BHARATHIDASAN UNIVERSITY

Tiruchirappalli- 620 024
Tamil Nadu, India

Programme: M.Sc. Biochemistry

Course Title : Chromatin and Epigenetics
Course Code : BC205DCE

Unit-2
Epigenetics

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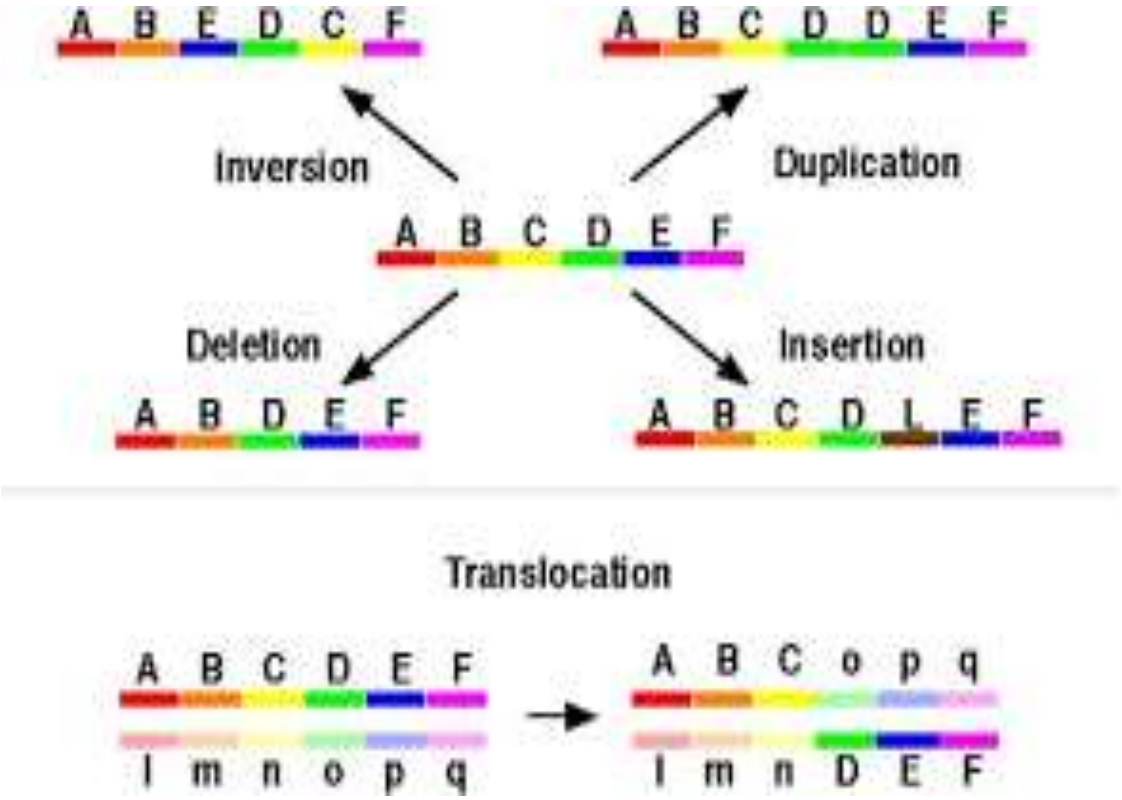
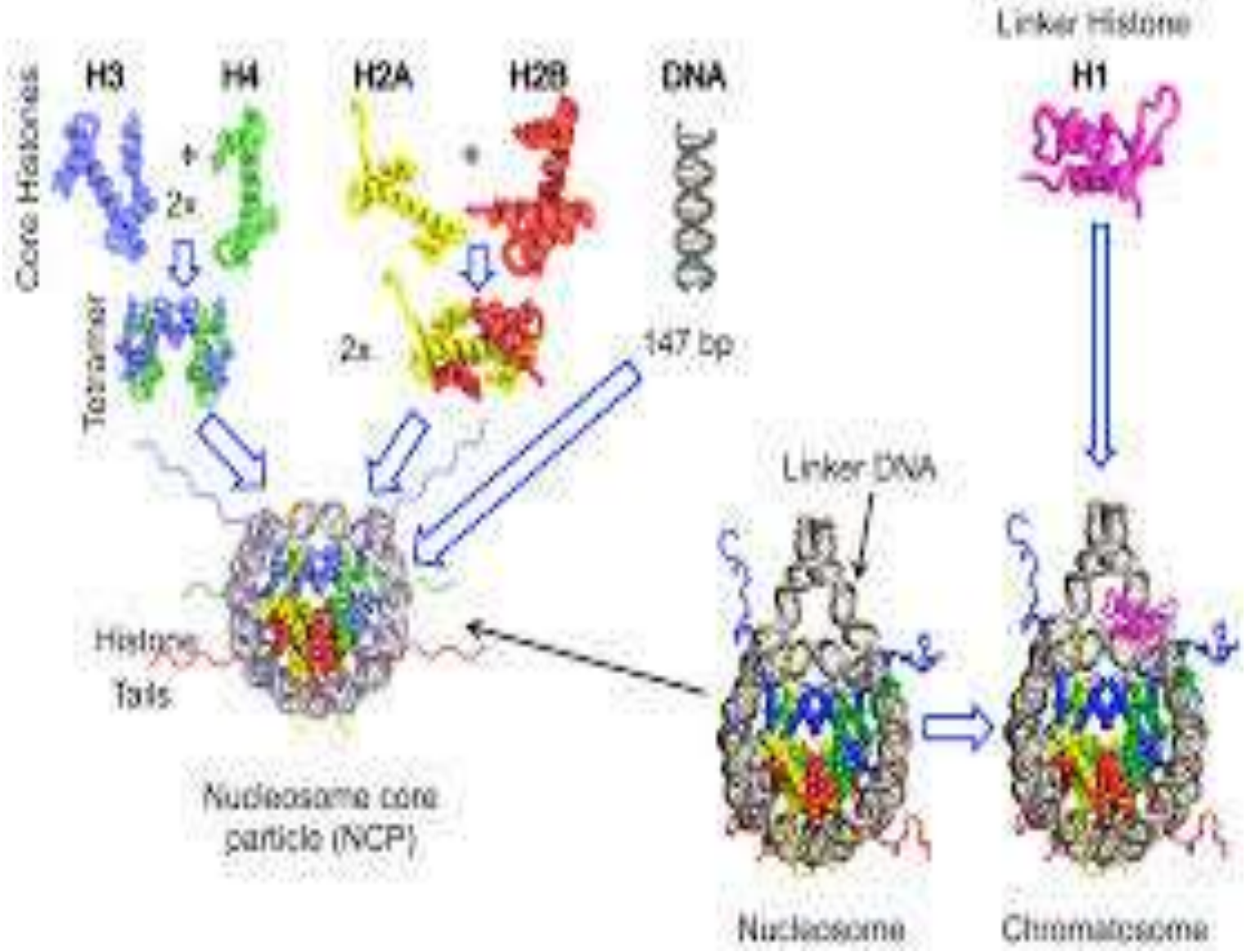
Unit-2 Overview

