

**PROTEIN
SYNTHESIS
OVERVIEW
MODIFICATION**

MODIFICATION



MODIFICATION

**NON-MODIFIED M-RNA
IS MODIFIED FOR
TRANSLATION**

MODIFICATION

CELL

PROTEIN / SYNTHESIS

L

NUCLEUS

CHROMOSOME



DNA/GENE

TRANSCRIPTION



CYTOSOL

CELL

PROTEIN / SYNTHESIS

M

NUCLEUS

CHROMOSOME



DNA/GENE

TRANSCRIPTION



LOCATION

CYTOSOL

CELL

PROTEIN / SYNTHESIS

N

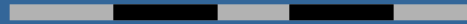
NUCLEUS

CHROMOSOME



DNA/GENE

TRANSCRIPTION



MODIFICATION

CYTOSOL

CELL

PROTEIN / SYNTHESIS

0

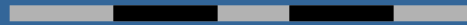
NUCLEUS

CHROMOSOME



DNA/GENE

TRANSCRIPTION



NON-MODIFIED M-RNA

MODIFICATION

CYTOSOL

CELL

M

PROTEIN / SYNTHESIS

NUCLEUS

CHROMOSOME



DNA/GENE

TRANSCRIPTION



NON-MODIFIED M-RNA

MODIFICATION

OUTCOME

CYTOSOL

CELL

PROTEIN / SYNTHESIS



NUCLEUS

CHROMOSOME



DNA/GENE

TRANSCRIPTION



NON-MODIFIED M-RNA

MODIFICATION



MODIFIED M-RNA

CYTOSOL

