YAKEEN NEET 2.0

2026

Cell - The Unit of Life

Botany | Lecture – 09

Rupesh Chaudhary Sir

Topics to be covered

1. RIBOSOME
2. CENTROSOME
3. NUCLEUS
4.

NOTE : AXONEME POSSESS MICROTUBULE RUN PARALLEL TO LONG AXIS.
(CORE)

CILIA & FLAGELLA ARISE FROM CENTRIOLE LIKE STRUCTURE CALLED BASAL BODY.

9 (doublet)+2

9(TRIPLET)+0

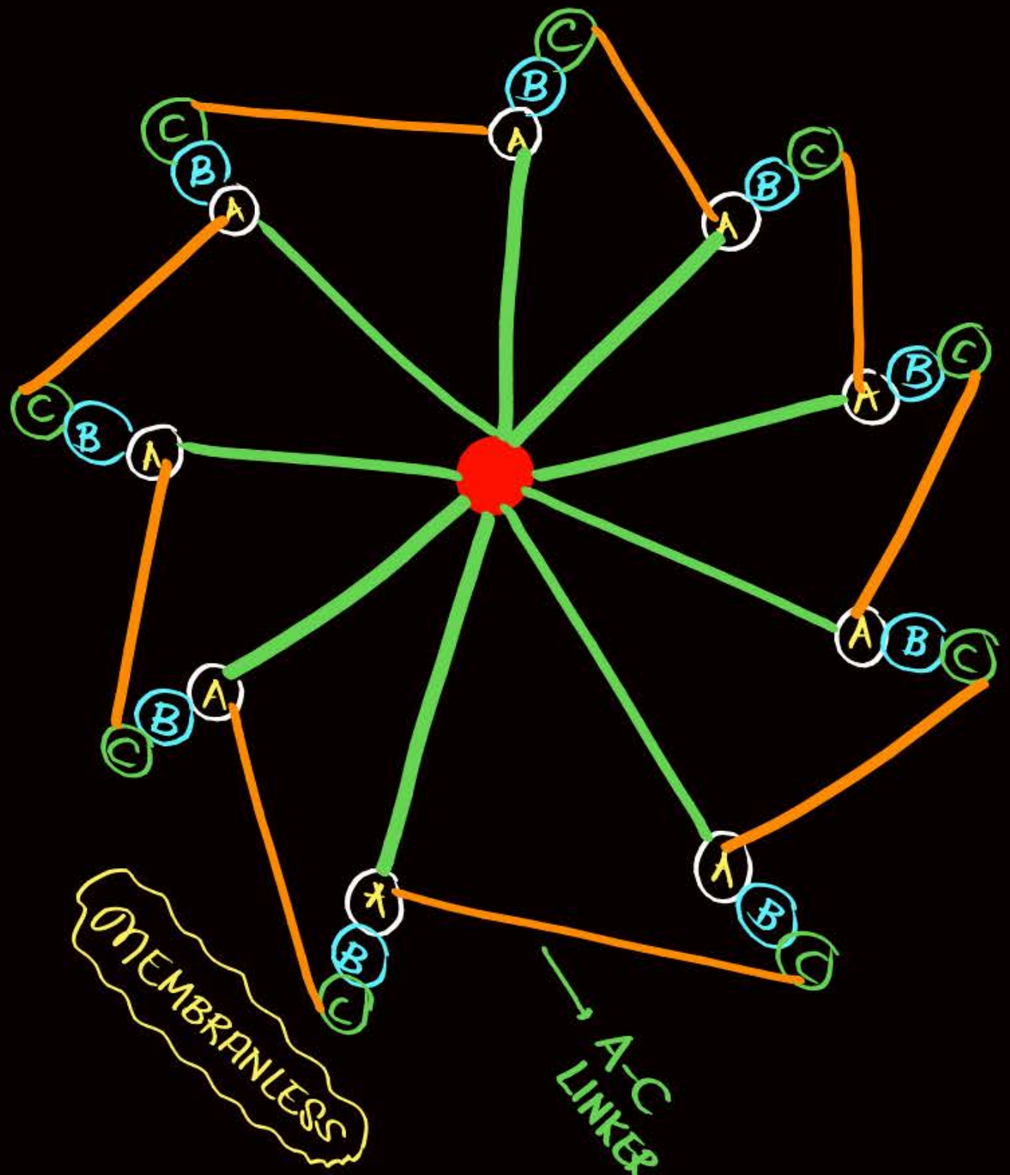
?

