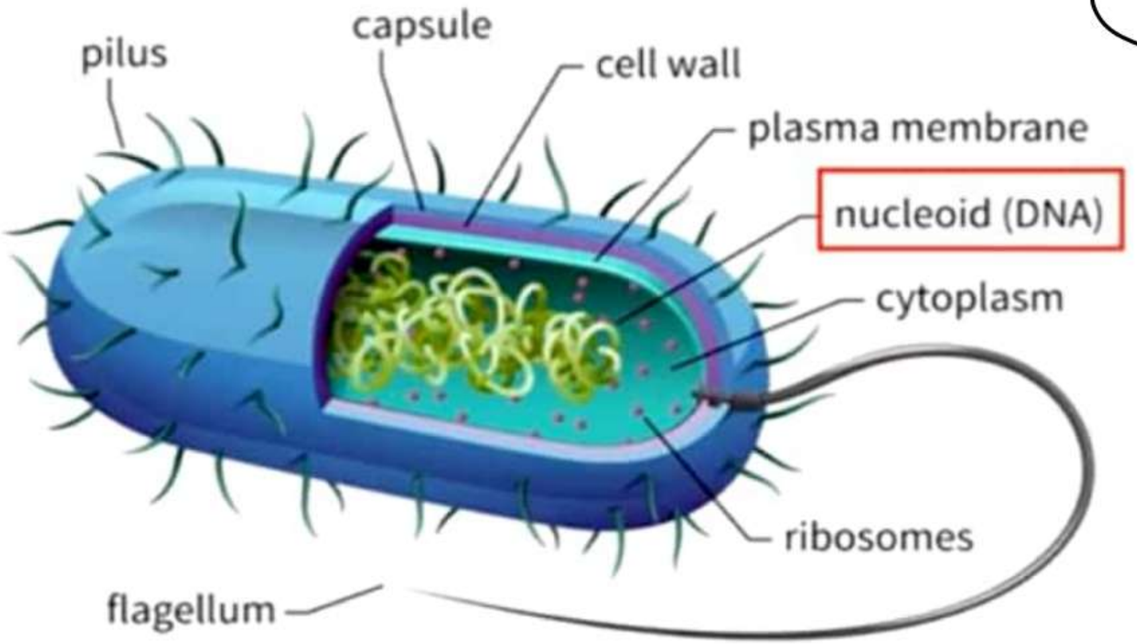
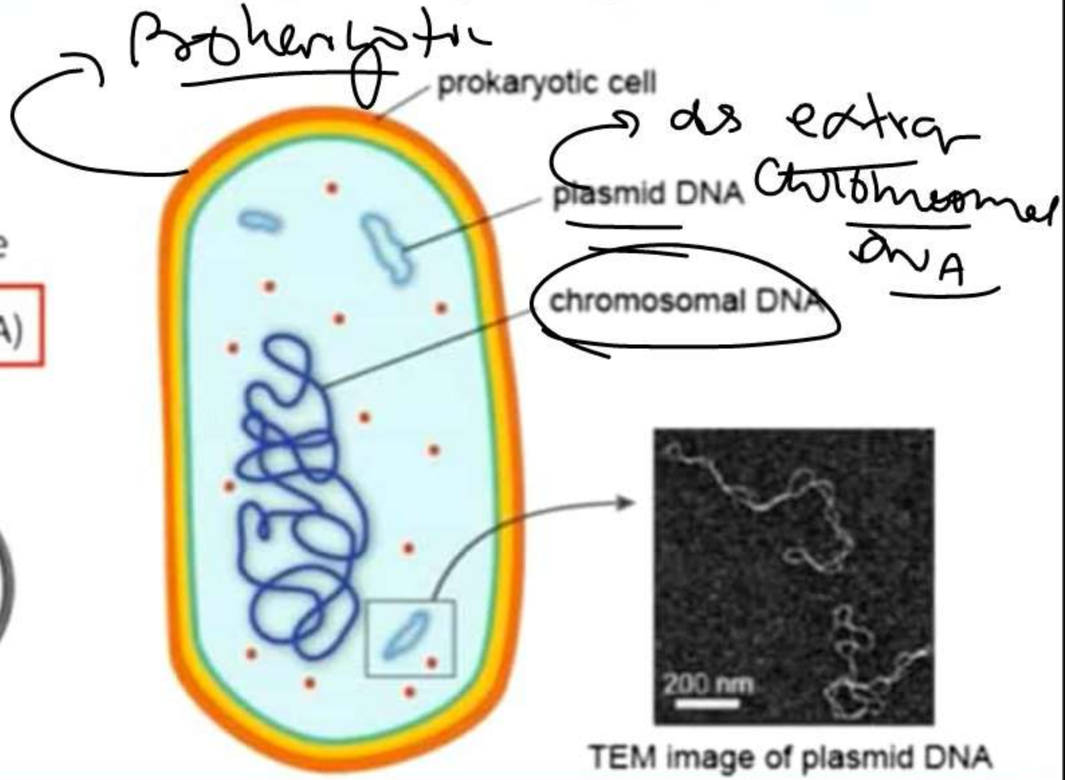
PACKAGING OF DNA HELIX IN PROKARYOTES

- In prokaryotes (E.g. *E. coli*), the DNA is not scattered throughout the cell.
- DNA is negatively charged. So it is held with some positively charged proteins to form nucleoid.