**PROTEIN
SYNTHESIS
OVERVIEW**
TRANSLATION

TRANSLATION



TRANSLATION

PROTEIN SYNTHESIZED
UTILIZING
MODIFIED M-RNA

TRANSLATION

CELL

L

PROTEIN / SYNTHESIS

NUCLEUS

CHROMOSOME



DNA/GENE

TRANSCRIPTION



NON-MODIFIED M-RNA

MODIFICATION



MODIFIED M-RNA

CYTOSOL

CELL

PROTEIN / SYNTHESIS



NUCLEUS

CHROMOSOME



DNA/GENE

TRANSCRIPTION



NON-MODIFIED M-RNA

MODIFICATION



MODIFIED M-RNA

LOCATION

CYTOSOL

CELL

PROTEIN / SYNTHESIS

NUCLEUS

CHROMOSOME



DNA/GENE

TRANSCRIPTION



NON-MODIFIED M-RNA

MODIFICATION



MODIFIED M-RNA



LOCATION

CYTOSOL

CELL

PROTEIN / SYNTHESIS

NUCLEUS

CHROMOSOME



DNA/GENE

TRANSCRIPTION



NON-MODIFIED M-RNA

MODIFICATION



MODIFIED M-RNA



MODIFIED M-RNA

TRANSLATION

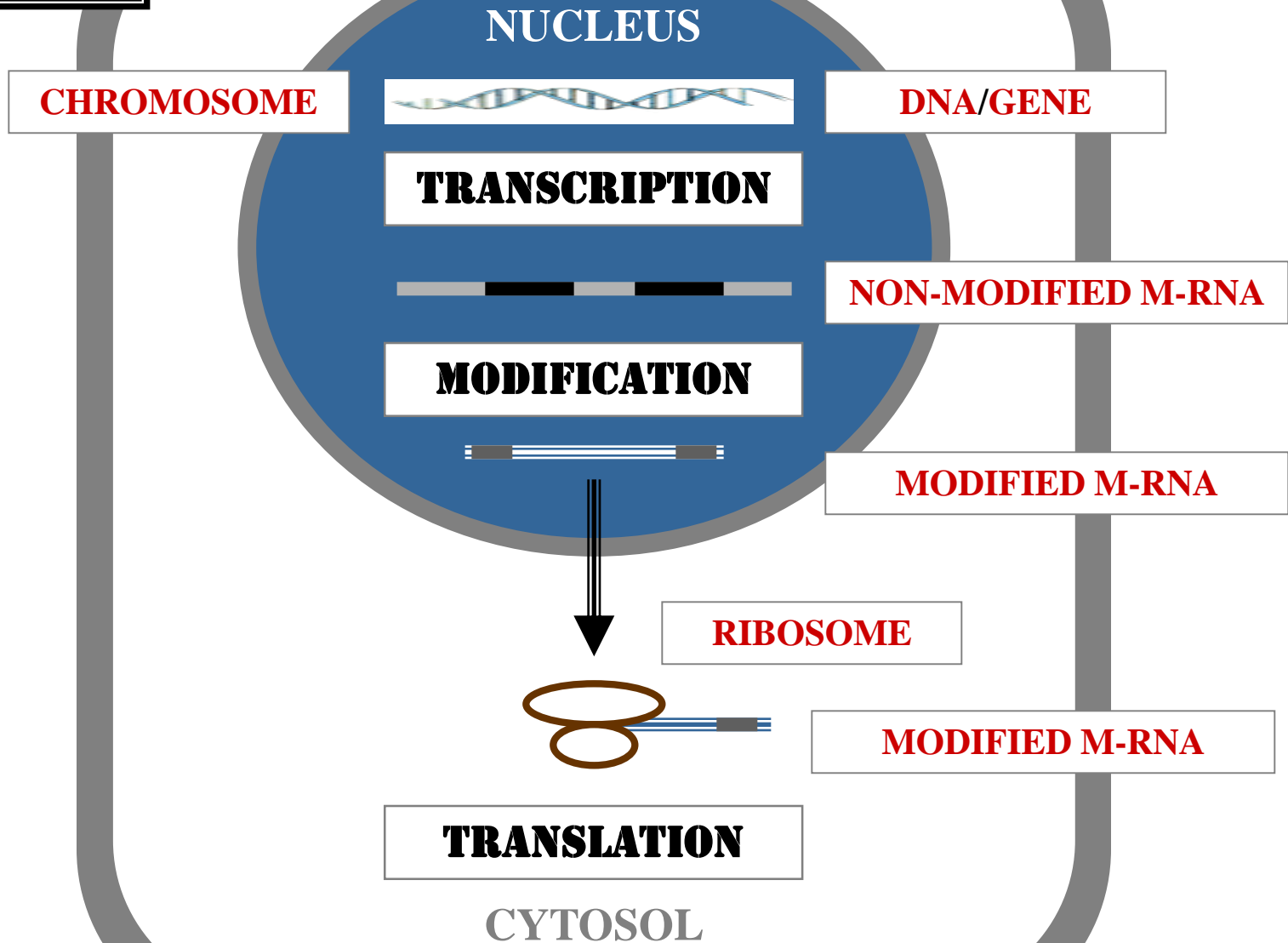
CYTOSOL



CELL

PROTEIN / SYNTHESIS

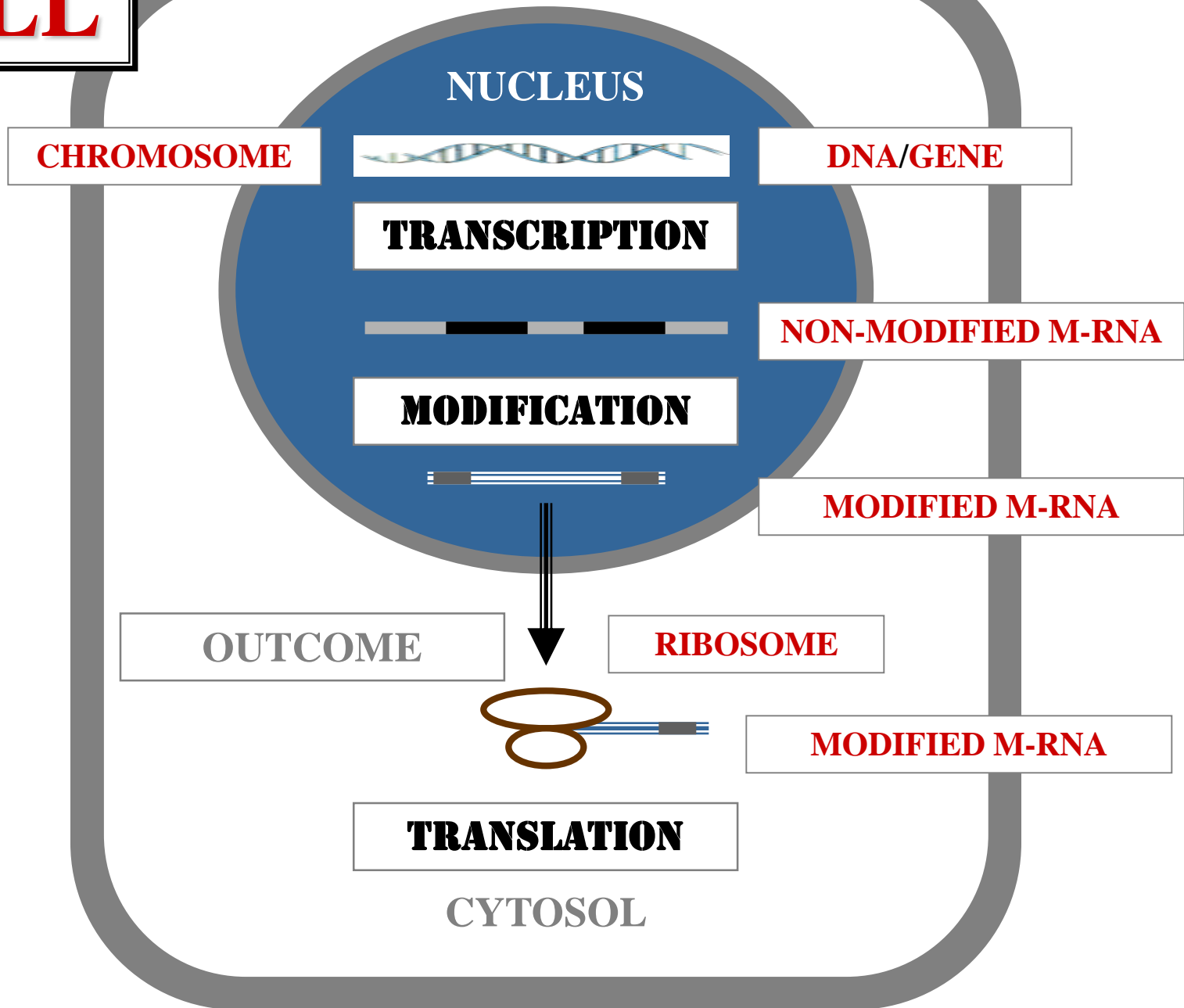
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CELL