9(TRIPLET)+0

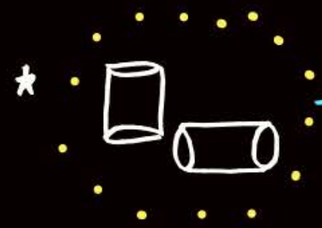
?

CENTROSOME

- CONSIST OF TWO CENTRIOLE
- 90° TO EACH OTHER
- CYLINDRICAL STRUCTURE
- PERIPHERY: 9 TRIPLET
- 1 TRIPLET: 3 M·T
- PERIPHERY: 9X3 = 27 M·T
- TWO TRIPLET CONNECTED BY A-C LINKER (PROTEIN)
- ● → CENTRAL PROTEINACEOUS STRUCTURE: HUB.
- CENTRE: NO M·T
- 9 (TRIPLET) + 0
  - PERIPHERY
  - CENTRE



- PROTEINACEOUS RADIAL SPOKE (9) CONNECTED TO PERIPHERAL M·T.



→ PROTEIN SURROUNDING CENTRIOLE (AMORPHOUS PERICENTRIOLAR MATERIAL).

- CART WHEEL STRUCTURE
- SELF DUPLICATING

↓

CENTRIOLE

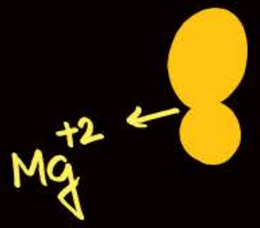
- 1 CENTROSOME: 27 MT + 27 M·T = 54 M·T
- CENTRIOLE FORM BASAL BODY & SPINDLE FIBRE IN ANIMAL CELL.

RIBOSOME

P: PROTEIN
rRNA: RIBOSOMAL RNA.

★ GEORGE PALADE, 1953, UNDER ELECTRON MICROSCOPE : DENSE GRANULE STRUCTURE, SMALLEST ORGANELLE, MEMBRANLESS.

★ PROTEIN FACTORY OF CELL /ORGANELLE WITHIN ORGANELLE (MITOCHONDRIA, CHLOROPLAST)
70S 70S.