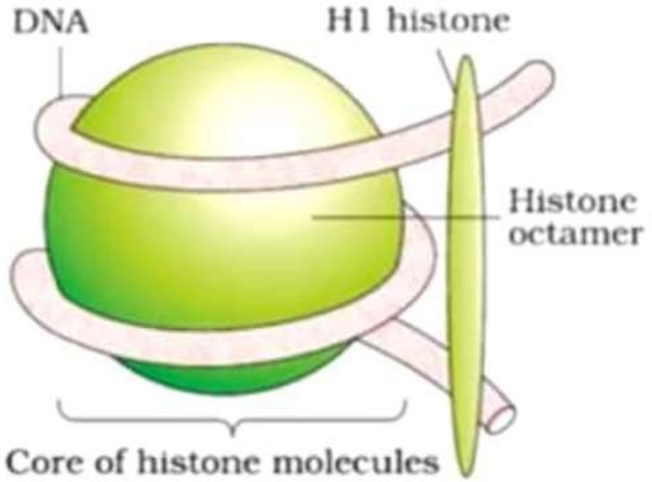




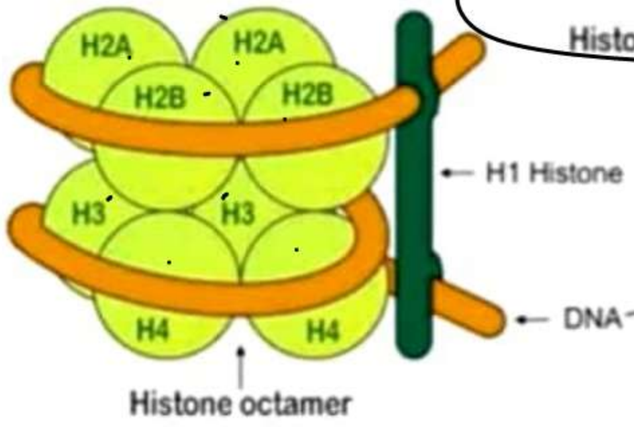
TEM image of plasmid DNA

PACKAGING OF DNA HELIX IN EUKARYOTES

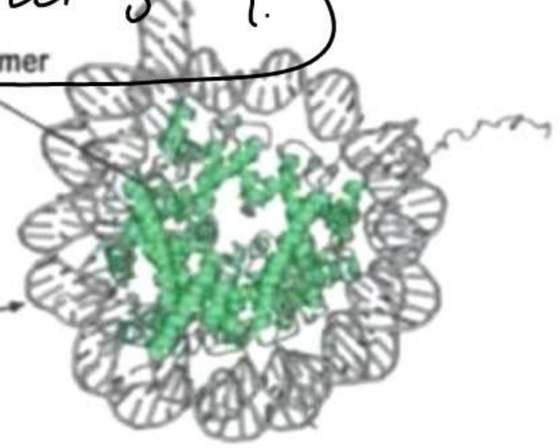
- In eukaryotes, there is a set of positively charged, basic proteins called histones.
- Histones are rich in positively charged basic amino acid residues lysines & arginines.
- 8 histones form histone octamer.
- Negatively charged DNA is wrapped around histone octamer to give nucleosome.



Nucleosome



A nucleosome molecule (side view)



Nucleosome molecule (Top view)

PACKAGING OF DNA HELIX IN EUKARYOTES

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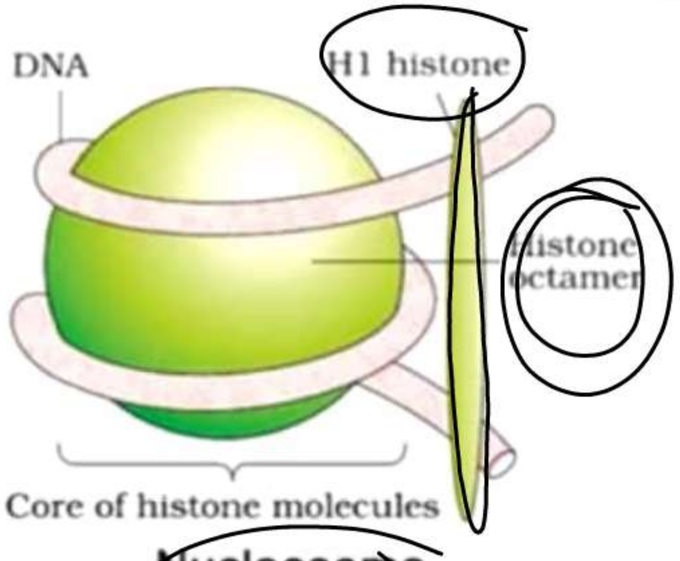
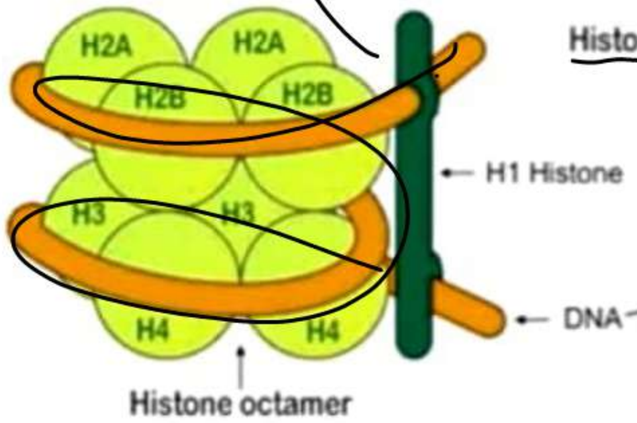
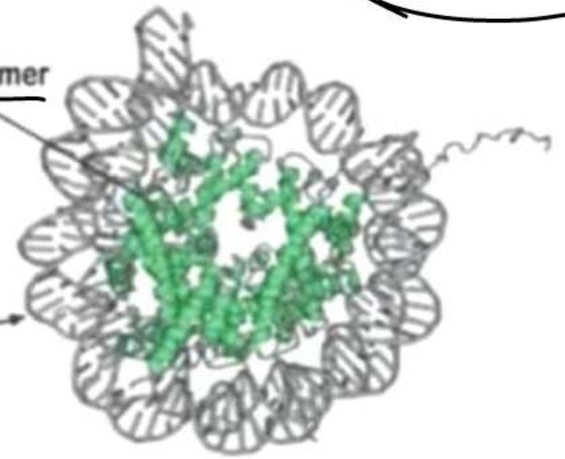