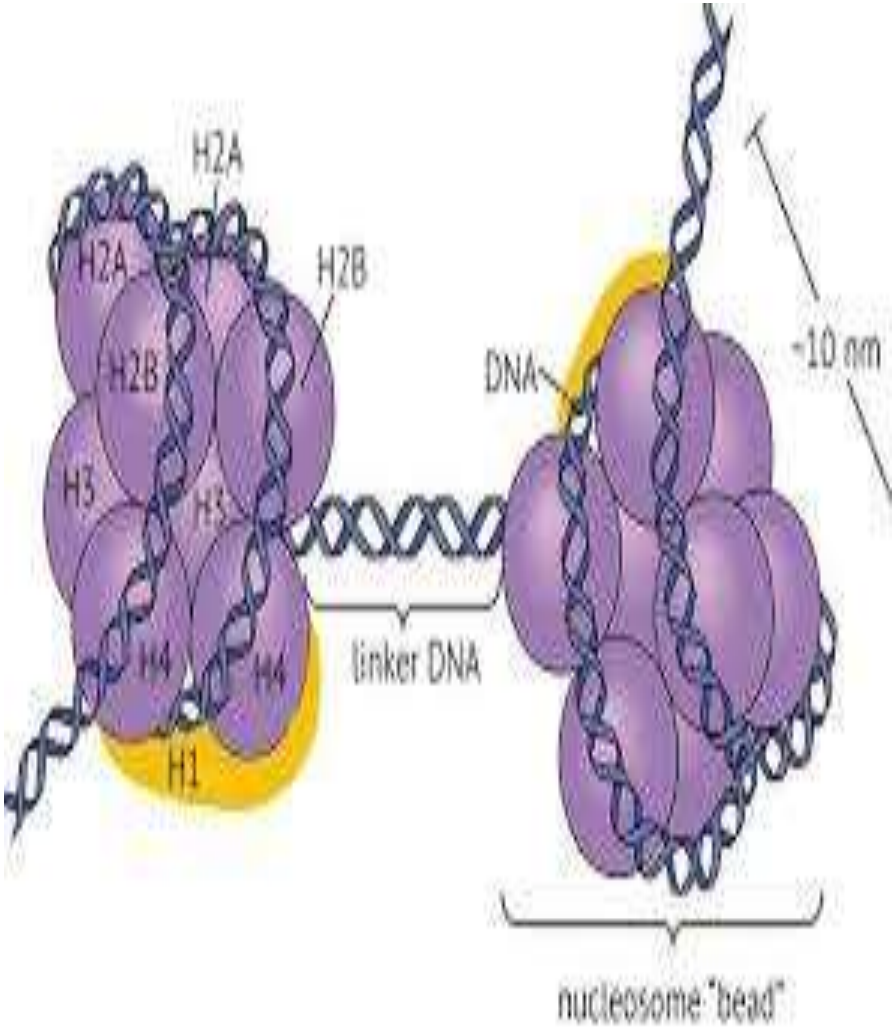
- Genetics vs epigenetics
- Regulation of gene expression and cell fate
- Regulation from zygote to multipotent cells
- Epigenetics of tissue development
- Homeostatis and regeneration
- Epigenetic process of chromatin modification by transcriptional regulation
- Heterochromatin and euchromatin