PROKARYOTE
↓
70S
↙ SUBUNIT ↘

30S (SMALLER)	50S (LARGER)
↓	↓
21P	34P
↓	↓
16S rRNA	5S, 23S rRNA

EUKARYOTE
↓
80S
↙ ↘

40S	60S
↓	↓
33P	47P → 80P.
↓	↓
18S rRNA	5S, 28S, 5.8S

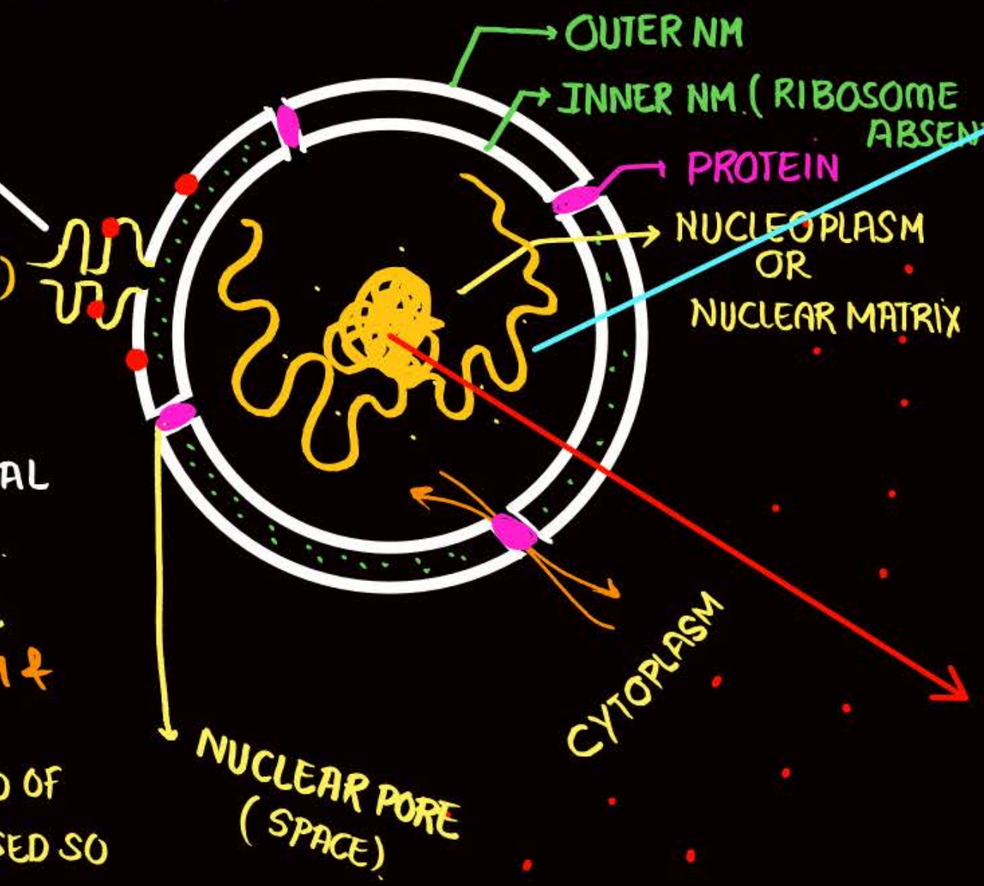
★ 'S' : STAND FOR SEDIMENTATION COEFFICENT
(VELOCITY WITH WHICH A PARTICLE MOVE & SEDIMENT DURING CENTRIFUGATION.
& THIS VELOCITY MEASURED IN TERMS OF UNIT — SVEDBERG UNIT

★ IT IS INDIRECT MEASURE OF SIZE & DENSITY.

★ RNA + PROTEIN IN RIBOSOME
↓
RIBONUCLEOPROTEIN.

NUCLEUS : ROBERT BROWN, 1831 , BINUCLEATED : PARAMECIUM , MULTINUCLEATED : FUNGUS. , WELL DEFINED : EUKARYOTE.

BUT MAMMALIAN RBC (MATURE) & SIEVE TUBE (PHLOEM) : NUCLEUS ABSENT.



① RER CONTINUOUS WITH OUTER NUCLEAR MEMBRANE
↓
RIBOSOME PRESENT (80S)

② SPACE B/W TWO NM : PERINUCLEAR SPACE WHICH OPEN INTO LUMINAL SPACE OF ER, 10-50nm.

③ NM / PERINUCLEAR SPACE SEPERATE NUCLEOPLASM & CYTOPLASM.

④ NUCLEAR PORE : BOTH END OF NUCLEAR MEMBRANE FUSED SO A SPACE IS FORMED.

