G_0 phase

- Known as quiscent stage or inactive stage.
- metabolically active stage.
- $\frac{2n}{2c}$
- cell exits from G_1 (end of G_1) and enters G_0.

↓ if

cell lacks mitogens or (and) energy (ATP)
↳ chemicals that induce cell division.
↳ auxin, GA, cytokinin, platelet growth factor, insulin, etc.

- cells in G_0 phase don't proliferate unless they are asked to do so.
(multiply or divide)

Cells in G_0 phase

1. Quiescent cell (QC)
- cell is in G_0 phase due to lack of mitogen or ATP.

$$QC \xrightarrow[ATP]{\text{mitogen}} \text{cell division} \rightarrow +ve$$

2. Senescent cell (SC)

cell is in G_0 phase after a no. of rounds of cell divisions due to decreased telomerase activity.

$$SC \xrightarrow[ATP]{\text{mitogen}} \text{cell division} \rightarrow -ve.$$

③ Terminally differentiated cell (TDC)

. certain cells once produced they enter G_0 and they never divide.

TDC $\xrightarrow[ATP]{\text{mitogen}}$ cell division → -ve.

Cyclin and CDK

cyclin ↓ activates

CDK (inactive) → CDK (active) activates ↓

Target proteins (inactive) → Target proteins (active) ↓

perform their activity in cell cycle.

. Cyclin → amount → varies with phases.

. CDK → amount → fixed

→ its activity varies (sometimes active and sometimes inactive)

Mitosis

. Discovery → Flemming (in animal cell), Strasburger (in plant cell)

. term → Flemming

. called as equational division

∵ ↳ no. of chromosomes in PC = no. of chromosomes in DC.

as Somatic division

∵ ↳ mitosis normally takes place in somatic cell.

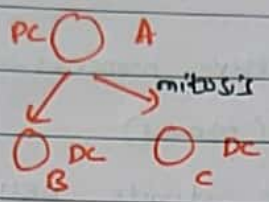
Note: In animals mitosis takes place in undifferentiated germ cells as well.

DATE
PAGE

mitocyte

- cell undergoing mitosis
- can be n, 2n, 3n, 4n, ... etc.
- in animals → 2n
  exception → in some social insects like honey bee
  mitocyte → n, 2n.
- Inplants → n, 2n

⇒ In mitosis the PC and DC are genetically identical.



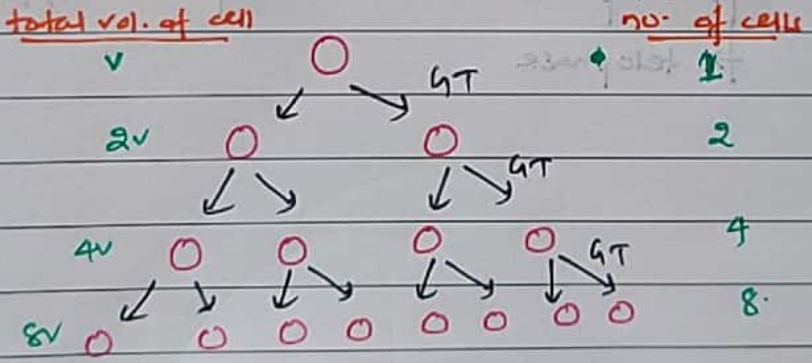
in this case cell A, B, C are identical to each other.

↓ Reason

no crossing over takes place in mitosis.

Generation time (GT)

- Time taken by a cell to divide.
- After each generation (time), the total volume of cells and total number of cells become double.



To produce X no. of cells (from single cell)

① No. of mitosis required → X-1

② no. of mitotic generation required → $2^n = x$. (n → no. of generati

Q. Culture → 1000 cells (initially)
GT → 5 min
Total time → 30 min.
total cells after 30 min = ?

Soln $n = \frac{30}{5} = 6$

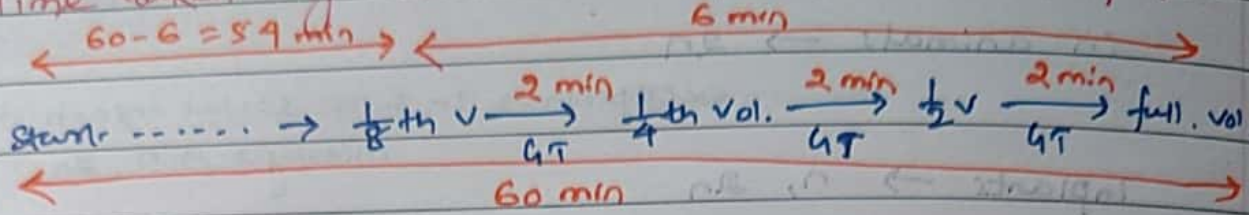
$1000 \times 2^6 = 64000$ cells.

DATE
PAGE

Q. Time taken by bacteria to fill the cup is 60 min.

4T → 2 min.

Time taken by bacteria to fill 1/8th vol. of cup ?



Note:

- Cell division is a progressive process and there is no clear cut lines b/w various stages (phases)
- For our convenience we divide cell cycle into various stages.

M phase of mitosis

- Karyokinesis
  - prophase
  - metaphase
  - anaphase
  - telophase
- cytokinesis (types)
  - cell plate formation → in plants
  - furrow formation → in animals