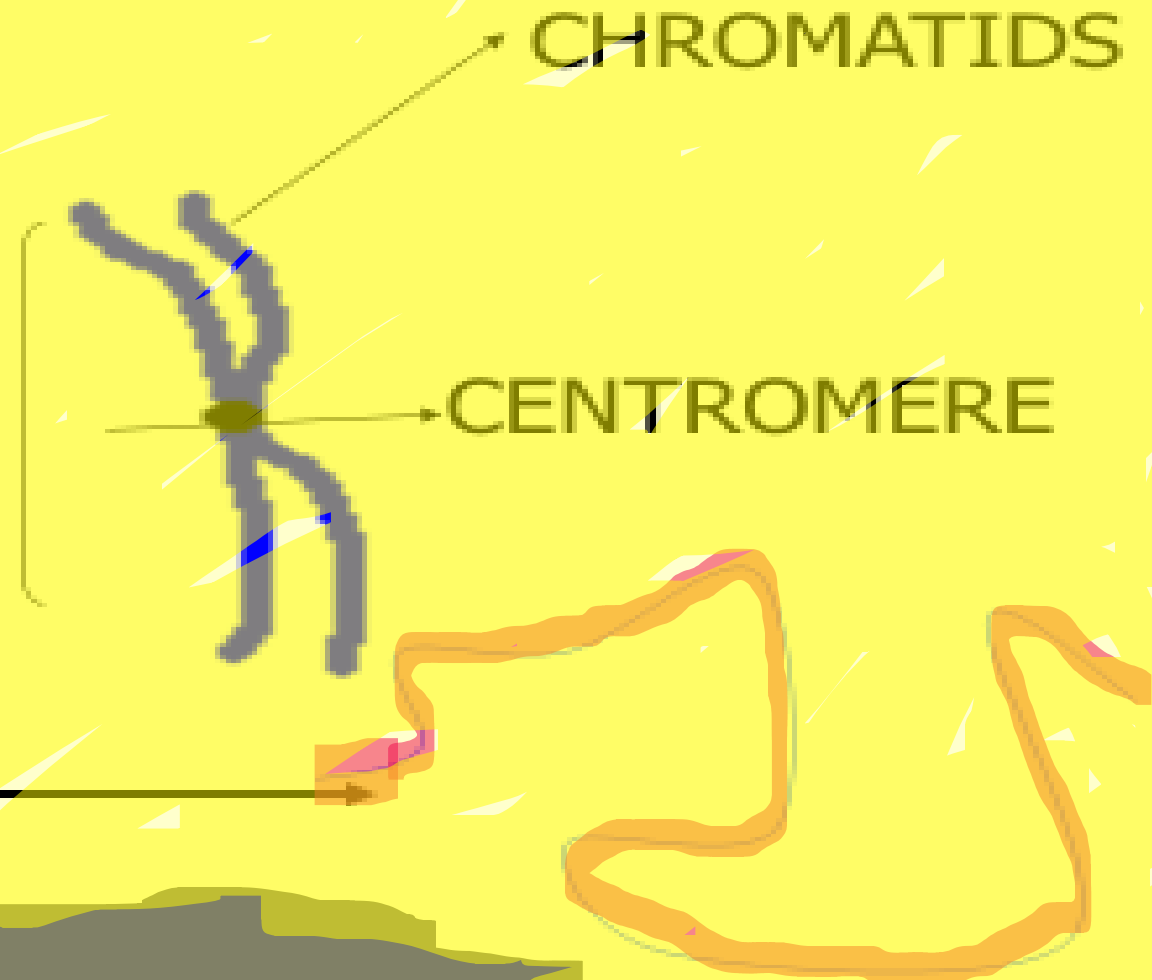
-Proteins are synthesised.