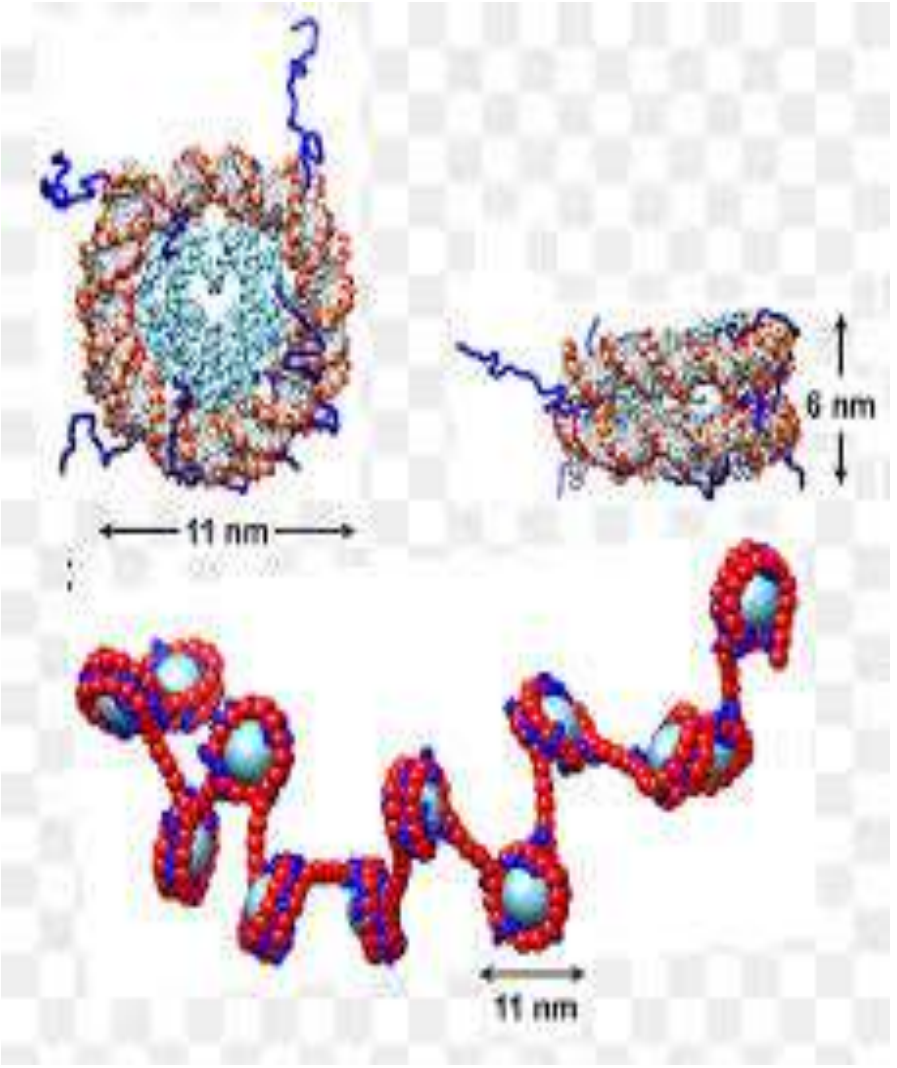
Modulation of Chromosome



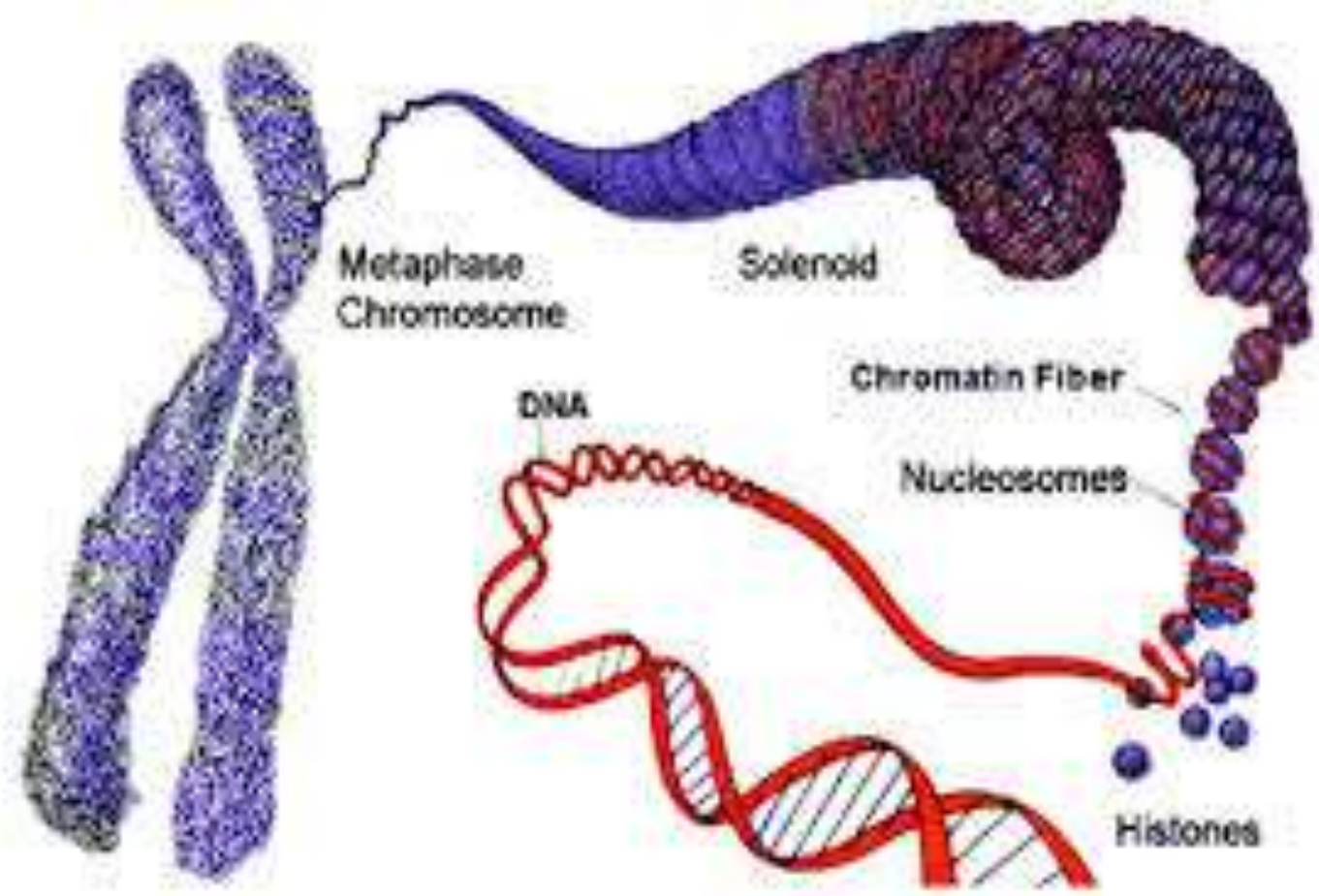

Core Histones
H3
H4
H2A
H2B
DNA
Linker Histone
H1
2x
2x
Tetramer
147 bp
Linker DNA
Histone
Tails
Nucleosome core
particle (NCP)
Nucleosome
Chromatosome

