FREE NOTES · NCERT + NEET LEVEL

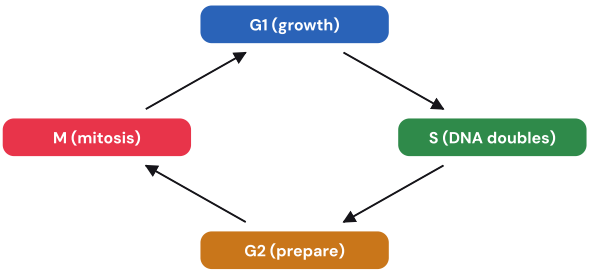
Cell Cycle & Cell Division

Cell cycle ke phases, G0, mitosis ke stages, cytokinesis, mitosis ka mahatva, meiosis I aur II, prophase I ke substages, aur meiosis ka mahatva.

01 Cell cycle
02 Mitosis (equational division)
03 Mitosis ka mahatva
04 Meiosis I: prophase I
05 Baaki meiosis I aur meiosis II
06 Meiosis ka mahatva
07 Extra + tricks
08 Important Q&A
09 Common mistakes
10 Practice (NEET style)
11 Quick revision

01 Cell cycle

- Human cell lagbhag 24 ghante me ek baar divide; yeast ~90 min me.
- **Interphase** (>95% samay): **G1** (growth, active), **S** (DNA 2C se 4C; chromosome number same; cytoplasm me centriole double), **G2** (mitosis ke proteins).
- **M phase**: karyokinesis + cytokinesis.
- **G0** (quiescent): cells G1 se bahar, divide band (jaise heart cells) par zinda aur active.



Cell cycle ke phases

02 Mitosis (equational division)

Stage	Mukhya ghatnayein
Prophase	Chromatin ghana; do chromatids centromere pe jude; centrioles poles pe, asters; Golgi, ER, nucleolus, nuclear envelope gayab (ant me)
Metaphase	Chromosomes sabse ghane (morphology padhne ka best stage); **metaphase plate** pe line; spindle fibres kinetochores se jude
Anaphase	Centromere toota; chromatids (daughter chromosomes) ulte poles ki taraf
Telophase	Poles pe chromosomes dheele; nuclear envelope, nucleolus, Golgi, ER wapas

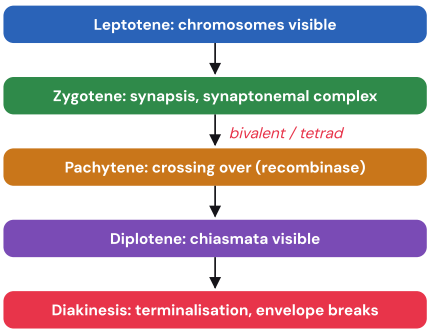
Cytokinesis: animal cells me membrane me furrow; plant cells me **cell plate** (middle lamella) beech se bahar ki taraf. Bina cytokinesis ke karyokinesis ⇒ syncytium (nariyal ka liquid endosperm).

03 Mitosis ka mahatva

- Daughter cells parent jaise (same chromosome number) ⇒ multicellular jeevon ki growth.
- Nucleo-cytoplasmic ratio wapas.
- Repair: epidermis ki upar ki layer, gut lining, blood cells badalte.
- Meristems (apical, lateral cambium) lagatar mitosis se badhte.
- Zyada tar diploid cells me, par kuch lower plants aur social insects (male honey bee) me haploid cells bhi mitosis karte.

04 Meiosis I: prophase I

- Meiosis: ek DNA replication, do divisions ⇒ 4 haploid cells. Gamete banate samay.
- Prophase I lamba, 5 substages (daayein).
- Synaptonemal complex zygotene me banta, diplotene me tootta.
- Crossing over (homologous chromosomes ke non-sister chromatids me adla-badli) pachytene me, enzyme **recombinase**.
- Kuch vertebrates ke oocytes me diplotene mahino ya saalon tak.



Prophase I ke substages

05 Baaki meiosis I aur meiosis II

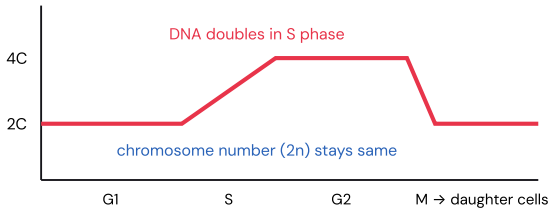
Stage	Meiosis I (reductional)	Meiosis II (equational, mitosis jaisa)
Metaphase	Bivalents equatorial plate pe	Chromosomes line me; spindle sister chromatids ke kinetochores se
Anaphase	Homologous chromosomes alag; sister chromatids saath	Centromere toota; sister chromatids alag
Telophase	Do haploid cells (dyad); phir interkinesis (DNA replication nahi)	Chaar haploid cells (tetrad)

06 Meiosis ka mahatva

- Sexual reproduction wale jeevon me peedhi-dar-peedhi chromosome number same rakhta (aadha karta, fertilisation poora karta).
- Crossing over aur independent assortment se **genetic variability** badhti; variation evolution ka kachcha maal.
- Mitosis vs meiosis: 2 vs 4 daughter cells; same vs alag; somatic vs reproductive cells.

07 Extra + tricks

Stage	Chromosomes	DNA
G1	2n	2C
S ke baad, G2	2n	4C
Mitosis daughter	2n	2C
Meiosis I ke baad	n	2C
Meiosis II ke baad	n	C



Cell cycle me DNA content

- **Amitosis**: bina spindle seedha division (kuch protozoa, cartilage cells). **Endomitosis**: nucleus baante bina chromosomes double ⇒ polyploidy.
- Mitosis trick **PMAT**; meiosis I homologues alag, meiosis II sisters alag.
- Crossing over se **recombinants**; independent assortment se 2^n gamete types (n = jode).

08 Important Q&A

Q1. G1 me 2C DNA. G2 aur meiosis I ke baad kitna?

G2: 4C. Meiosis I ke baad har cell: 2C (haploid chromosomes, har ek me 2 chromatids).

Q2. Chromosome morphology ke liye best stage aur kyun?

Metaphase, kyunki chromosomes sabse ghane aur metaphase plate pe hote.

Q3. Crossing over ka stage aur enzyme?

Pachytene; recombinase.

09 Common mistakes

- Sochna ki S phase me chromosome number double (sirf DNA double).
- Chiasmata ko pachytene me rakhna (diplotene me dikhte).
- Kehna ki anaphase I me sister chromatids alag (homologues alag hote).
- Kehna ki interkinesis me DNA replicate hota.

10 Practice (NEET style)

1. Cycle se bahar ka stage?
2. Synaptonemal complex kab banta?
3. Cell plate kisme?
4. Meiosis ke baad cells?
5. Chiasmata ka terminalisation?

ANSWERS

1) G0 · 2) Zygotene · 3) Plant cell cytokinesis · 4) 4 haploid · 5) Diakinesis

11 Quick revision: exam se 5 minute pehle

INTERPHASE

- G1 → S (DNA 2C→4C) → G2
- G0 quiescent

MITOSIS

- Metaphase plate
- Anaphase: centromere toota
- Plant: cell plate

PROPHASE I

- L-Z-P-D-D: Lazy Zebras Prefer Dark Days
- Pachytene crossing over

MEIOSIS

- I reductional, II equational
- 4 haploid, variation

Koi doubt? padhaiadda.netlify.app pe AI Doubt Solver se poocho, ya is chapter ka mock test do.