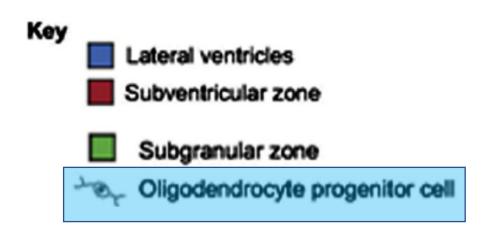
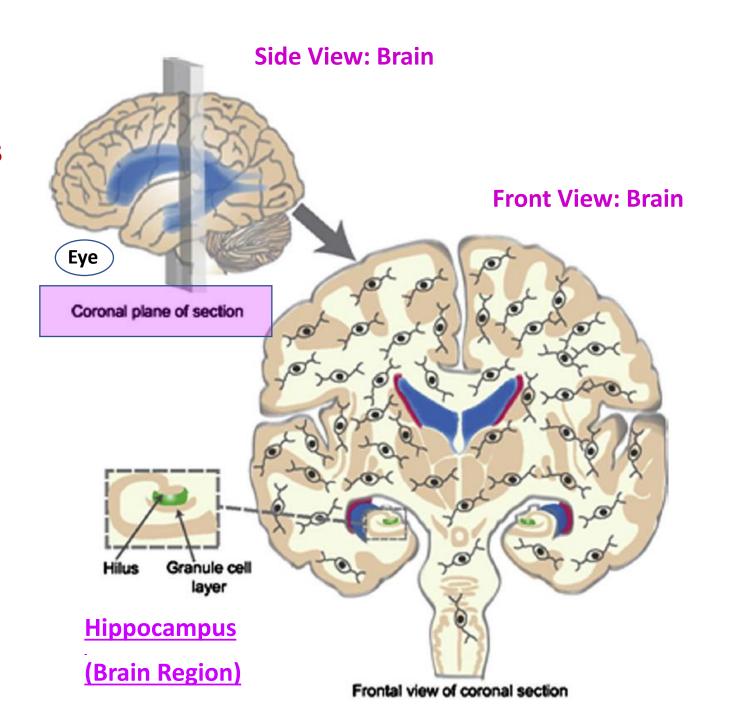
Neuronal Stem Cell: DNA Replication

Brain:

Neural Stem Cells & Progenitor Cells



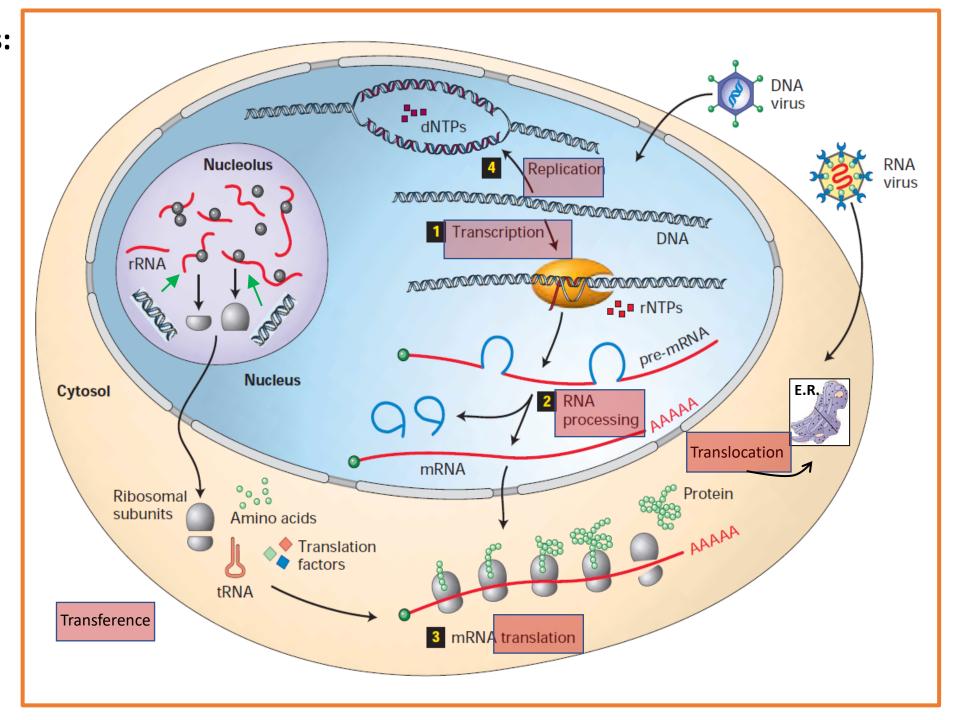


Basic Genetic Processes: R² T⁵

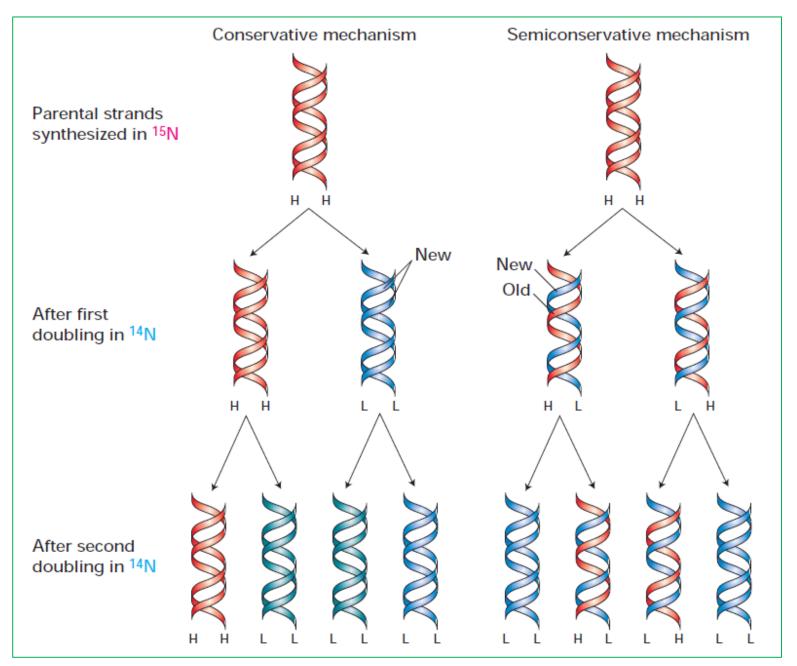
Replication of DNA (during Cell Division)

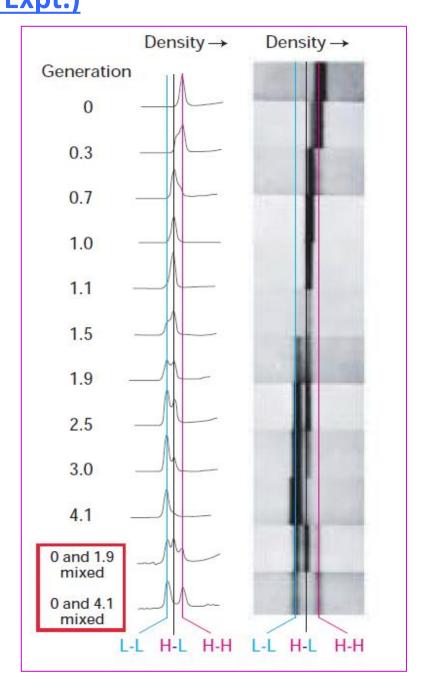
Protein Formation Steps:

- > Transcription,
- > RNA processing,
- > Transference,
- > Translation
- > Translocation



DNA Reproduces Semi-Conservatively (Meselson-Stahl Expt.)