Histone, Nucleosome and Chromatin

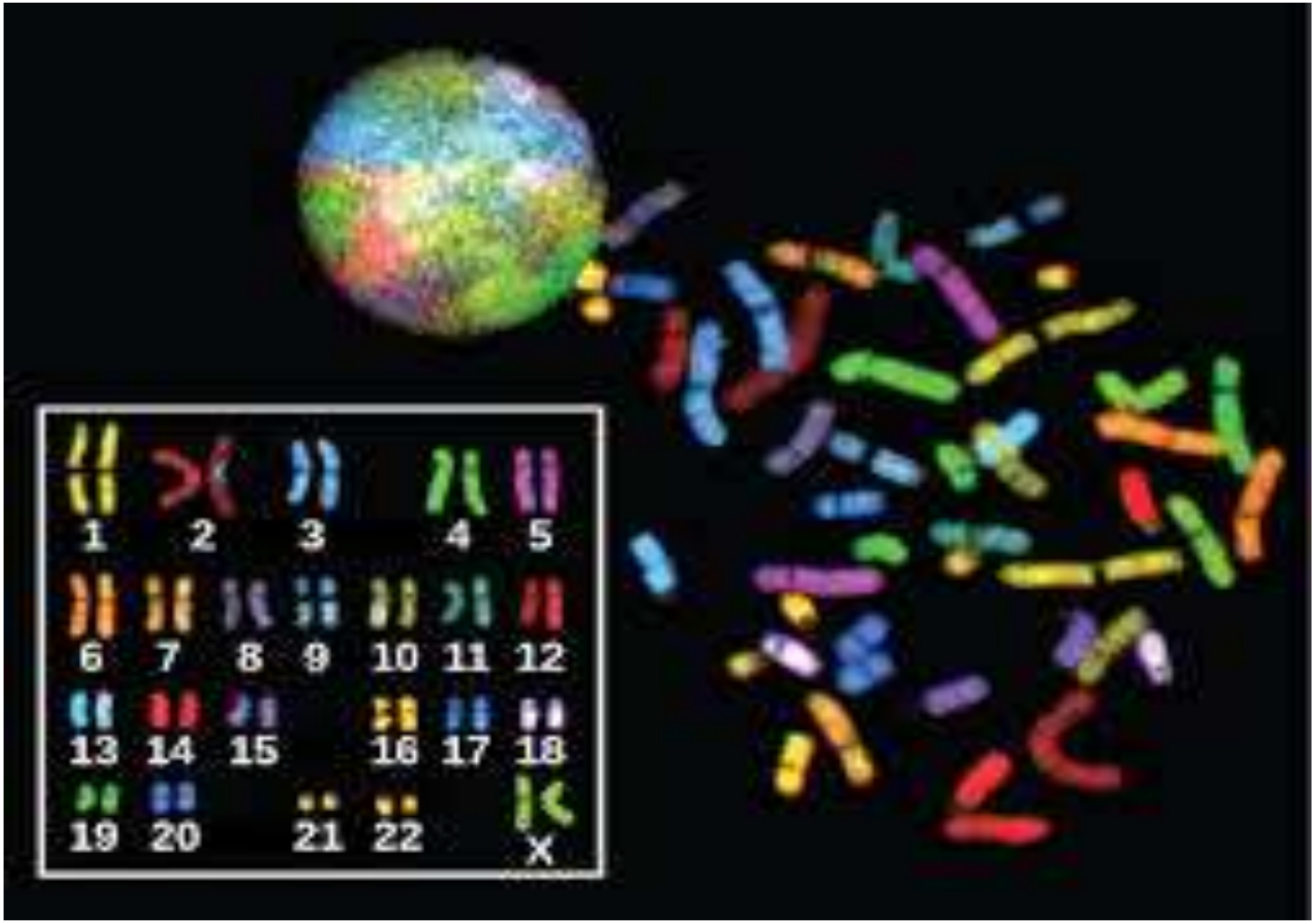




Chromatin Structure



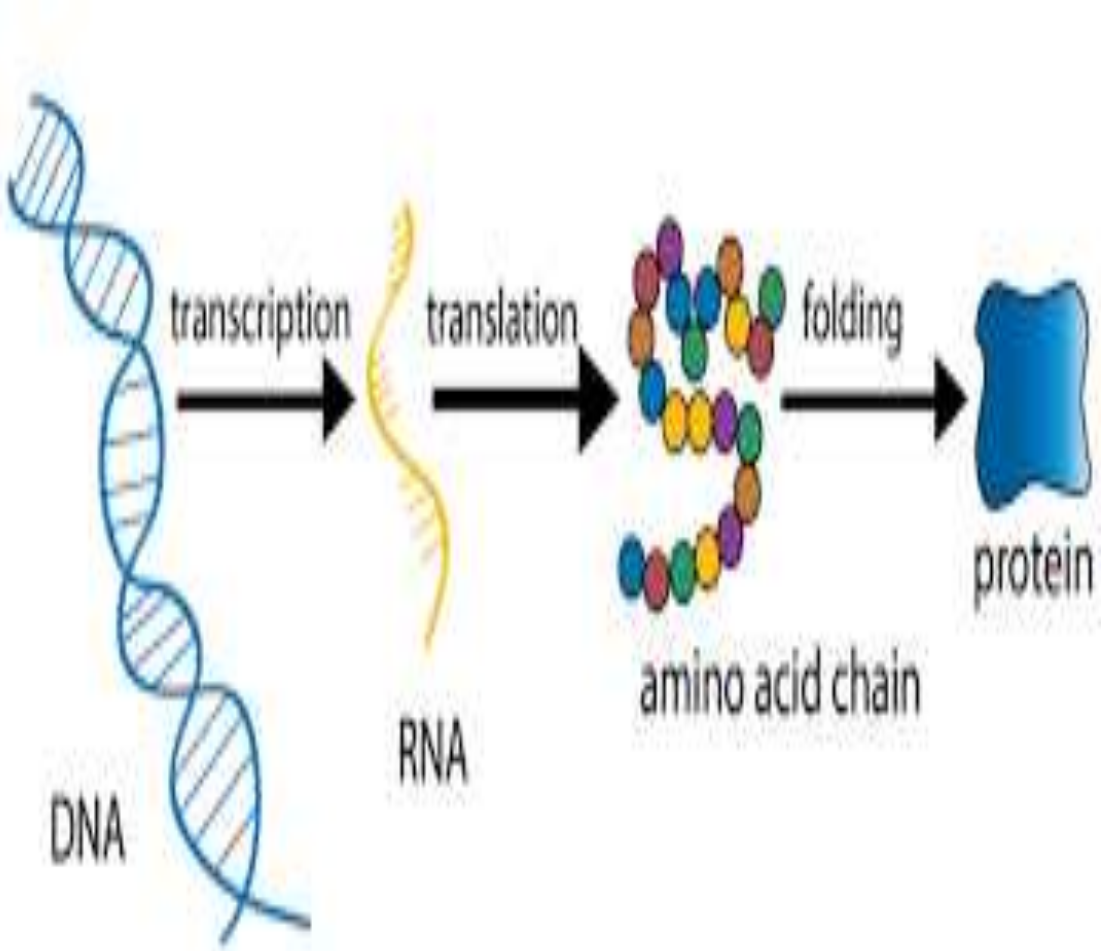