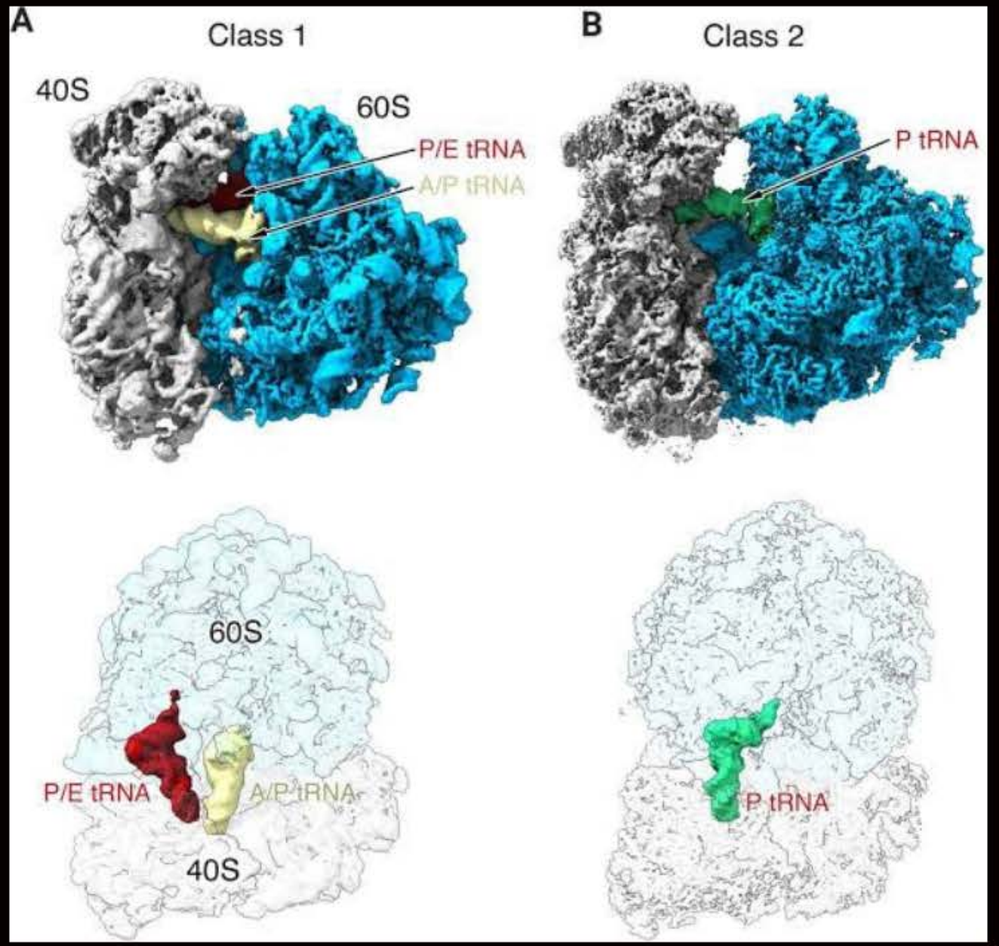
NUCLEAR PORE + PROTEIN = NUCLEAR PORE COMPLEX.
↓
MAINTAIN BIDIRECTIONAL MOVEMENT (RNA & PROTEIN)