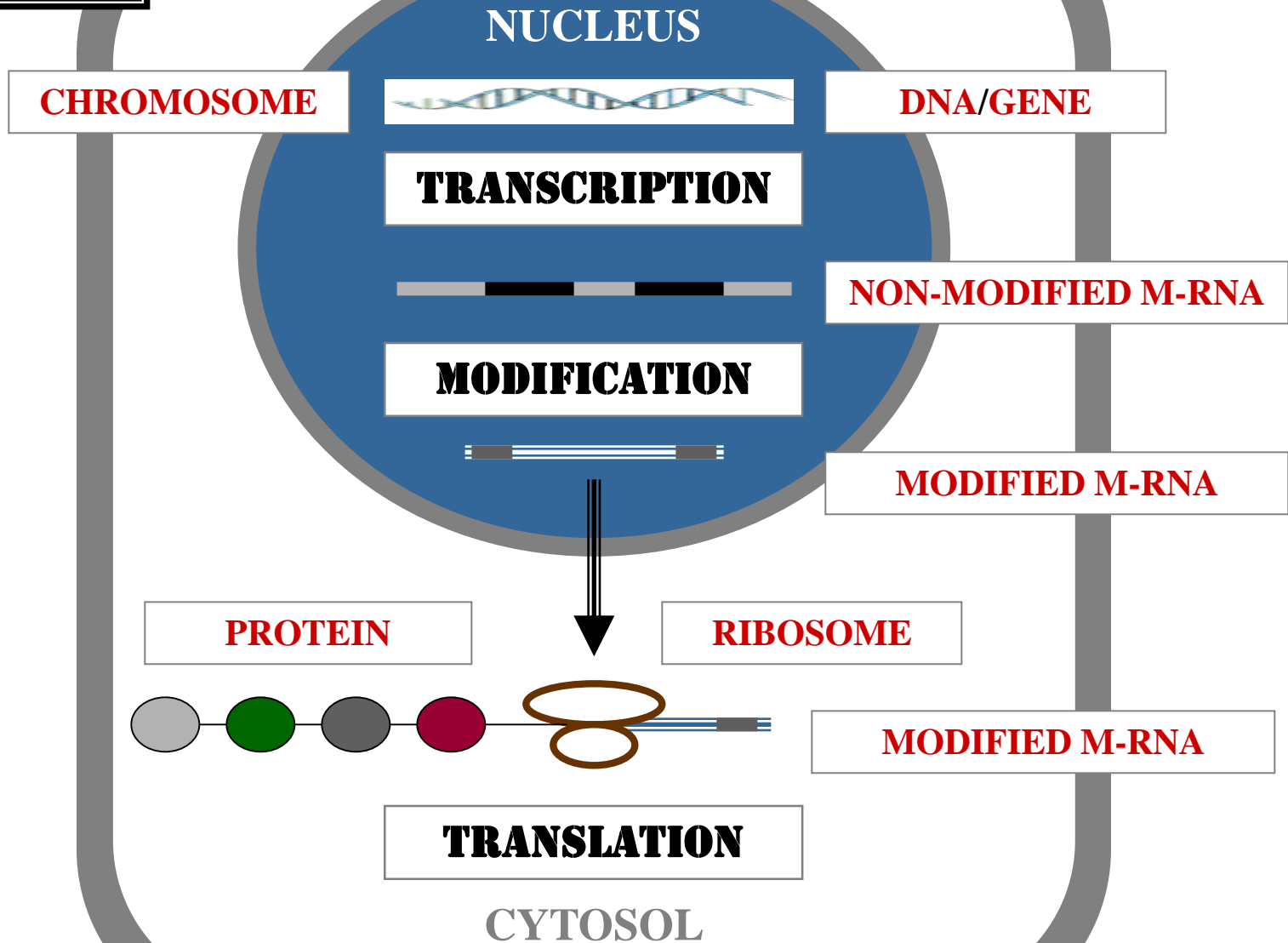
P

PROTEIN / SYNTHESIS



CELL

PROTEIN / SYNTHESIS





PROTEIN SYNTHESIS SPECIFICS



**PROTEIN
SYNTHESIS
SPECIFICS**

TRANSCRIPTION

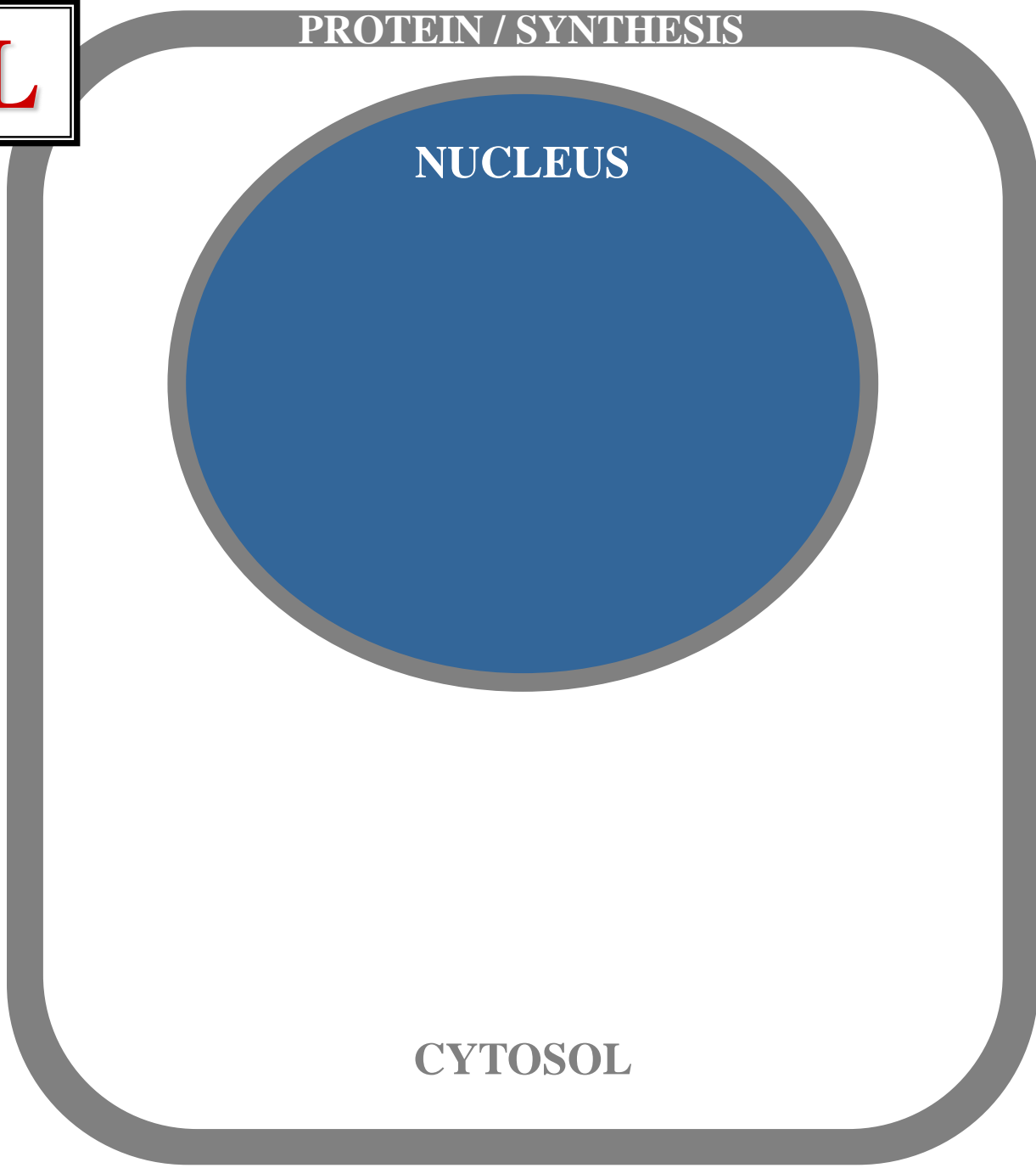
CELL

PROTEIN / SYNTHESIS