Assembly of Chromosome in Nucleus



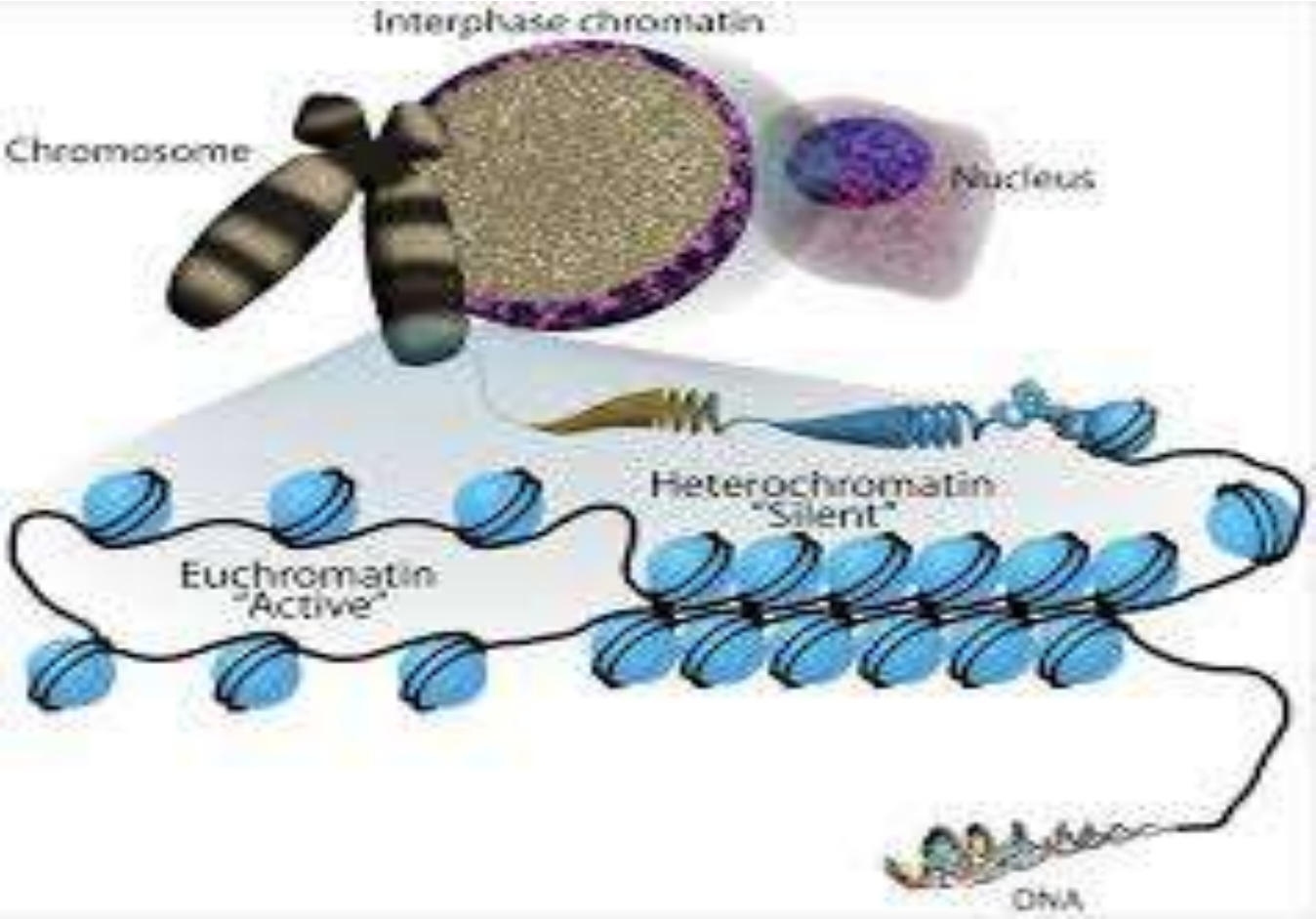
Why Chromosome modification is necessary?