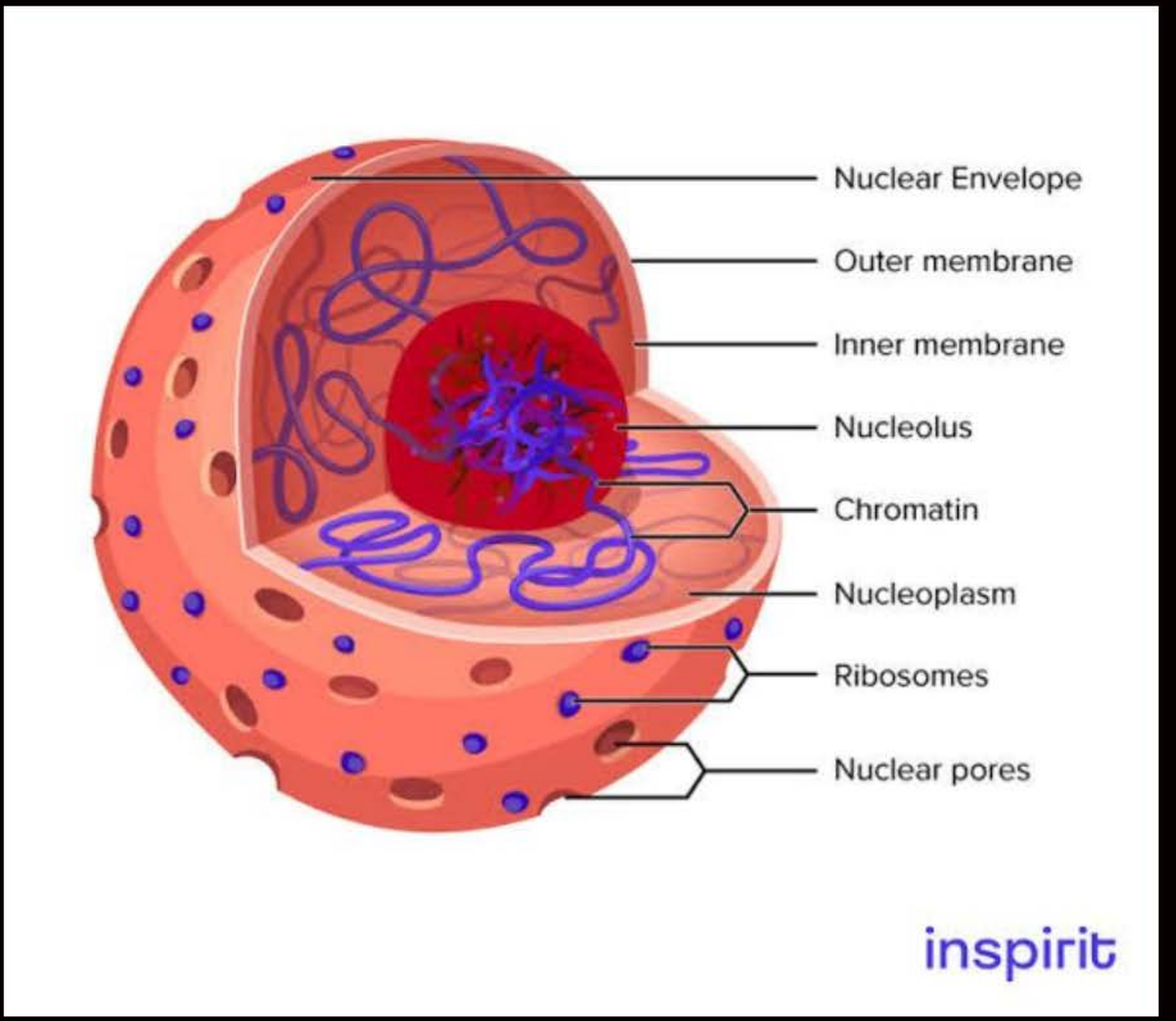
★ CHROMATIN (DECONDENSED FORM OF CHROMOSOME), EXTENDED IN NUCLEUS ELABORATE / COMPLEX. (ITS VISIBILITY IS POOR).

★ INTERPHASE : NON-DIVIDING PHASE (CHROMATIN WORD USE)

★ PROPHASE, METAPHASE, ANAPHASE (DIVIDING STAGE) → NUCLEAR MEMBRANE ABSENT., CHROMOSOME WORD → USE.

★ DNA + HISTONE PROTEIN / BASIC + NON HISTONE PROTEIN (ACIDIC) + RNA. ⇒ CHROMATIN / CHROMOSOME


A
Class 1
40S
60S
P/E tRNA
A/P tRNA
B
Class 2
P tRNA
60S
P/E tRNA
A/P tRNA
40S
P tRNA


Nuclear Envelope
Outer membrane
Inner membrane
Nucleolus
Chromatin
Nucleoplasm
Ribosomes
Nuclear pores
inspirit

8.5.6 Ribosomes

Ribosomes are the granular structures first observed under the electron microscope as dense particles by George Palade (1953). They are composed of ribonucleic acid (RNA) and proteins and are not surrounded by any membrane.

The eukaryotic ribosomes are 80S while the prokaryotic ribosomes are 70S. Each ribosome has two subunits, larger and smaller subunits (Fig 8.9). The two subunits of 80S ribosomes are 60S and 40S while that of 70S ribosomes are 50S and 30S. Here 'S' (Svedberg's Unit) stands for the sedimentation coefficient; it is indirectly a measure of density and size. Both 70S and 80S ribosomes are composed of two subunits.