A nucleosome molecule (side view)

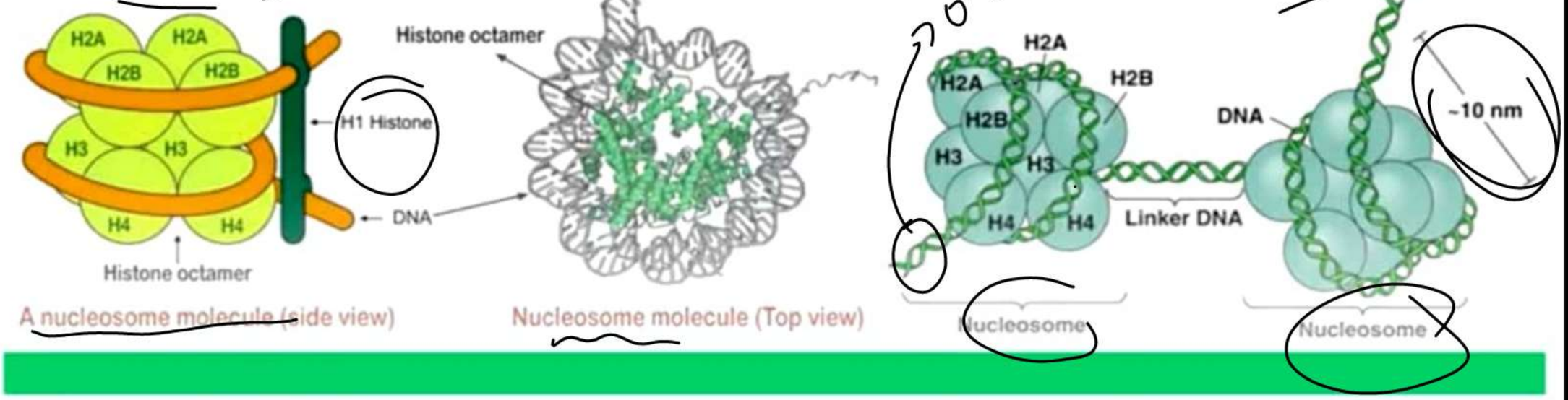


Nucleosome molecule (Top view)

PACKAGING OF DNA HELIX IN EUKARYOTES

- A typical nucleosome contains 200 bp.
- Therefore, total number of nucleosomes in human =

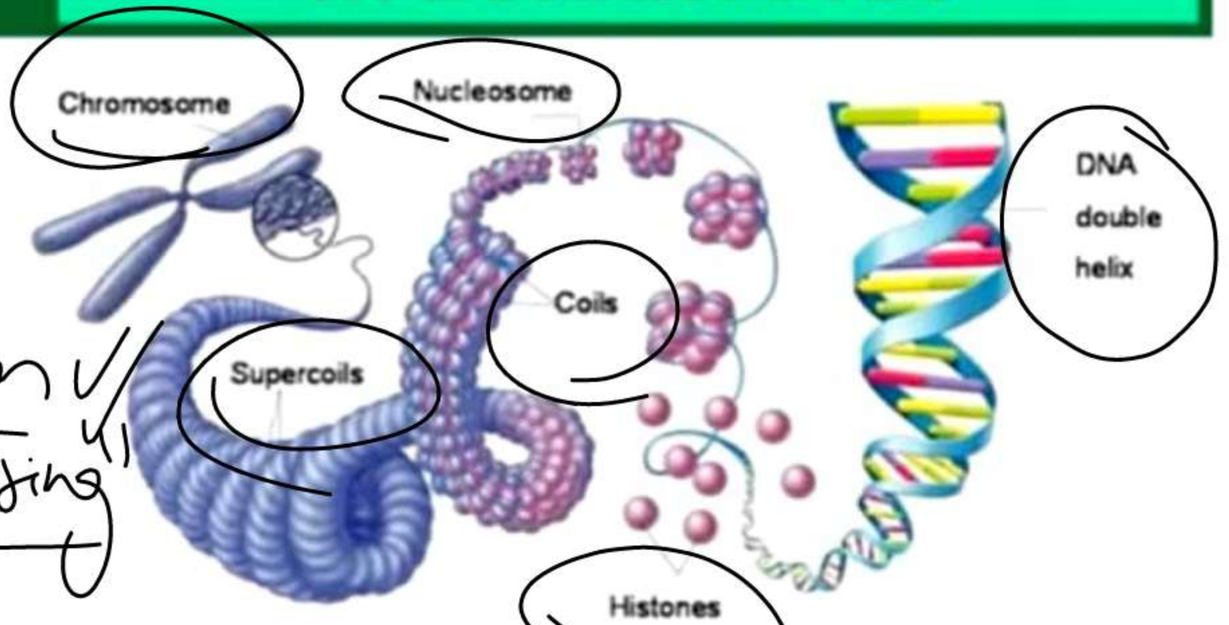
$$\frac{6.6 \times 10^9 bp}{200} = 3.3 \times 10^7$$