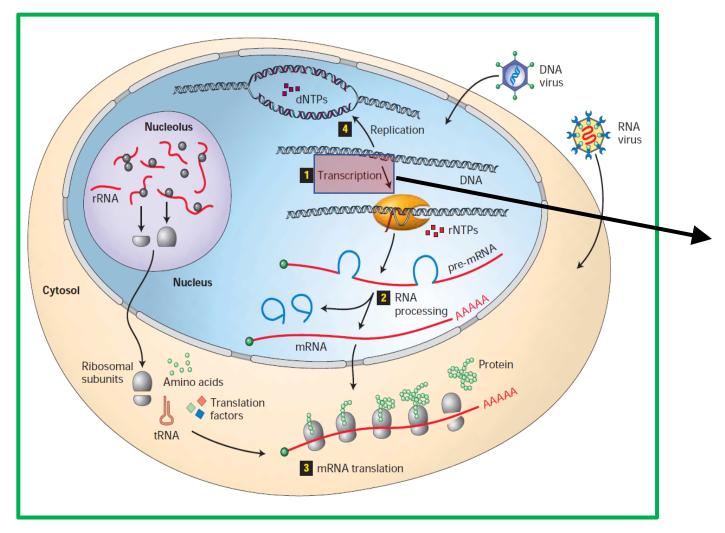


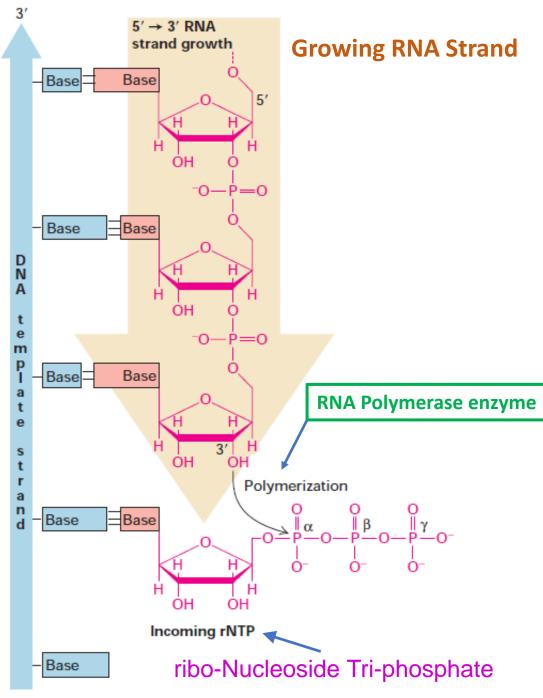


Stage 1: Translation

DNA Template Strand

Forming Pre-mRNA





RNA polymerase Start site Stop site on template on template INITIATION strand strand Polymerase binds to 5', MANAGE STATE S promoter sequence in duplex DNA. "Closed complex" Promoter Polymerase melts duplex DNA near 5', transcription start site, forming a transcription bubble. "Open Transcription complex" bubble Initial rNTPs Polymerase catalyzes DODOO DOO S phosphodiester linkage of two initial rNTPs.

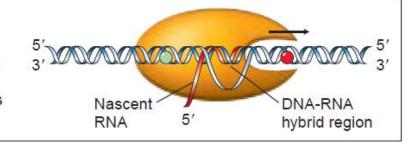
14 base pairs,

1000 nucleotides per minute

Three Stages of Transcription

ELONGATION

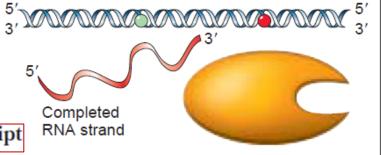
Polymerase advances
3' → 5' down template
strand, melting duplex
DNA and adding rNTPs
to growing RNA.