What will happen if chromatin is not modified?

Chromatin Transcription

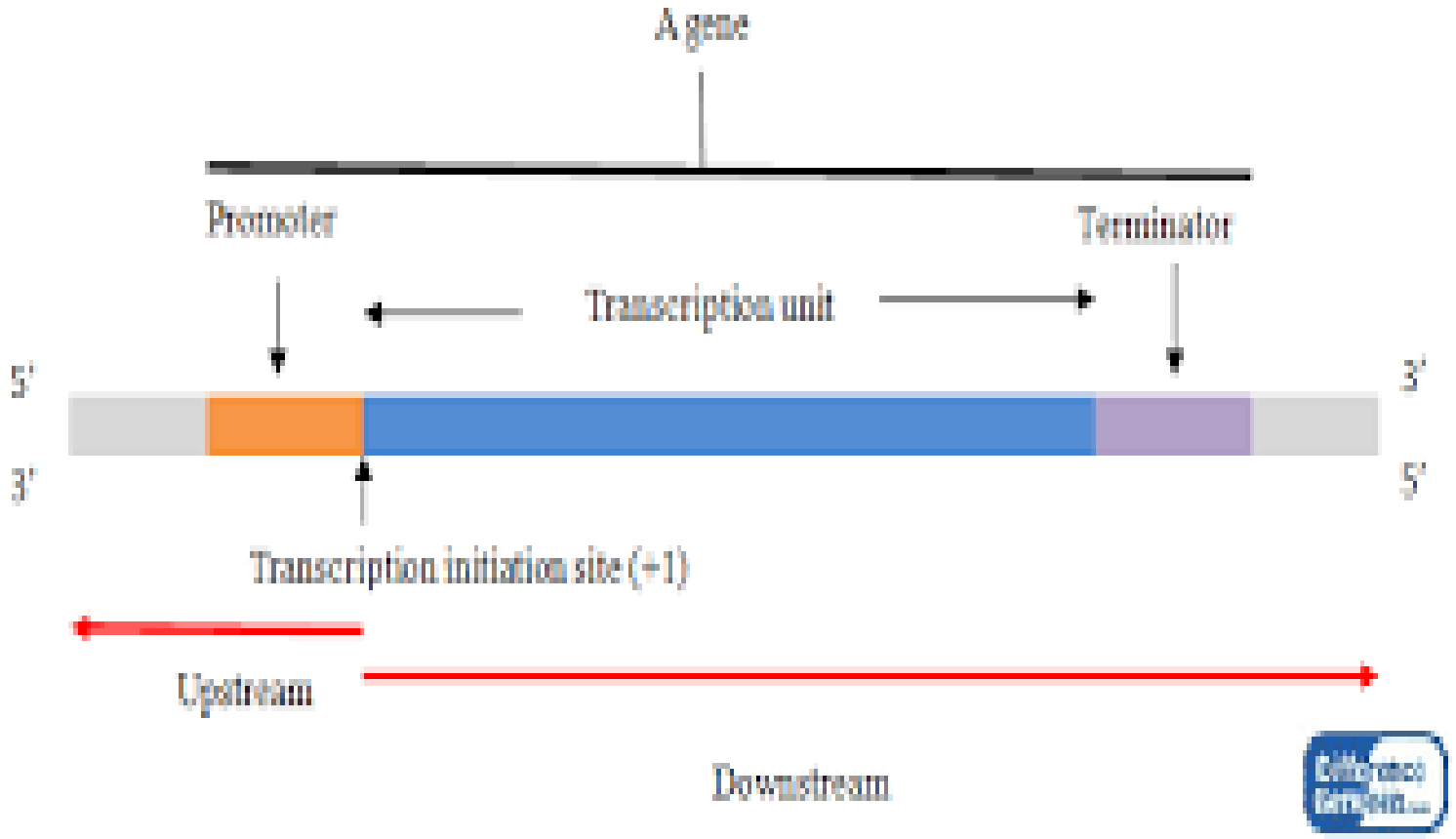


Chromatin remodelling

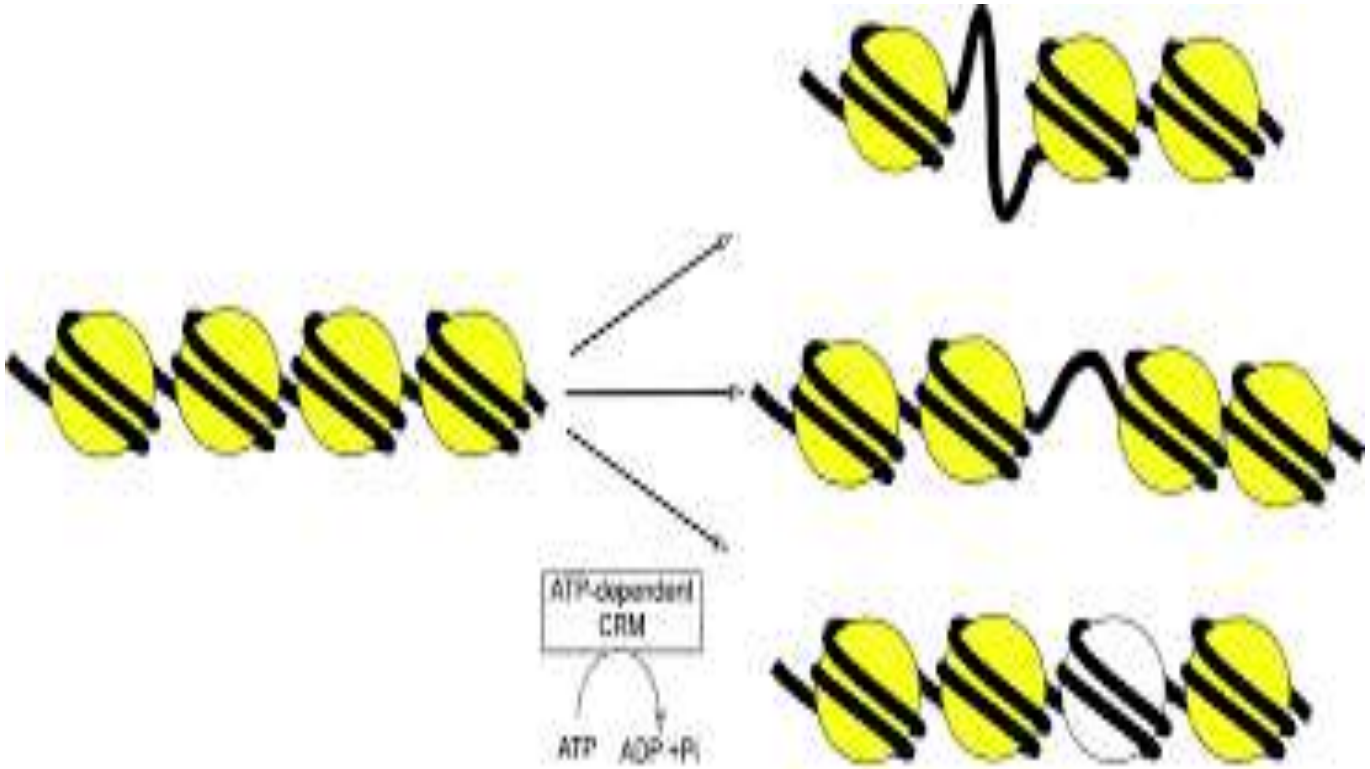


Chromatin remodelling is necessary to achieve chromatin transcription

- Chromatin remodelling achieves access to DNA.
- Access to Promotor region and regulatory region
- Regulatory proteins can switch on or off gene expression
- Activators and repressors
- Expression of gene is tightly regulated


A gene
Promoter
Terminator
Transcription unit
5'
3'
3'
5'
Transcription initiation site (+1)
Upstream
Downstream

Chromatin remodeling



Histone Variants

Substitute for core canonical Histones

Variants of histone H3 - H3.1, H3.2, TS H3.4

Variants of histone H4 - H4.V.

Variants of histone H2A - H2A.X, H2A.Z, H2A.B, H2A.L, H2A.P

Variants of histone H2B - H2B.1, H2B.L, H2B.Z

Function – Canonical histones is confined to S-phase, histone variants are available throughout the cell cycle

histone variants by wrapping more or less DNA or by altering nucleosome stability

DNA repair, chromosome segregation and regulation of transcription initiation, or perform tissue-specific roles