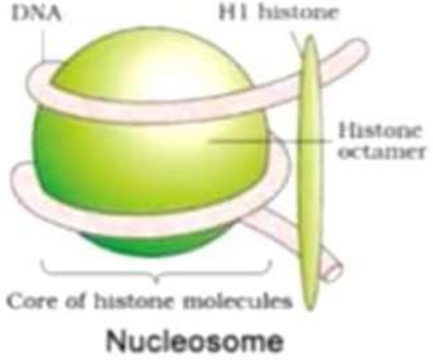


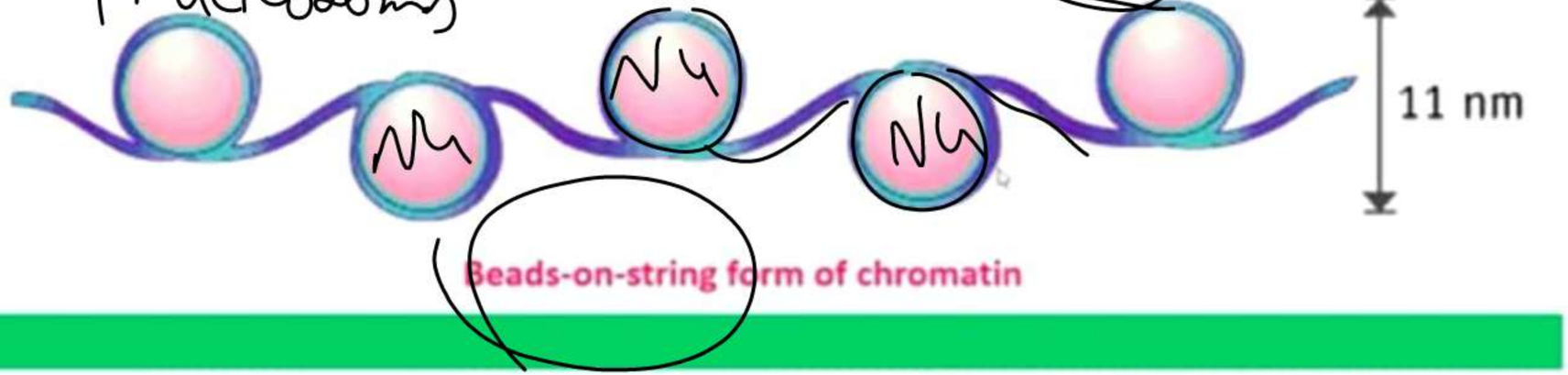
PACKAGING OF DNA HELIX IN EUKARYOTES

NEET- 2023

- Nucleosomes constitute the repeating unit to form chromatin.
- Chromatin is the thread-like stained bodies.
- Nucleosomes in chromatin = 'beads-on-string'.







PACKAGING OF DNA HELIX IN EUKARYOTES

Chromatin is packaged

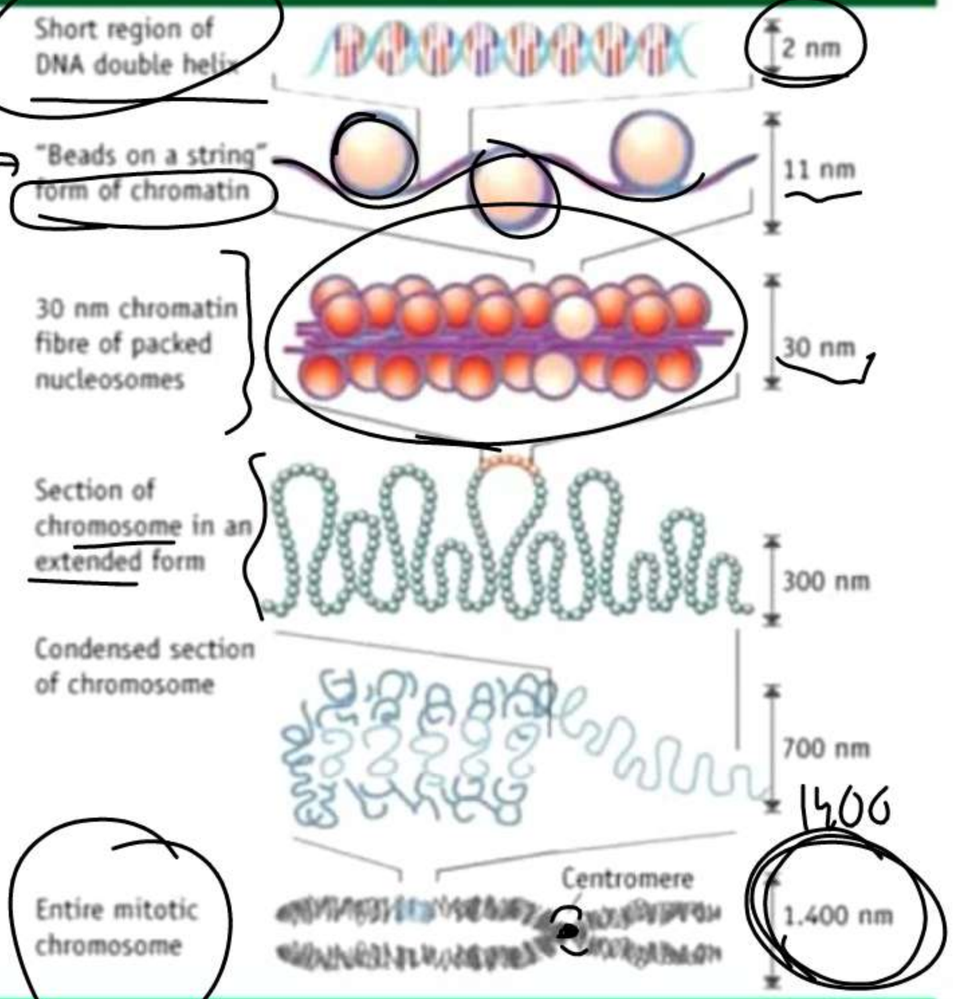
→ Chromatin fibres

→ Coiled and condensed at metaphase stage

→ Chromosomes

(NHC)
g: Human

Higher level packaging of chromatin requires non-histone chromosomal (NHC) proteins.



