FREE NOTES · NCERT + NEET LEVEL

Cell: The Unit of Life

Cell theory, prokaryotic cell, eukaryotic cell membrane (fluid mosaic model), cell wall, endomembrane system, mitochondria, plastids, ribosomes, cytoskeleton, cilia, centrosome aur nucleus.

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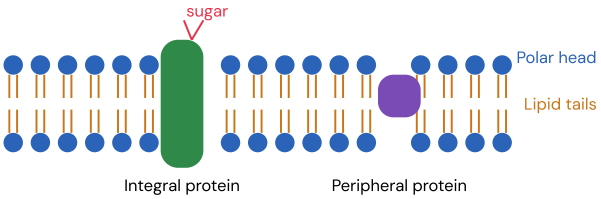
01 Cell theory aur cell types

- Schleiden (paudhe) aur Schwann (jaanwar): sab jeev cells se bane. **Rudolf Virchow** (1855): *omnis cellula-e cellula* (cells pehle ke cells se bante).
- Sabse chhote cells: mycoplasma (0.3 µm); bacteria 3–5 µm; sabse bada single cell: shutarmurg ka anda. Nerve cells sabse lambe me.
- **Prokaryotes** (bacteria, blue-green algae, mycoplasma, PPLO): membrane wala nucleus ya organelles nahi.
- **Eukaryotes**: membrane wala nucleus aur organelles.

02 Prokaryotic cell

- Cell envelope: **glycocalyx** (slime layer ya capsule) + cell wall + plasma membrane. Gram +ve stain rakhte, Gram -ve nahi.
- **Mesosome**: membrane ki tah; wall banana, DNA replication, respiration, secretion me madad.
- Nucleoid: ek gol nanga DNA; **plasmids** (extra DNA, jaise antibiotic resistance).
- Ribosomes 70S (50S + 30S); polysome = mRNA pe chain. Inclusion bodies: phosphate, glycogen granules, gas vacuoles.
- Flagella (filament, hook, basal body), pili, fimbriae (chipakne ke liye).

03 Cell membrane aur cell wall

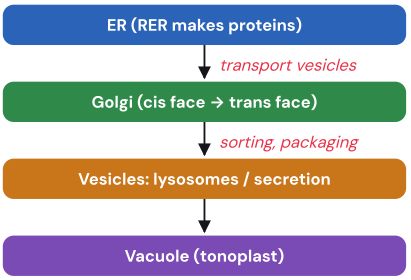


Fluid mosaic model (Singer & Nicolson, 1972)

- Proteins ke saath lipid bilayer; quasi-fluid hone se proteins idhar-udhar chal sakte. Human RBC membrane: ~52% protein, 40% lipid.
- Transport: passive (diffusion, osmosis), active (ATP lagta, jaise Na^+/K^+ pump).
- Plant cell wall: primary wall (badhta), secondary wall (andar), **middle lamella** (calcium pectate, cells ko chipkata). Plasmodesmata cytoplasm jodte. Algae walls: cellulose, galactans, mannans, $CaCO_3$.

04 Endomembrane system

- ER, Golgi, lysosomes, vacuoles saath kaam karte (mitochondria, chloroplasts, peroxisomes isme nahi).
- **RER**: ribosomes, protein banana aur bhejna. **SER**: lipid/steroid banana.
- **Golgi** (Camillo Golgi, 1898): cisternae, cis (banne wala) aur trans (pakne wala) face; packaging, glycoproteins aur glycolipids yahin bante.
- **Lysosomes**: hydrolytic enzymes (lipases, proteases, carbohydrases), acidic pH pe active.
- **Vacuole**: tonoplast; plant cell ka 90% tak; *Amoeba* me contractile vacuole (excretion), protists me food vacuoles.