L

NUCLEUS

CYTOSOL



CELL

PROTEIN / SYNTHESIS

T

NUCLEUS

LOCATION

CYTOSOL

CELL

PROTEIN / SYNTHESIS

C

NUCLEUS

TRANSCRIPTION

CYTOSOL

CELL

PROTEIN / SYNTHESIS

D

NUCLEUS

CHROMOSOME



TRANSCRIPTION

CYTOSOL

CELL

PROTEIN / SYNTHESIS

NUCLEUS

CHROMOSOME



DNA/GENE

TRANSCRIPTION

CYTOSOL



C

+

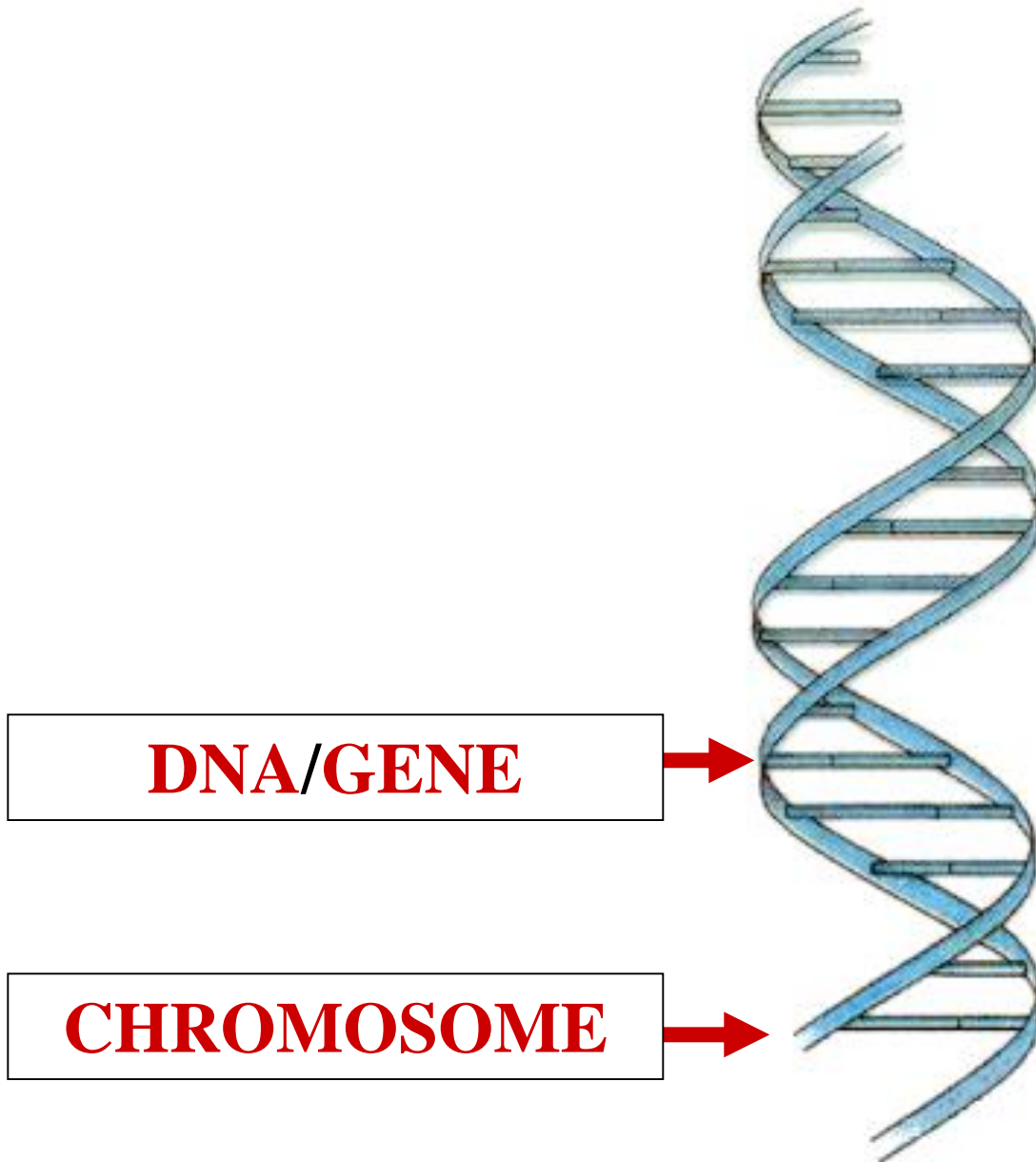
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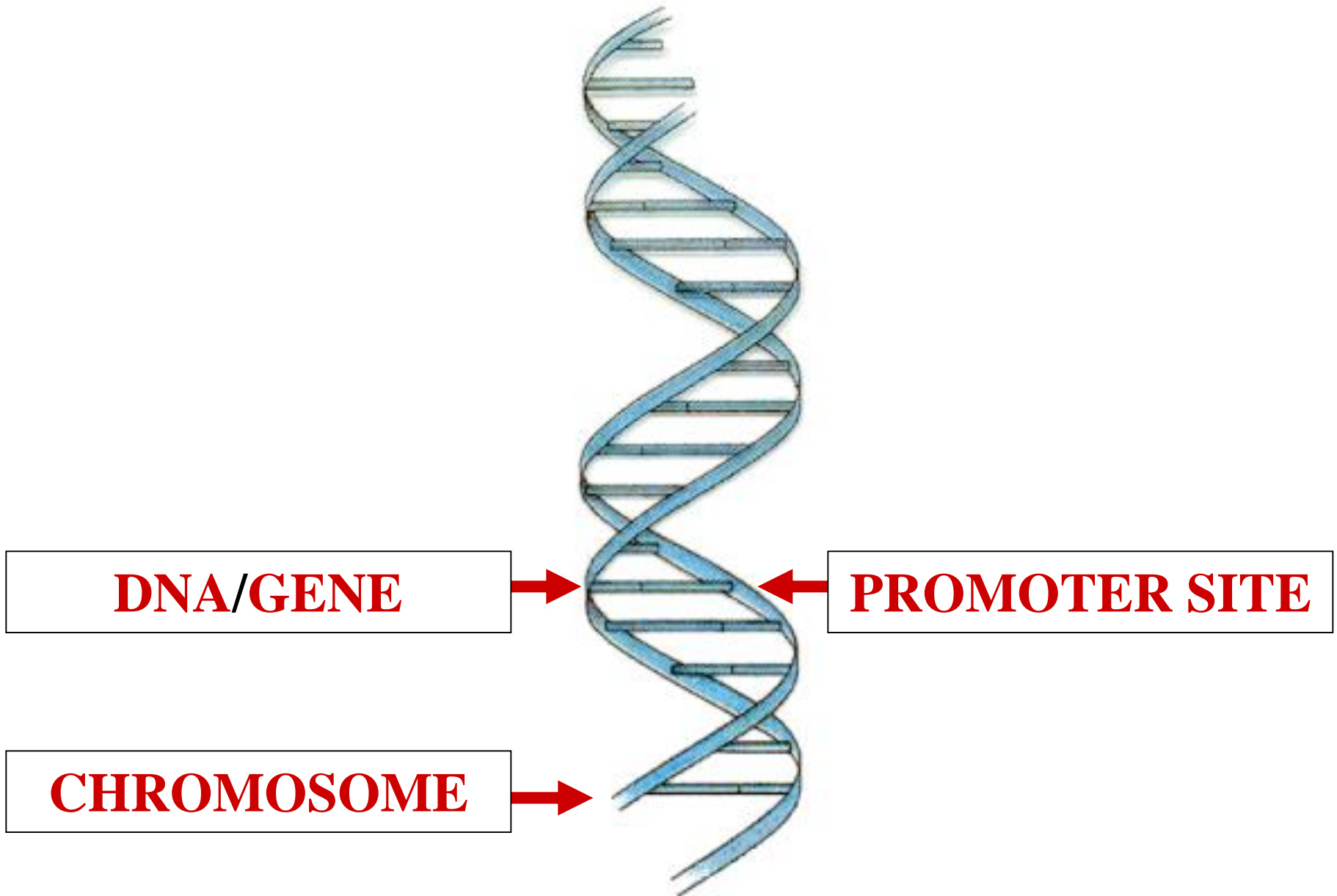
CHROMOSOME