PACKAGING OF DNA HELIX IN EUKARYOTES

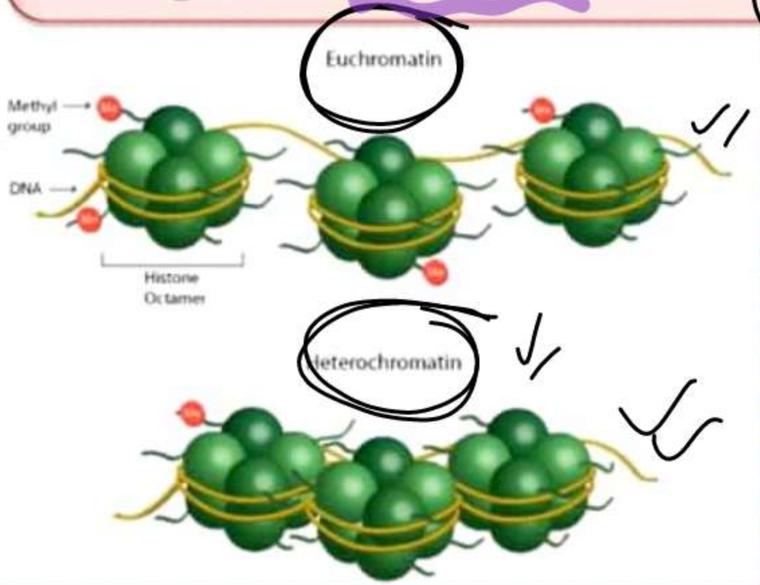
Chromatin has 2 forms

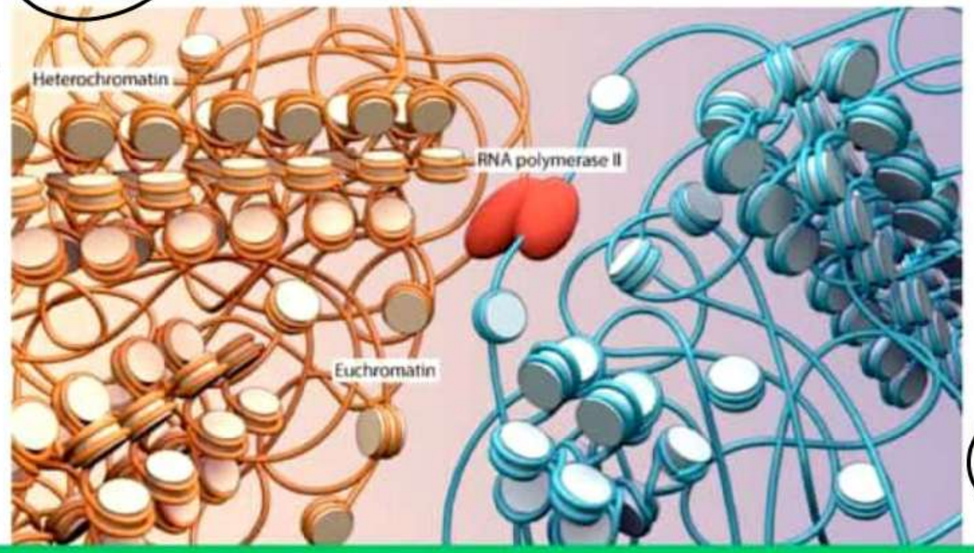
Euchromatin

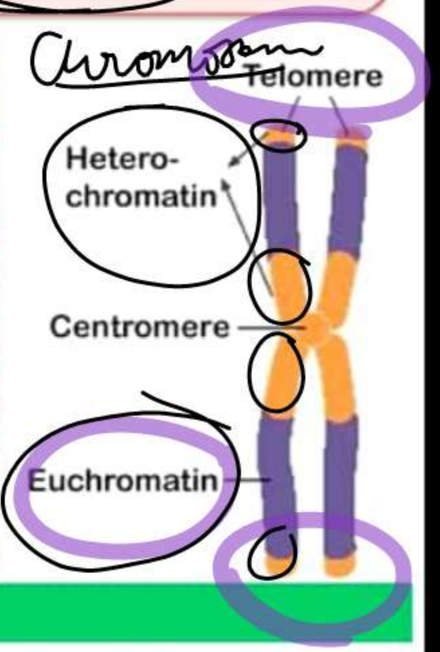
Loosely packed, transcriptionally active region of chromatin. It stains light.

Heterochromatin

Densely packed, inactive region of chromatin. It stains dark.