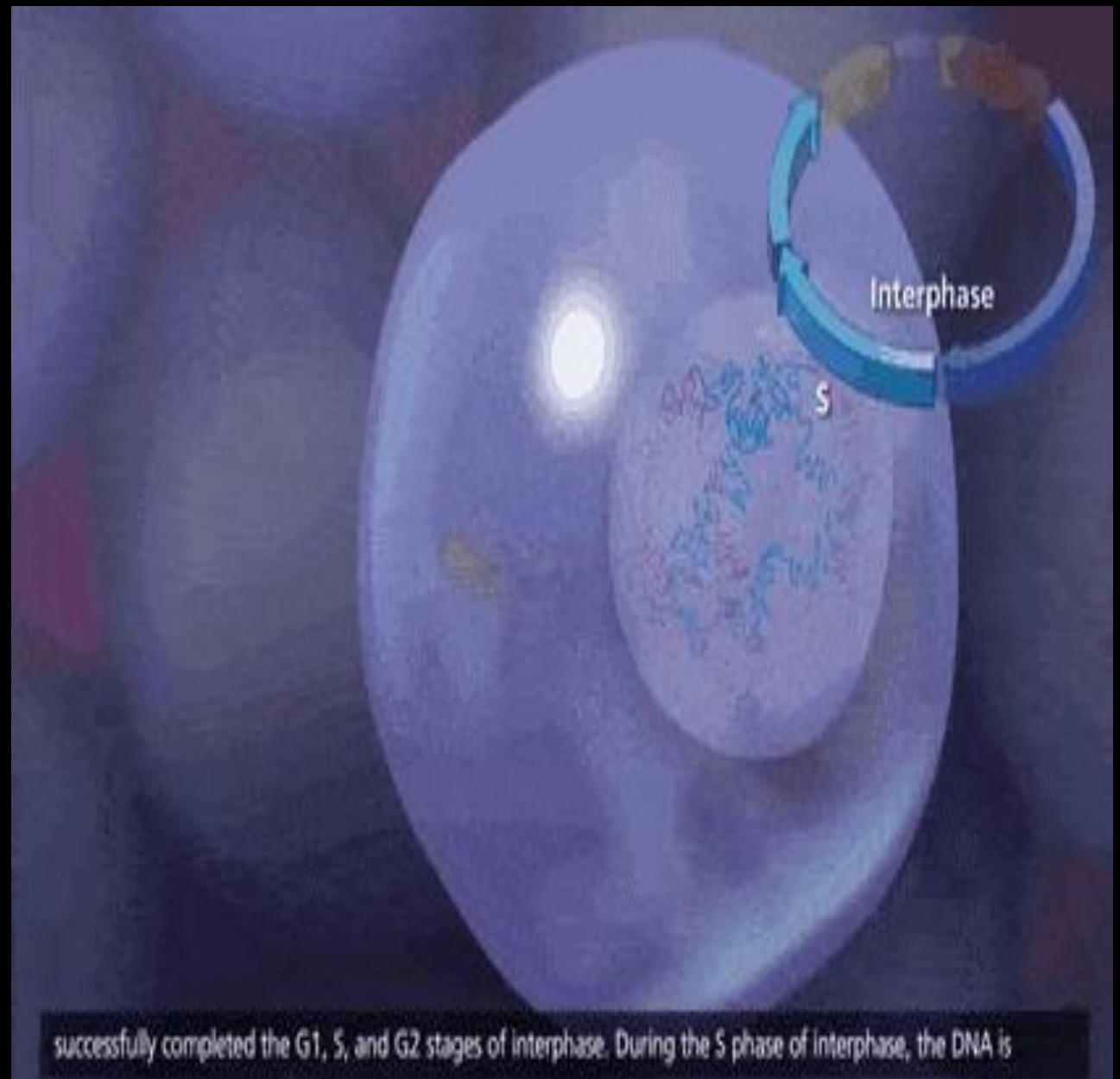
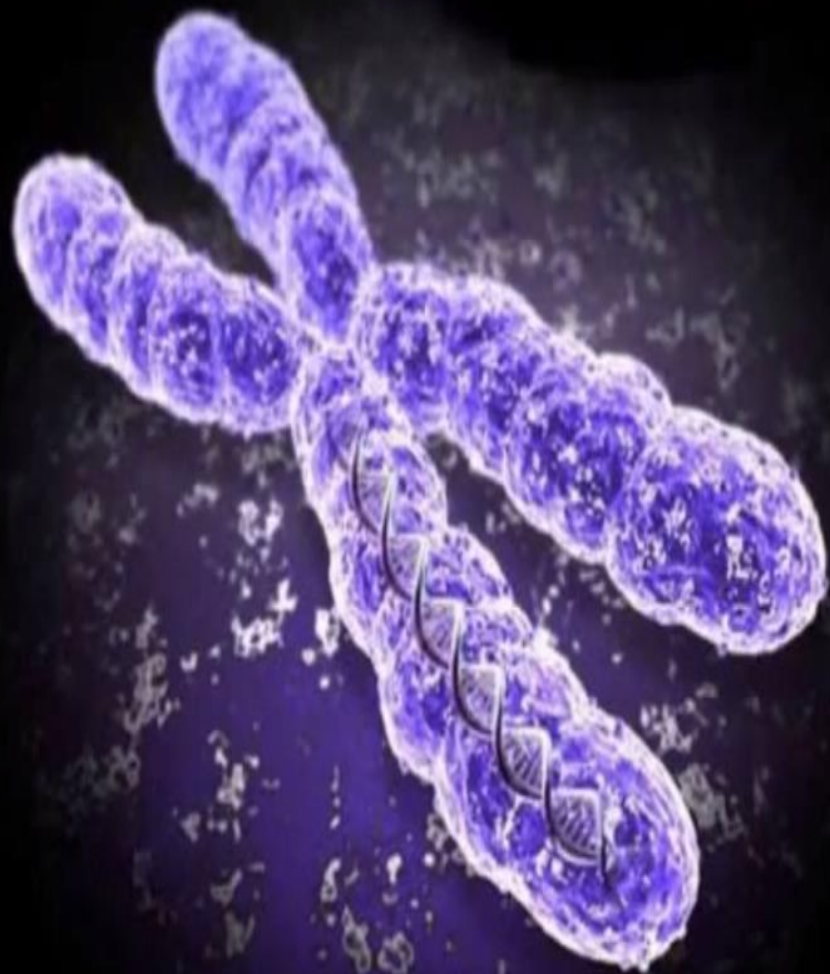
-Cell growth continues

CHROMOSOMES

- At the time of cell division the material inside the nucleus become clearly visible.- the chromosomes

- During the interphase the chromosomes appear as thin diffuse threads called chromatin





successfully completed the G1, S, and G2 stages of interphase. During the S phase of interphase, the DNA is