Ribosome

A. Membraneless, smallest, palade particle (1853)
B. consist of RNA & protein
C. eukaryote - 80S & prokaryote - 70S
D. 80S - Smaller subunit 30S & larger 50S
E. 70S -smaller subunit - 40S & larger 60S
F. S is svedberg unit stand for sedimentation coefficient
G. Sedimentation coefficient is indirectly measure of density & size

(A) 1 (B) 2 (C) 3 (D) 4

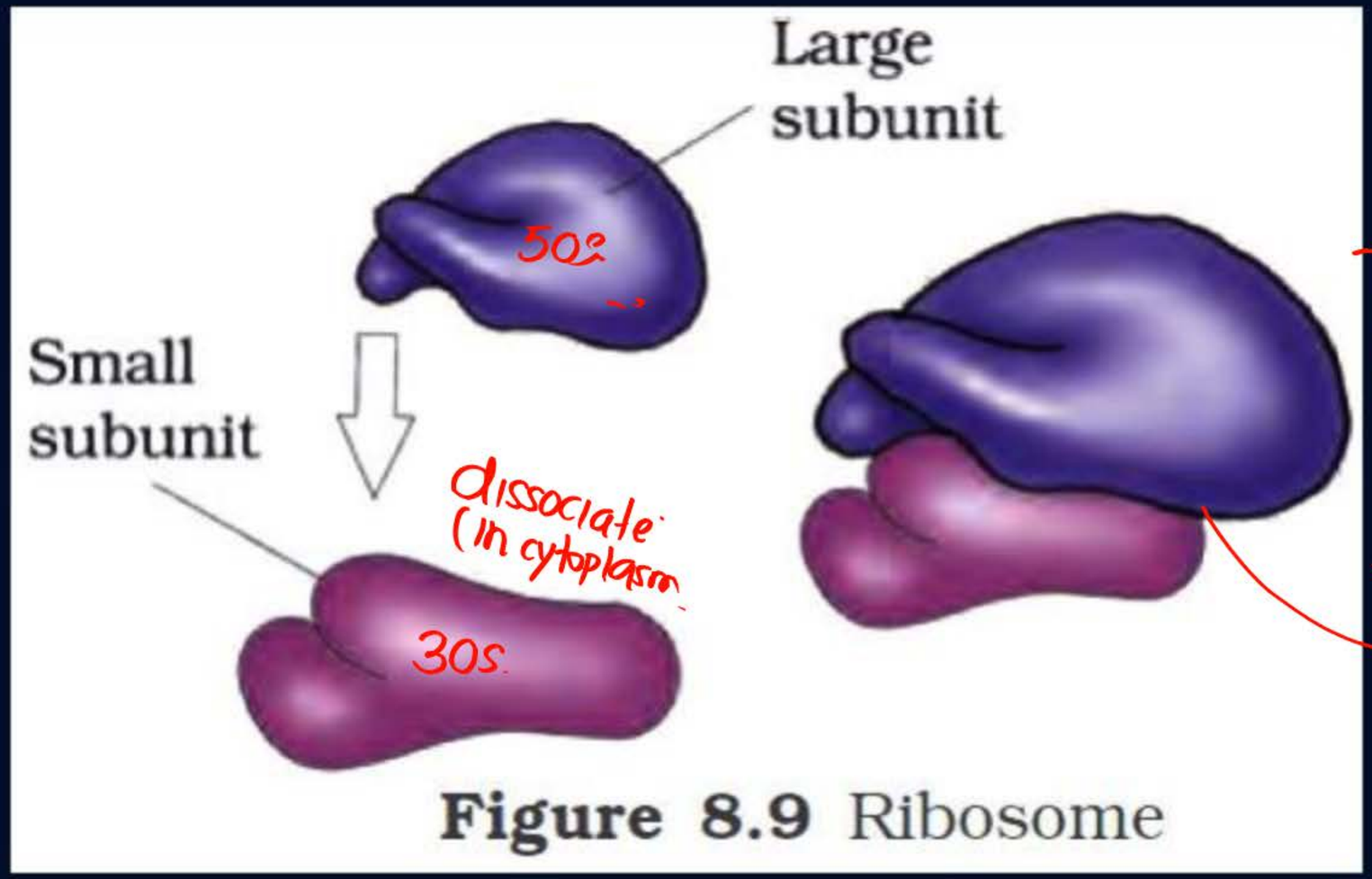


Figure 8.9 Ribosome

DURING PROTEIN SYNTHESIS (ASSOCIATED) STATE

Mg^{+2}

8.5.8 Cilia and Flagella

Cilia (sing.: cilium) and flagella (sing.: flagellum) are hair-like outgrowths of the cell membrane. Cilia are small structures which work like oars, causing the movement of either the cell or the surrounding fluid. Flagella are comparatively longer and responsible for cell movement. The prokaryotic bacteria also possess flagella but these are structurally different from that of the eukaryotic flagella.

How many statements are correct

A. Cilia & flagella Are outgrowth of cell wall in eukaryotes

B. Cilia work Like oars cause movement of cell only but not surrounding fluid

C. flagella shorter than cilia

D. prokaryote flagella and eukaryotes flagella are structurally similar

dissimilar.

Options

(A) 1 (B) 2 (C) 3 (D) All are in correct

The electron microscopic study of a cilium or the flagellum show that they are covered with plasma membrane. Their core called the **axoneme,** possesses a number of microtubules running parallel to the long axis. The axoneme usually has nine doublets of radially arranged peripheral microtubules, and a pair of centrally located microtubules. Such an arrangement of axonemal microtubules is referred to as the 9+2 array (Figure 8.10).

9(doublet) +2

The central tubules are connected by bridges and is also enclosed by a central sheath, which is connected to one of the tubules of each peripheral doublets by a radial spoke. Thus, there are nine radial spokes. The peripheral doublets are also interconnected by linkers. Both the cilium and flagellum emerge from centriole-like structure called the basal bodies.

(A)

arise

How many statement are correct

A. Core of cilia and flagella -axoneme
B. axoneme posses microtubule running parallel to axis
C. axoneme has 9 peripheral doublet of microtubule
D. axoneme posses a pair of centrally located microtubule, both are singlet
E. Central microtubule connected by bridge but enclosed by sheath
F. 9 radial spokes Are present
G. peripheral doublet also connected by linkers
H. cilia and flagella show 9 + 0 arrangement
I. Cilia and flagella arise from centriole like structure called Basal Body

Options

(A) 6 (B) 5 (C) 7 (D) 4

(a)