Endomembrane system ka raasta

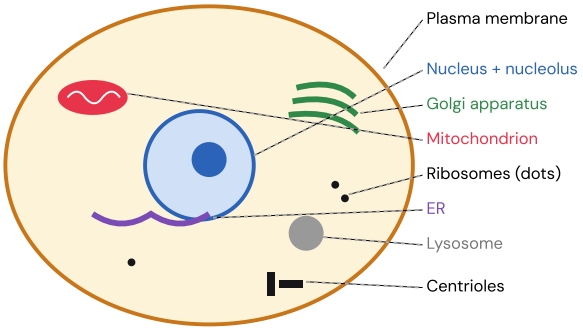
05 Mitochondria, plastids, ribosomes

Organelle	Structure	Function
Mitochondria	Double membrane; inner folds = cristae; matrix with circular DNA, 70S ribosomes	Aerobic respiration, ATP ("powerhouse"); divide by fission
Chloroplast	Double membrane; grana (stacks of thylakoids), stroma lamellae, stroma with DNA, 70S ribosomes	Photosynthesis
Chromoplast	Carotene, xanthophyll	Yellow/orange/red colour
Leucoplast	Colourless: amyloplast (starch), elaioplast (oil), aleuroplast (protein)	Storage
Ribosomes	Non-membranous; RNA + protein; 80S (60S+40S) in eukaryotes	Protein synthesis

06 Cytoskeleton, cilia, centrosome, nucleus

- **Cytoskeleton**: microtubules, microfilaments, intermediate filaments; support, chalna, shape.
- **Cilia/flagella**: axoneme me **9+2** microtubules, basal body se. Cilia chhote (chappu jaise), flagella lambe.
- **Centrosome**: do centrioles, har ek me **9+0** triplet fibrils (cartwheel); animal cells me spindle banata.
- **Nucleus** (Robert Brown, 1831): do parat wala nuclear envelope pores ke saath, nucleoplasm, nucleolus (rRNA banana), chromatin. Chromosome: centromere, kinetochore; metacentric, sub-metacentric, acrocentric, telocentric. Kuch chromosomes pe satellite.
- **Microbodies**: enzymes wale chhote vesicles (peroxisomes, glyoxysomes).

07 Extra + tricks



Animal cell (saral)

Organelle	Kisne khoja / naam diya
Cell	Robert Hooke (1665, cork)
Nucleus	Robert Brown (1831)
Golgi apparatus	Camillo Golgi (1898)
Ribosome	George Palade (1953)
Lysosome	Christian de Duve
Mitochondria (naam)	Benda

- Plant vs animal cell: paudhon me cell wall, plastids, bada vacuole; centrioles zyada tar animal cells me.
- Lysosomes = "suicidal bags"; ribosomes = "protein factories"; mitochondria = "powerhouse".

08 Important Q&A

Q1. Kin organelles ka apna DNA? Kya mahatva?

Mitochondria aur chloroplasts: gol DNA aur 70S ribosomes, isliye semi-autonomous.

Q2. Middle lamella ka kaam?

Calcium pectate ki layer jo paas ke plant cells ko jodti.

Q3. Nok pe centromere wala chromosome?

Telocentric.

09 Common mistakes

- Mitochondria ko endomembrane system me ginna.
- Centriole ke liye 9+2 likhna (centriole 9+0; cilia 9+2).
- Prokaryotic ribosomes ko 80S kehna.
- Golgi ka cis face (lene wala) aur trans face (bhejne wala) mix karna.

10 Practice (NEET style)

1. Omnis cellula-e cellula kisne diya?
2. Prokaryotic membrane ki tah?
3. rRNA kahan banta?
4. Tel store karne wala plastid?
5. Fluid mosaic model kisne diya?

ANSWERS

1) Rudolf Virchow · 2) Mesosome · 3) Nucleolus · 4) Elaioplast · 5) Singer and Nicolson

11 Quick revision: exam se 5 minute pehle

PROKARYOTE

- Nucleoid, plasmid
- Mesosome
- 70S ribosome

MEMBRANE

- Fluid mosaic
- Middle lamella: Ca pectate
- Plasmodesmata

ORGANELLES

- RER protein, SER lipid
- Golgi packaging
- Lysosome acidic enzymes

NUMBERS

- Cilia 9+2, centriole 9+0
- 80S = 60S+40S
- 70S = 50S+30S

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