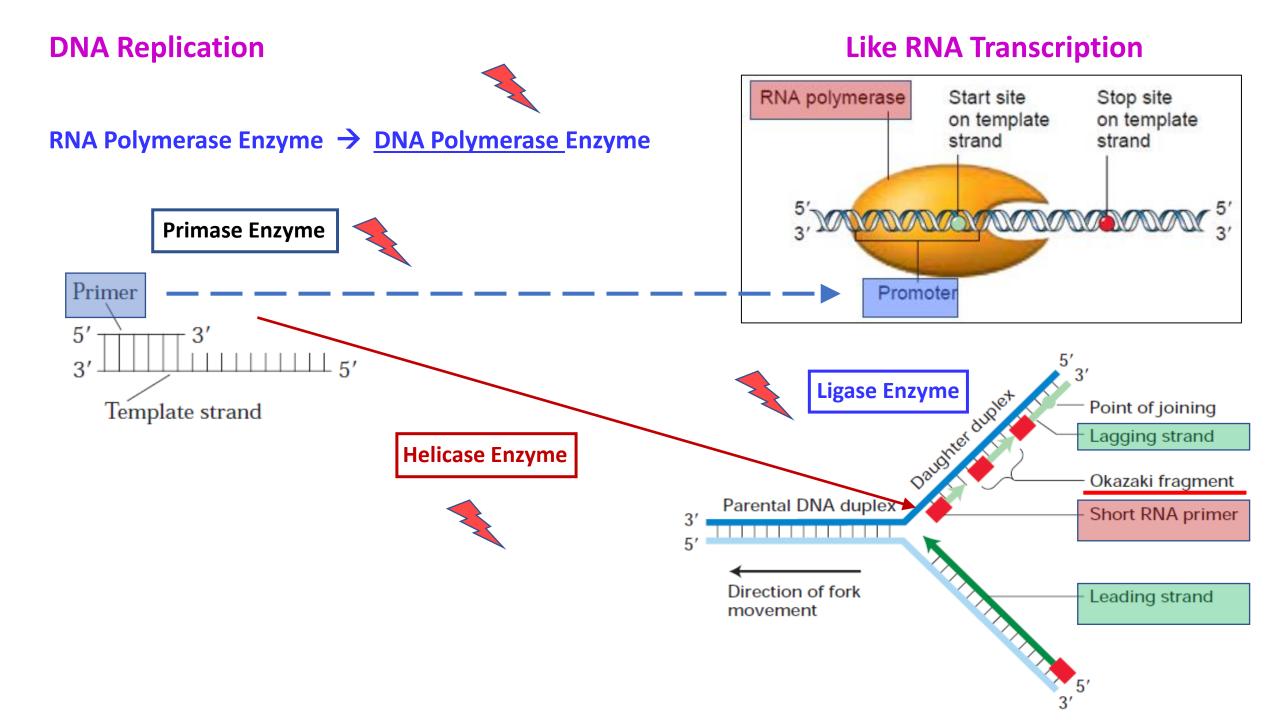


TERMINATION

5 At transcription stop site, polymerase releases completed RNA and dissociates from DNA.

primary transcript





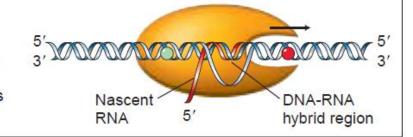
(a) SV40 DNA replication fork **Monkey DNA Replication:** Large T-antigen Pol α Lagging strand 5 Pol δ **Simian Virus 40** 4 Primase Rfc Primer **PCNA 700000** 5' (b) PCNA Double-VIV stranded DNA Pol δ Leading strand 3 **PCNA** Single-(c) RPA stranded DNA

RNA polymerase Start site Stop site on template on template INITIATION strand strand Polymerase binds to 5', MANAGE STATE S promoter sequence in duplex DNA. "Closed complex" Promoter Polymerase melts duplex DNA near transcription start site, forming a transcription bubble. "Open Transcription complex" bubble Initial rNTPs Polymerase catalyzes phosphodiester linkage of two initial rNTPs.

Three Stages of Transcription

ELONGATION

Polymerase advances
3' → 5' down template
strand, melting duplex
DNA and adding rNTPs
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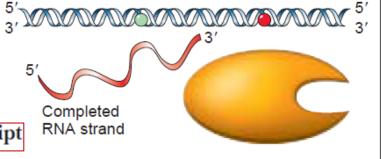
14 base pairs

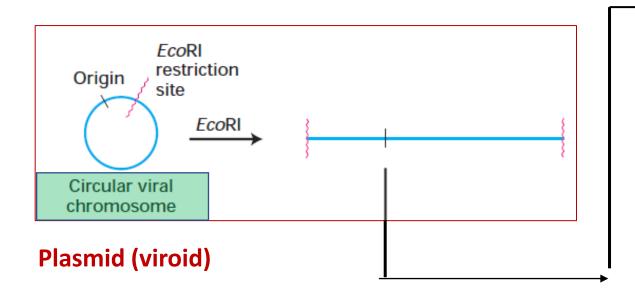
1000 nucleotides per minute

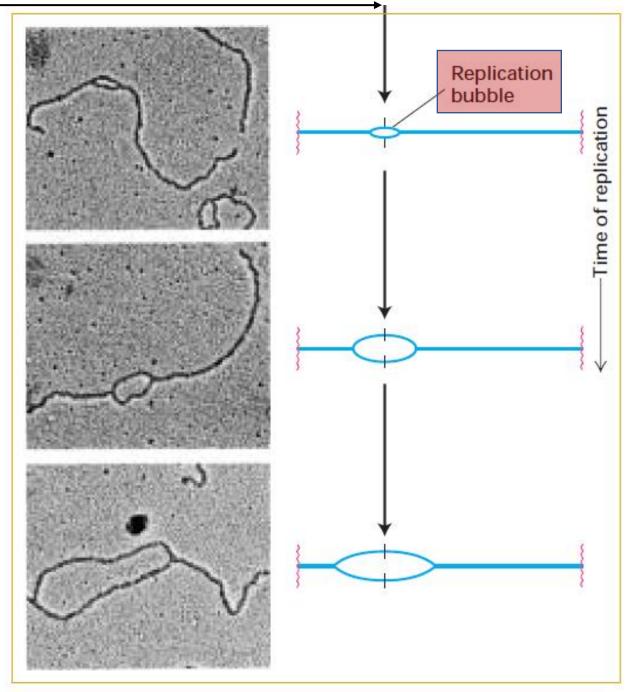
TERMINATION

At transcription stop site, polymerase releases completed RNA and dissociates from DNA.