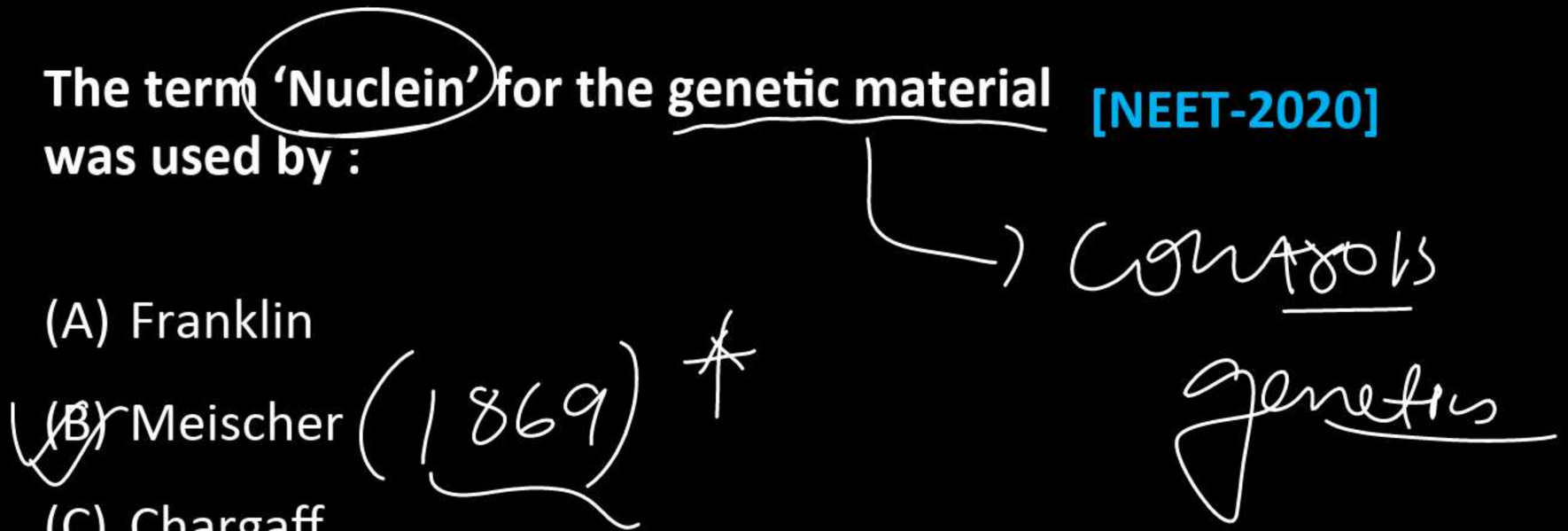
The term 'Nuclein' for the genetic material was used by : [NEET-2020]

(A) Franklin

(B) Meischer

(C) Chargaff

(D) Mendel



Purines found both in DNA and RNA are: [NEET-2019]

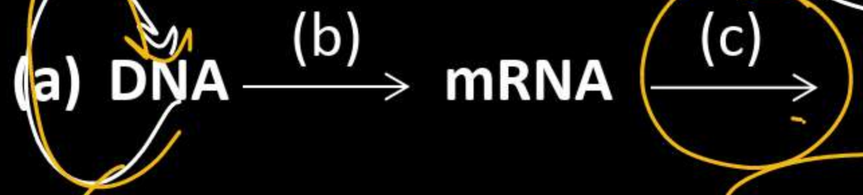
(A) Cytosine and thymine

(B) Adenine and thymine

(C) Adenine and guanine

(D) Guanine and cytosine

Complete the flow chart on central dogma **[NEET-2021]**



(1) (a) – Replication; (b) - Transcription;
(c) – Translation; (d) – Protein

(2) (a) – Transduction; (b) – Translation;
(c) – Replication; (d) – Protein

(3) (a) – Replication; (b) – Transcription
(c) – Transduction; (d) – Protein

(4) (a) – Transcription; (b) – Replication
(c) – Transcription; (d) - Transduction

