Cell cycle and cell division

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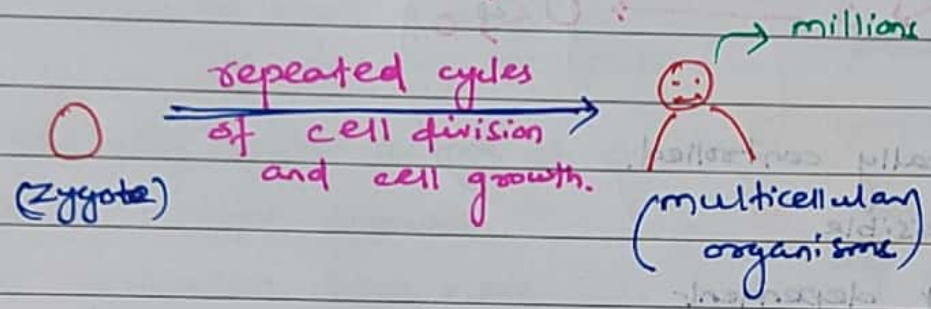
Growth and reproduction:

characteristics of cells, indeed of all living organisms.

All organisms (↓ sexually reproducing) start their life from a single cell. (↓ zygote.)



→ very important process for all organisms.
∵ ↳ growth, reproduction requires cell division

Cell division:

- Known as cell multiplication, cell reproduction.
- includes DNA replication and cell growth
  - called genome duplication
  - occurs only in S phase of cell cycle, hence, discontinuous.
  - w.r.t. cytoplasm it takes place throughout cell cycle, hence, continuous.
  - ↑ in cellular components.

cell division, DNA replication, cell growth
↓
take place in a coordinated way
↓ result
correct cell division and formation of progeny cells with intact genomes.

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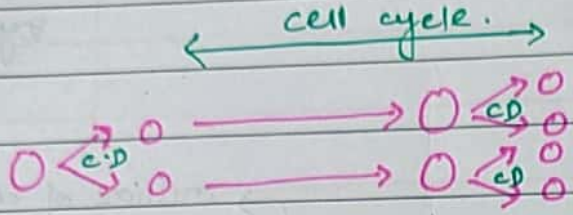
EK cell cycle

- sequence of events by which cell duplicates its genome, ↑es cellular components and eventually divides.

- sequence of events from one cell division to the next.

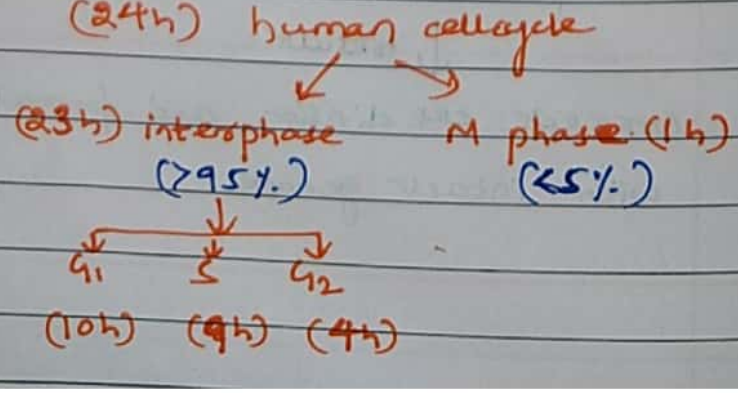


- genetically controlled.
- irreversible
- energy dependent

Duration of cell cycle

- species specific → PK
  - ↳ E. coli → 20 min
  - yeast → 90 min
  - human cell in culture → 24 hours.
- cell specific (depends on cell type)
  - ↳ different types of cells of same organism have different duration of cell cycle.

- cell cycle is regulated by cyclin and CDK (cyclin dependent kinase).



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Decreasing order of duration of phases of cell cycle

$G_1 > S > G_2 >$ prophase > metaphase > telophase > anaphase

Cell cycle

↙ interphase

- nondividing phase, resting phase
  ∵ no event related to division take place.
- # metabolically most active phase.
- phase of intense growth
- # DNA replication takes place.
- phase b/w 2 successive M phases
- includes G_1, S, G_2, G_0.