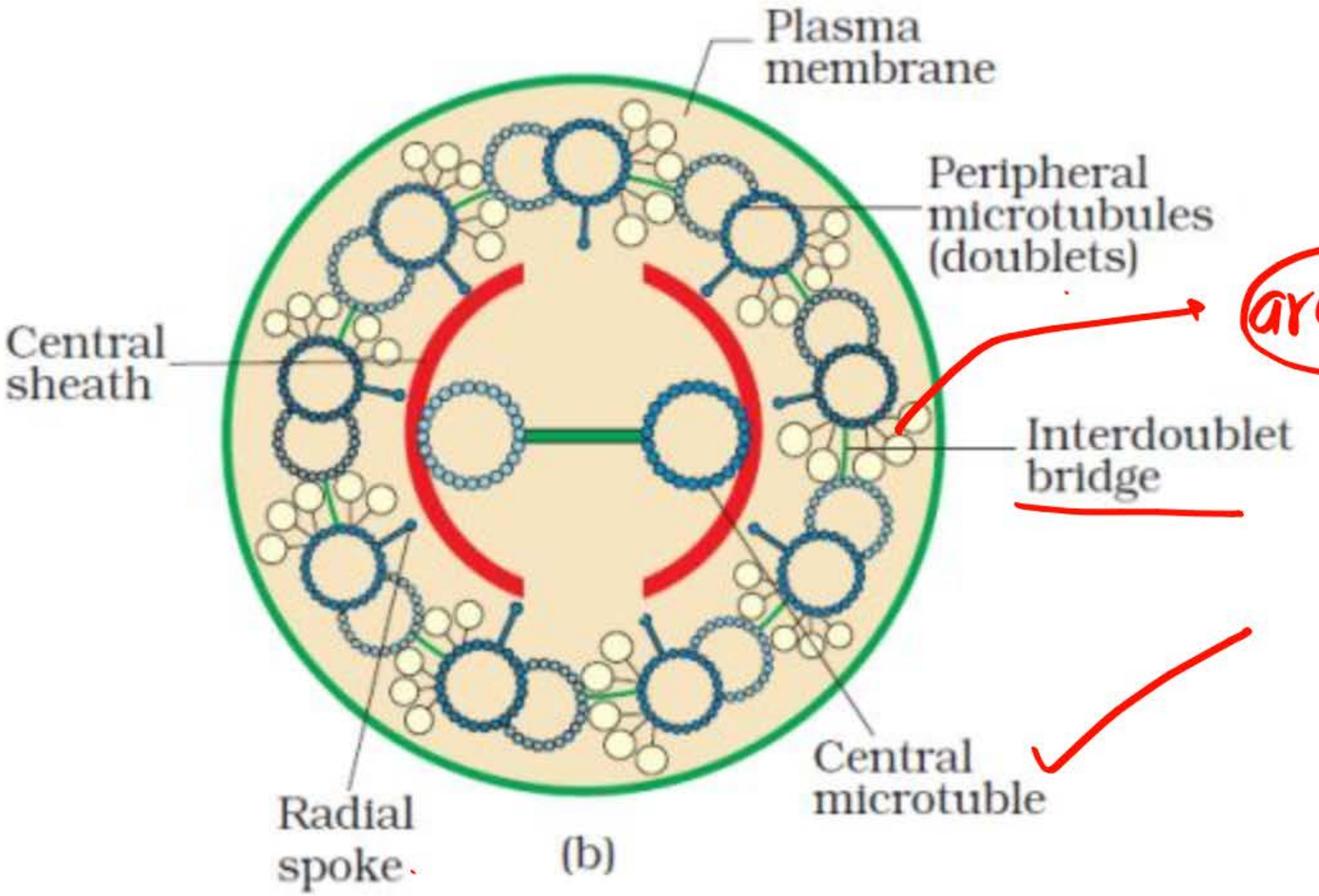


Figure 8.10 Section of cilia/flagella showing different parts : (a) Electron micrograph (b) Diagrammatic representation of internal structure

8.5.9 Centrosome and Centrioles

Centrosome is an organelle usually containing two cylindrical structures called centrioles. They are surrounded by amorphous pericentriolar materials. Both the centrioles in a centrosome lie perpendicular to each other in which each has an organisation like the cartwheel. They are made up of nine evenly spaced peripheral fibrils of tubulin protein. Each of the peripheral fibril is a triplet. The adjacent triplets are also linked.

A-C LINKER.

Correct statement

(A) Centrosome consist of one cylindrical structure - Centriole

(B) Centriole surrounded by amorphous pericentriolar material

(C) both centriole Are perpendicular to each other and show cartwheel structure and also membrane less

(D) both B and C

The central part of the proximal region of the centriole is also proteinaceous and called the **hub**, which is connected with tubules of the peripheral triplets by radial **spokes** made of protein. The centrioles form the basal body of cilia or flagella, and spindle fibres that give rise to spindle apparatus during cell division in animal cells.

A

BOTH STRUCTURE ARE SIMILAR

Incorrect statement

(A) Peripheral - 9 triplet microtubule present and adjacent triplets are also linked

(B) Central part is proteinaceous called central hub

(C) Hub connected with peripheral triplets by radial spokes made up of protein

(D) Centriole form the basal Body of cilia and flagella and also form spindle fibre in plant cell during cell division

animal

Revision PLANNER कल दूँगा

THANK YOU