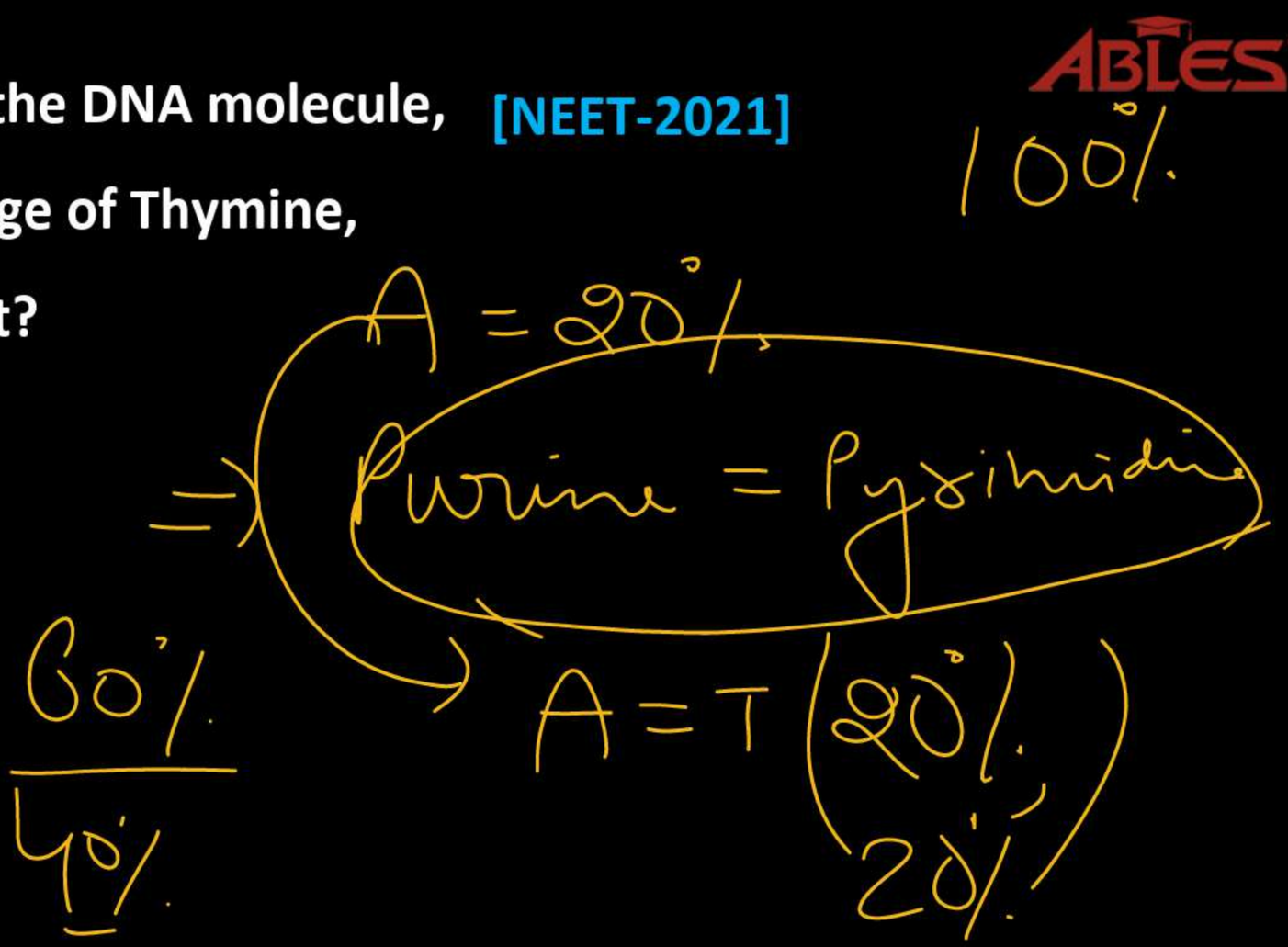
If Adenine makes 30% of the DNA molecule, what will be the percentage of Thymine, Guanine and Cytosine in it? [NEET-2021]

(A) T:30; G:20; C:20

(B) T:20; G:25; C:25

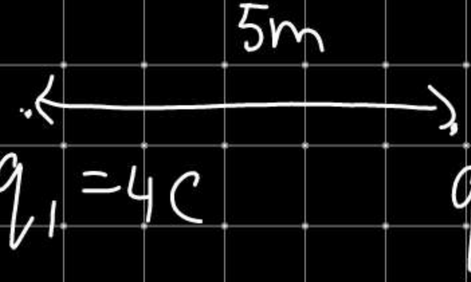
(C) T:20; G:30; C:20

(D) T:20; G:20; C:30



Ques Calculate the force acting between two charges, $q_1 = 4C$ & $q_2 = 3C$ kept at 5m distance between them:

Ans.



$$F = \frac{Kq_1q_2}{r^2}$$

$$F = \frac{9 \times 10^9 \times 4 \times 3}{5 \times 5}$$

$$= 9 \times 10^7 \times \frac{100}{25} \times 4 \times 3$$

$$= 432 \times 10^7 \text{ N}$$

$$= 4.32 \times 10^9 \text{ N}.$$

Amino Acid

- Acidic:
  - Glutamic
  - Aspartic acid
  - Cysteic acid
- Basic: Histidine, Lysine, Arginine
- Neutral: Valine, Isoleucine, Leucine, Tryptophan, Phenylalanine

Valine, Isoleucine, Leucine, Tryptophan, Phenylalanine

→ Histones are only present in Eukaryotes not Prokaryotes because Prk. are simpler and don't have true chromosome & are primitive in nature.

Q. → Human cell (2n)

Nucleosome ?

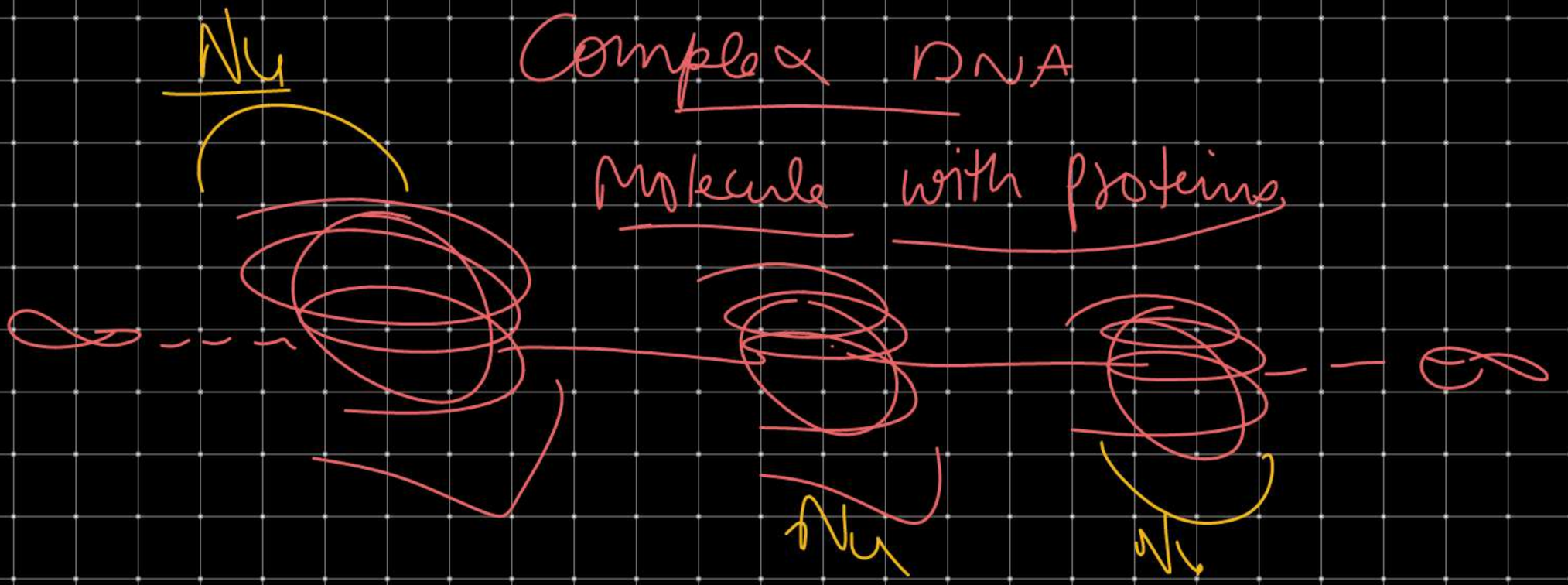
↳ 2n ⇒ $\frac{3.3\times10^{9}\times2}{200\ 100}$ = Total BP