TRANSCRIPTION



TRANSCRIPTION



PROMOTER SITE

PROMOTER SITE

PROMOTER SITE

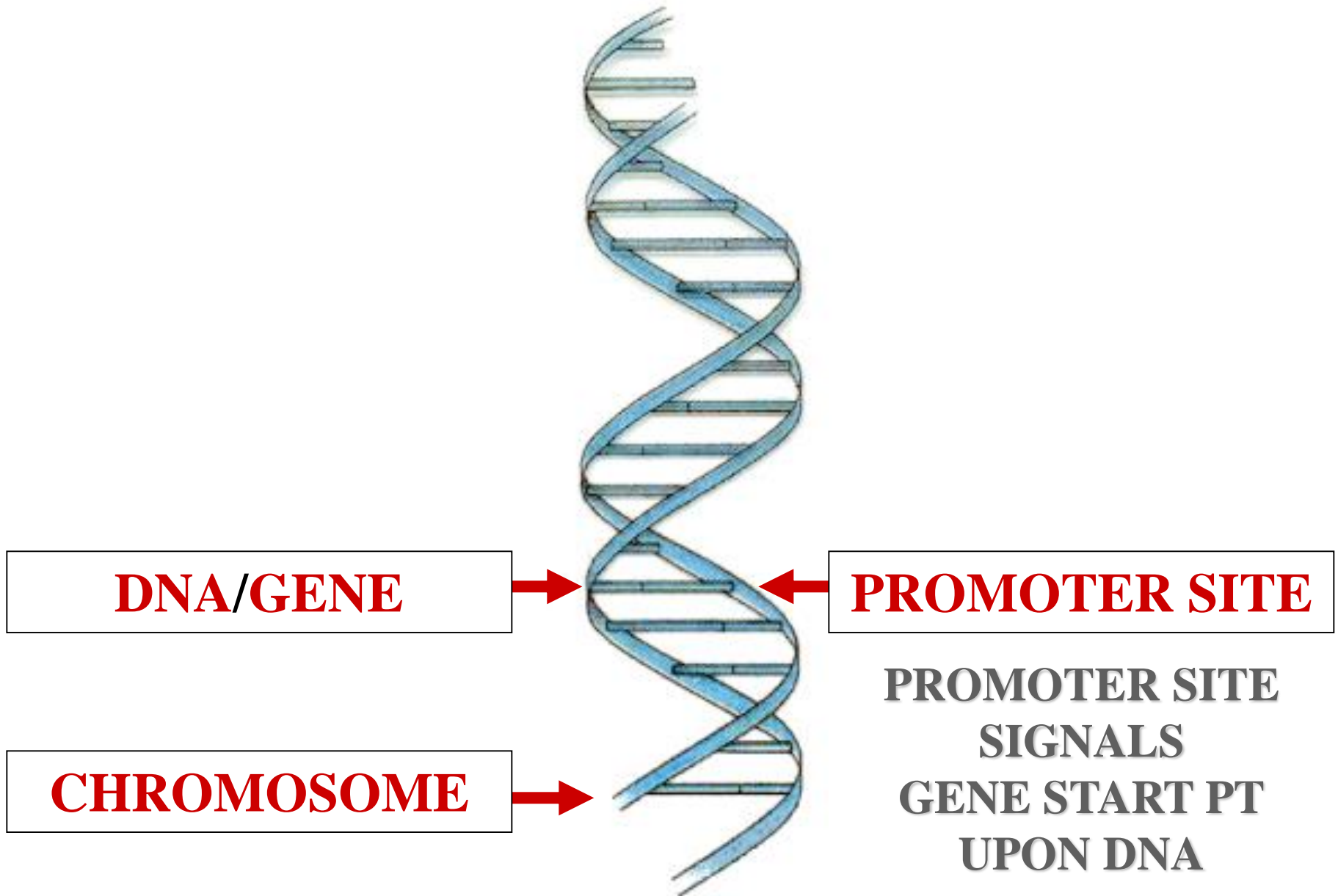


SIGNALS GENE

START POINT UPON DNA

PROMOTER SITE

TRANSCRIPTION



TRANSCRIPTION



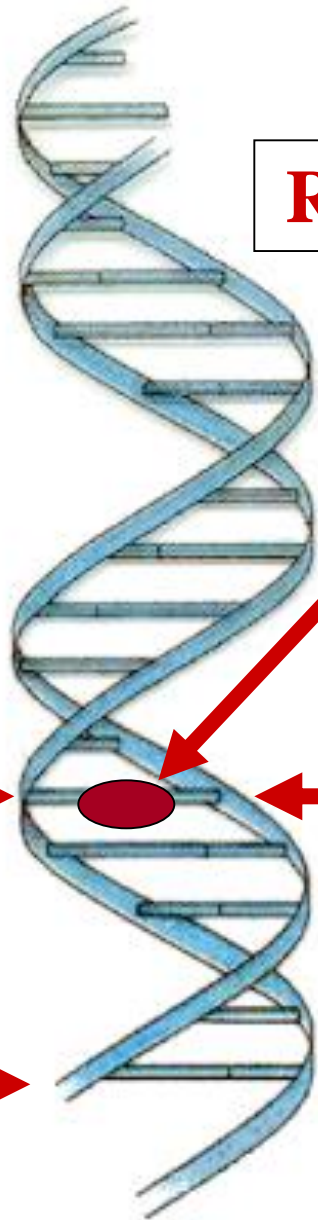
PROMOTOR SITE
RECOGNIZED BY
RNA POLYMERASE