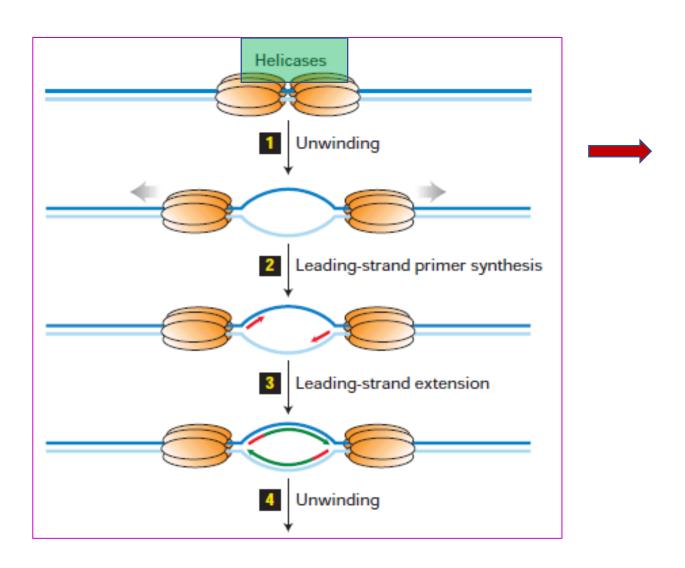
primary transcript

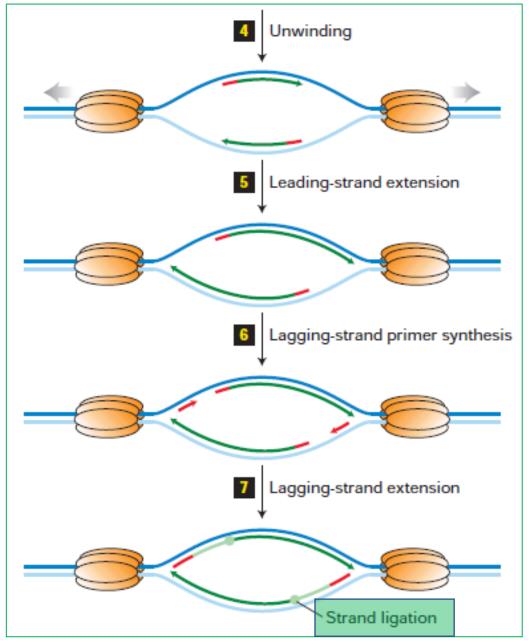






Bi-directional Mechanism of DNA Replication





DNA Outside Nucleus:

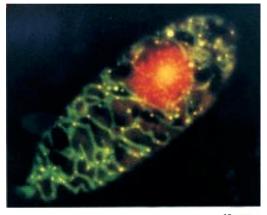
Human Mitochondrial Clock

Mitochondrion Outer Mitochondrial Inner membranes - Matrix Intermembrane space Golgi Exoplasmic Lysosome Cytosolic Endoplasmic reticulum Plasma membrane Nucleus' Exterior Cytosol Inner Nuclear membranes Intermembrane space

SNP rate Subregions Regions(s) (or site within codon) (per site * year) 1.6×10^{-7} HVR I Control 2.3×10^{-7} HVR II region 1.5 × 10⁻⁸ remaining 8.8×10^{-9} Protein-(1st and 2nd) 1.9×10^{-8} coding (3rd) 8.2×10^{-9} DNA encoding rRNA (rDNA) 6.9×10^{-9} DNA encoding tRNA (tDNA) 2.4×10^{-8} other T_{CHI CA} assumed 6.5 Ma, relative rate to 1st & 2nd codons

Mitochondrial Circular DNA Like Plasmid

(Mitochondria: a bacteria earlier)



small ribosomal RNA Large ribosomal RNA Leu Glu ND1 ND6 -lle ND5 **Human mtDNA** GInf-Met L strand -ND2 H strand Ala Leu Cys Ser Tyr His ND4 Arg Asp Gly Lys ND4L Cytochrome c Cytochrome c ND3 oxidase 3 **ATPase** ATPase subunit 8

Phe

Thr

Annual Mutation:

SNP Rates