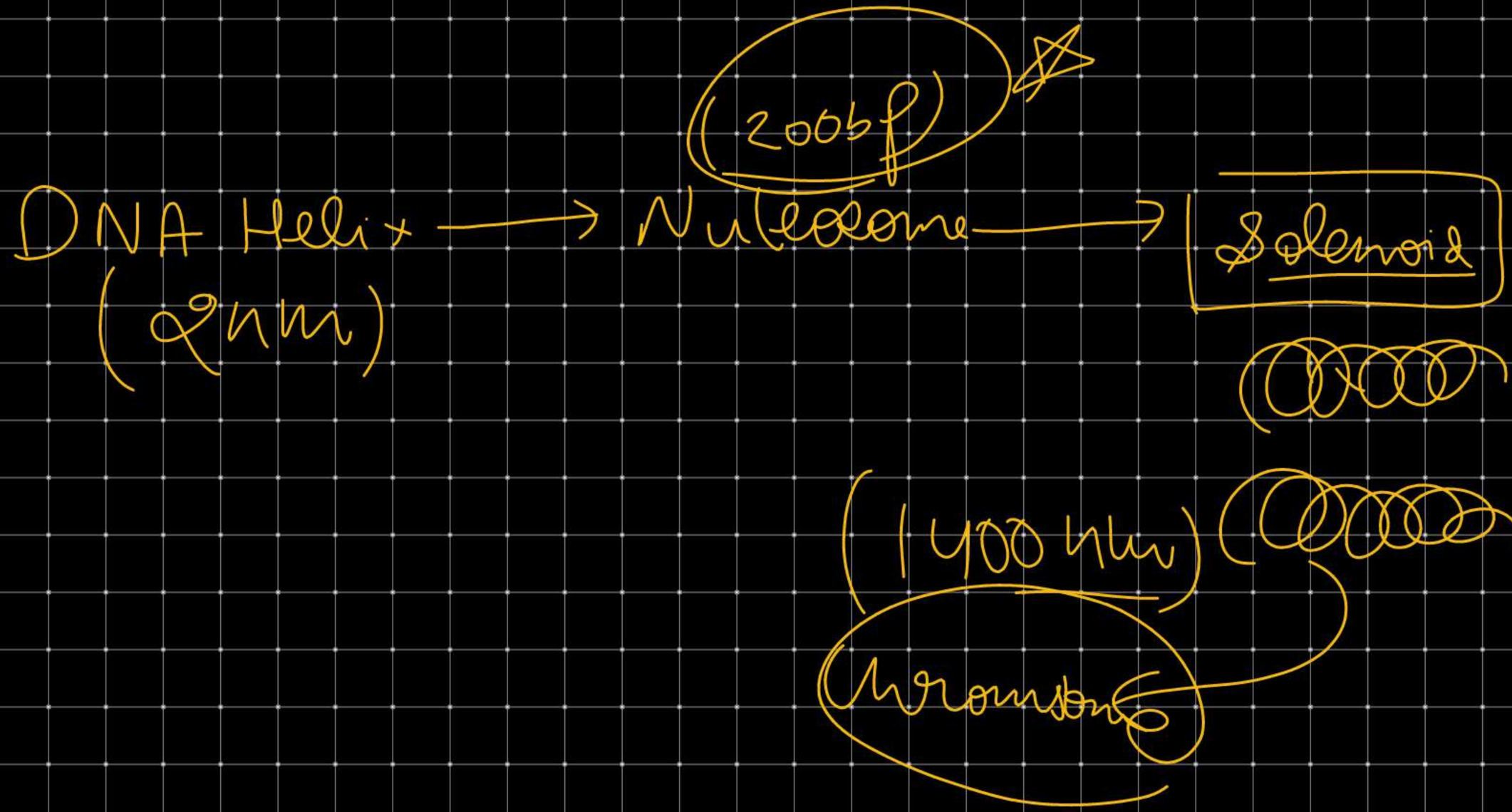
Total ⇒ 3.3×10^{7} Nucleosome

→ Nucleosomes are the repeating unit of Chromatin (DNA + Protein)

↓

Complex DNA molecule with protein




DNA Helix
(2nm)
(200bp)
Nucleosome
Solenoid
(1400 nm)
Chromosome