RNA-POLYMERASE

DNA/GENE

PROMOTER SITE

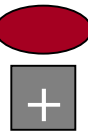
CHROMOSOME



RNA POLYMERASE

RNA POLYMERASE

RNA POLYMERASE



ENZYME

TRANSCRIBES

NON-MODIFIED

M-RNA

RNA POLYMERASE

TRANSCRIPTION

T

+

 = RNA POLYMERASE

 = HYDROGEN BOND

**COMPLIMENTARY
DNA STRAND**

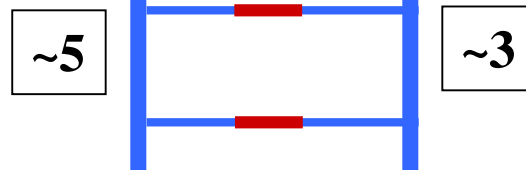
**COMPLIMENTARY
DNA STRAND**

CHROMOSOME

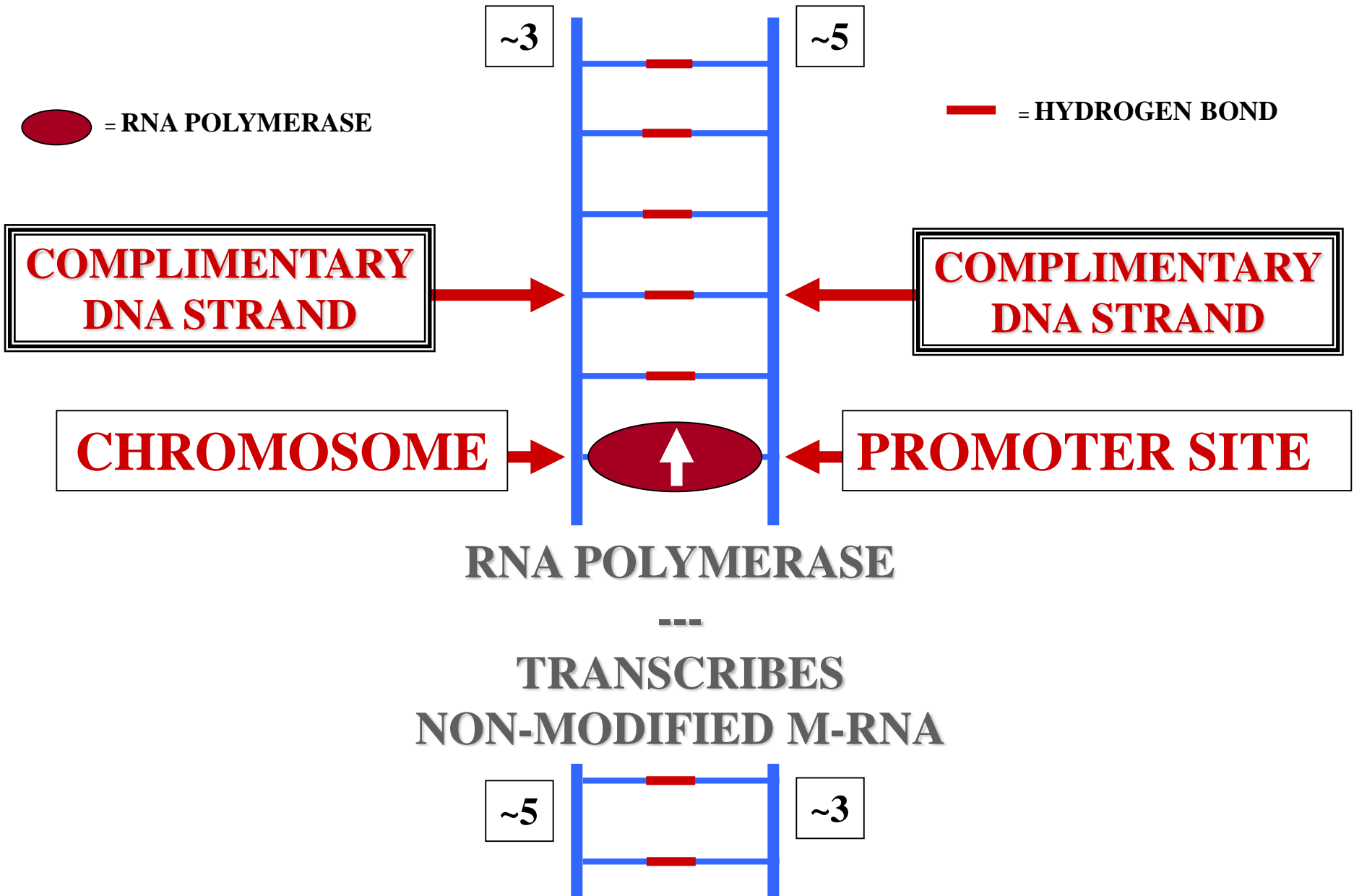
PROMOTER SITE

RNA POLYMERASE

**RECOGNIZES
PROMOTOR SITE**



TRANSCRIPTION

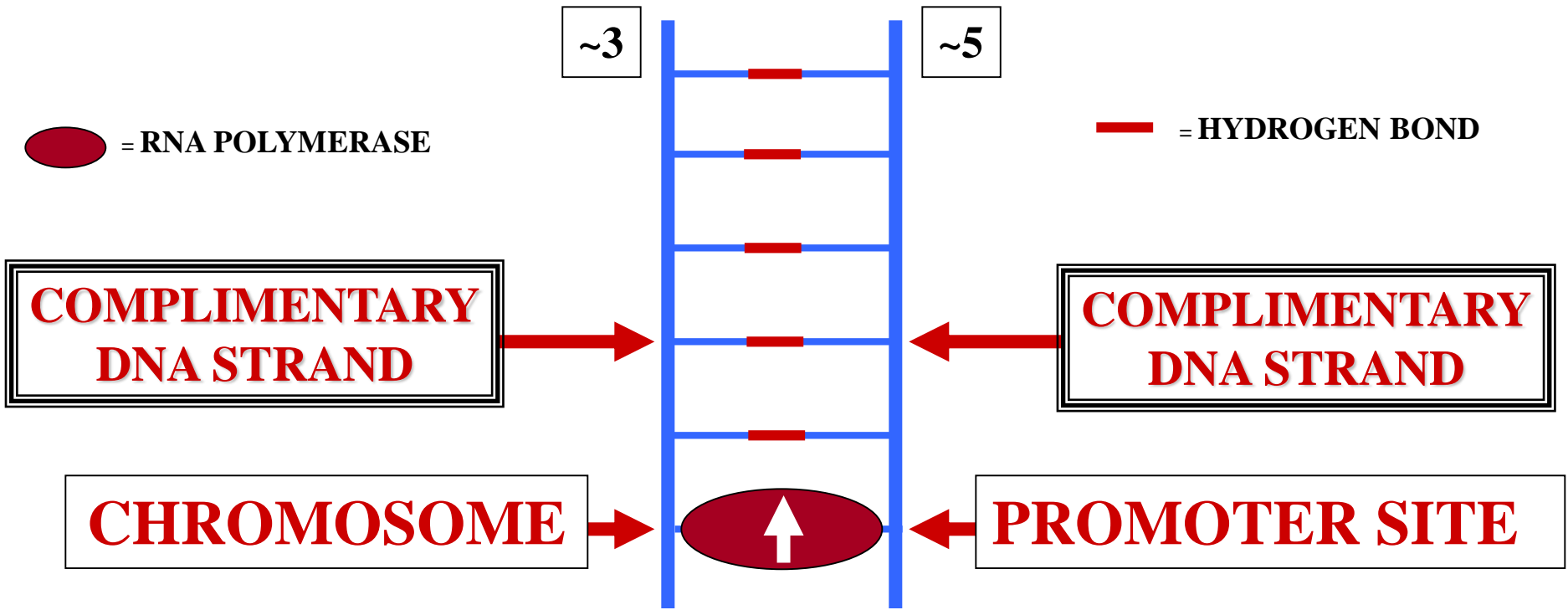


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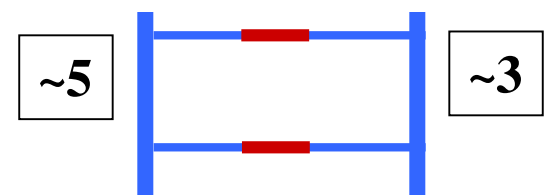
 = RNA POLYMERASE