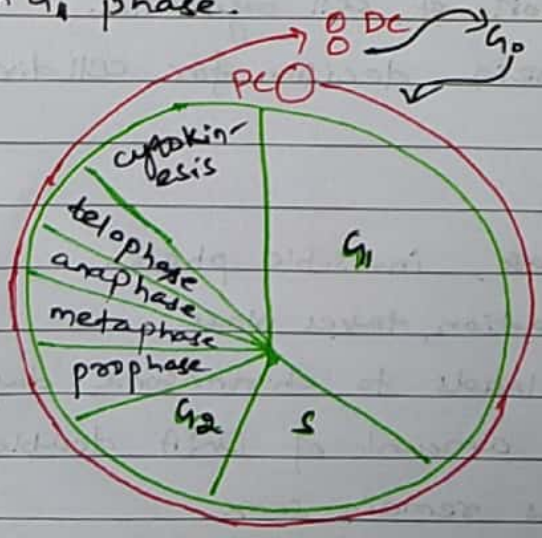
↘ M (mitotic) phase.

- cell division proper
- dividing phase
- metabolically less active phase.
- growth is low.
- # most dramatic phase of cell cycle
- starts with karyokinesis and ends with cytokinesis.

∵ M phase involves reorganisation of almost all organelles.

Sequence of phases of cell cycle

- move clock wise direction
- start from G_1 phase.



Keys

PC → parent cell

DC → daughter cell.

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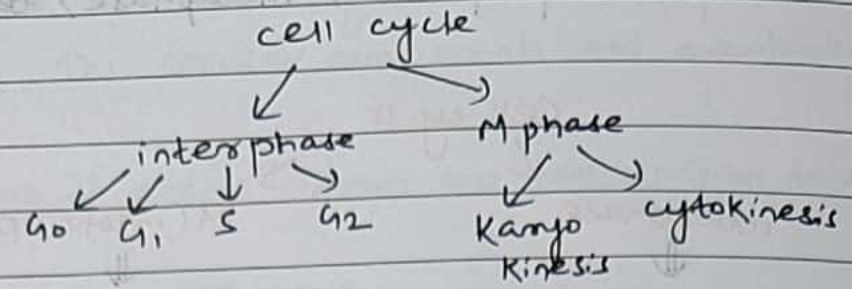
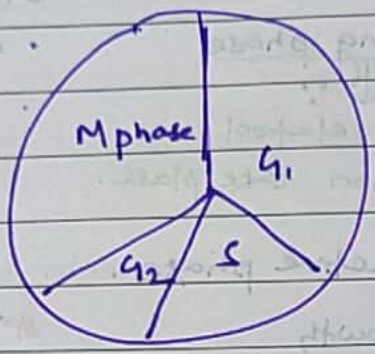
Various phases of cell cycle





G1 phase

- post mitotic / presynthesis / 1st gap / 1st growth phase.
- most durable (longest) phase of cell cycle.
- most variable phase
  - ↳ shorter G1 → in frequently dividing cells
    longer G1 → in less frequently dividing cells.
- Synthesis of Amino acid, proteins, RNA, nucleoside, nucleotides, etc.
- ↑ in no. of most of cell organelles.
- phase wherein decision for cell division is taken.

S phase

- Synthesis phase, invisible phase.
- DNA replication, takes place
  leads to chromosome duplication
- In S phase amount of DNA doubles but no. of chromosomes remain same.
- Synthesis of histone protein, Kinetochore subunits.
- Duplication of centriole.

Note: In bacteria DNA replication takes place before binary fission.

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G2 phase

- post. synthesis phase, premitotic phase, 2nd gap phase, and growth phase.
- Synthesis of tubulin protein.
- Synthesis of RNA, proteins required in M phase.
- ↑ in no. of mitochondria, plastids, GB.

G0 phase

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