 = HYDROGEN BOND



RNA POLYMERASE

BREAKS COMPLIMENTARY DNA STRAND
H-BONDS



TRANSCRIPTION



 = RNA POLYMERASE

 = HYDROGEN BOND

**COMPLIMENTARY
DNA STRAND**

**COMPLIMENTARY
DNA STRAND**

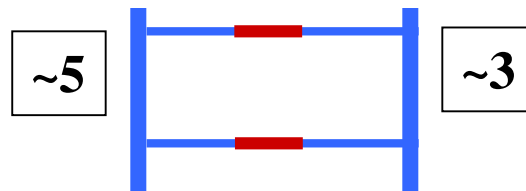
CHROMOSOME

PROMOTER SITE

RNA POLYMERASE

BREAKS COMPLIMENTARY DNA STRAND

H-BONDS



TRANSCRIPTION



 = RNA POLYMERASE

 = HYDROGEN BOND

**COMPLIMENTARY
DNA STRAND**

**COMPLIMENTARY
DNA STRAND**

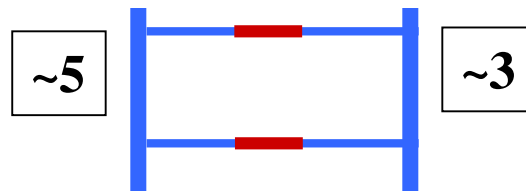
CHROMOSOME

PROMOTER SITE

RNA POLYMERASE

BREAKS COMPLIMENTARY DNA STRAND

H-BONDS



TRANSCRIPTION



 = RNA POLYMERASE

 = HYDROGEN BOND

**COMPLIMENTARY
DNA STRAND**

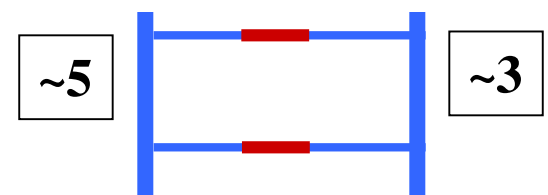
**COMPLIMENTARY
DNA STRAND**

CHROMOSOME

PROMOTER SITE

RNA POLYMERASE

**BREAKS COMPLIMENTARY DNA STRAND
H-BONDS**

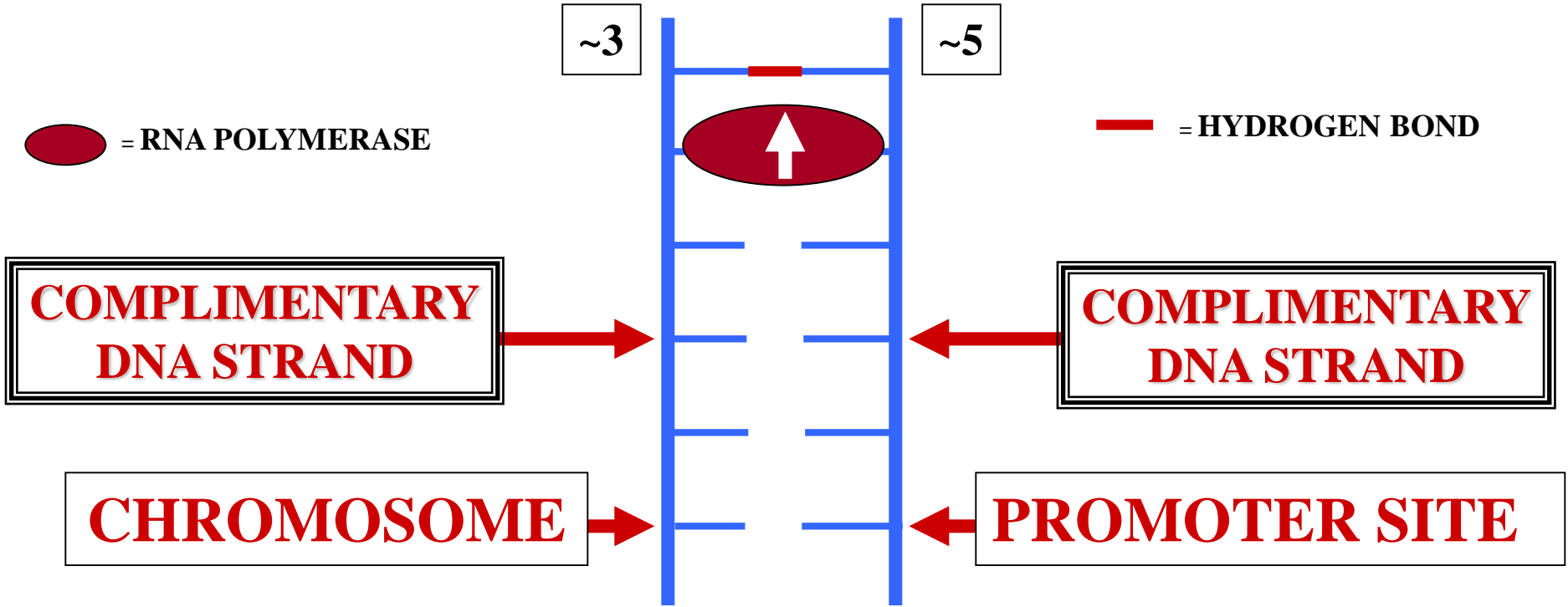


TRANSCRIPTION



 = RNA POLYMERASE

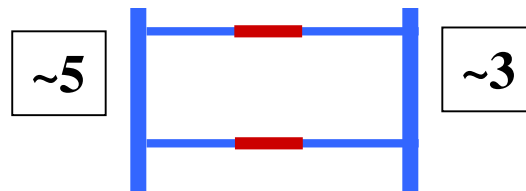
 = HYDROGEN BOND



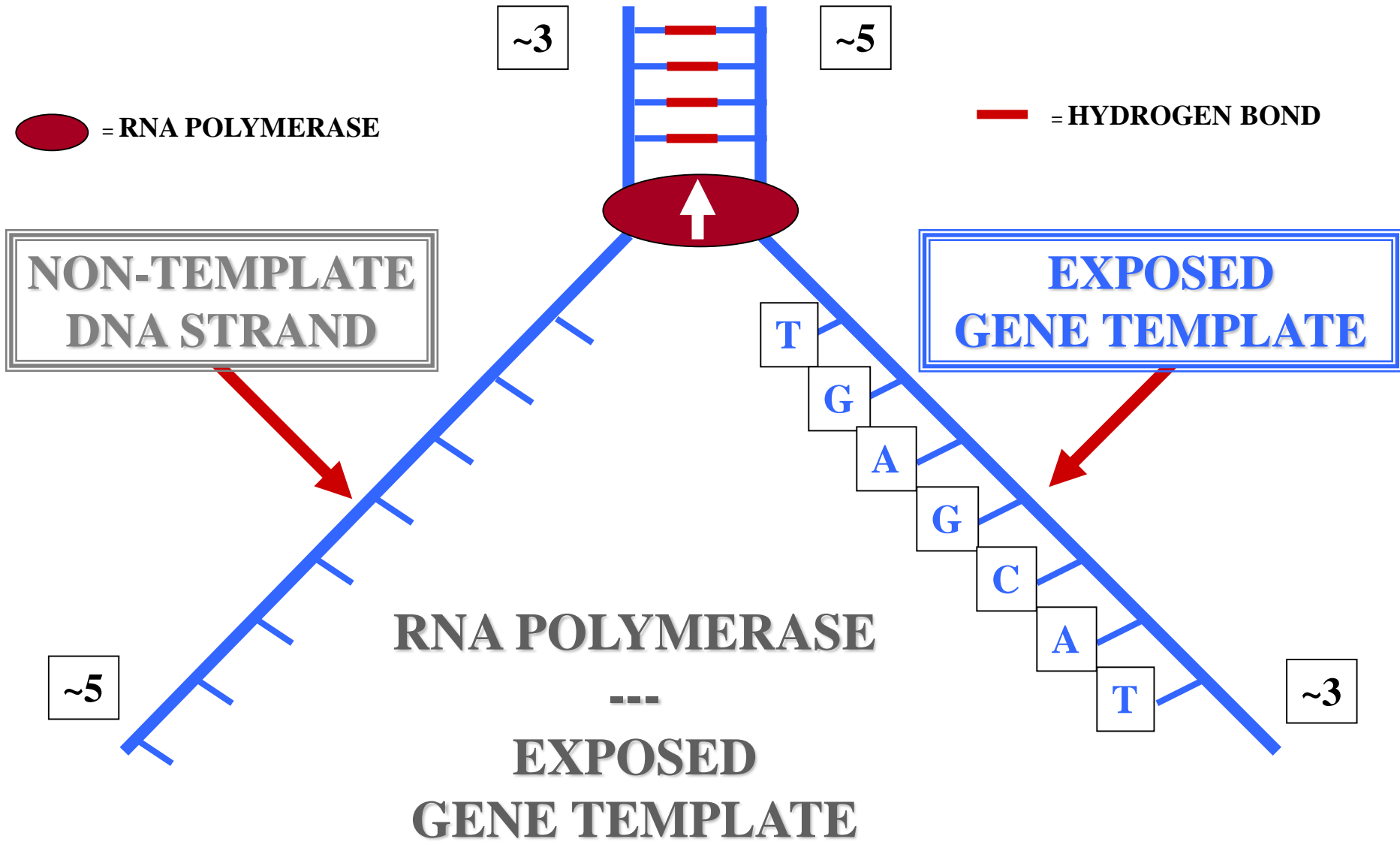
RNA POLYMERASE

BREAKS COMPLIMENTARY DNA STRAND

H-BONDS



TRANSCRIPTION



GENE TEMPLATE

GENE TEMPLATE

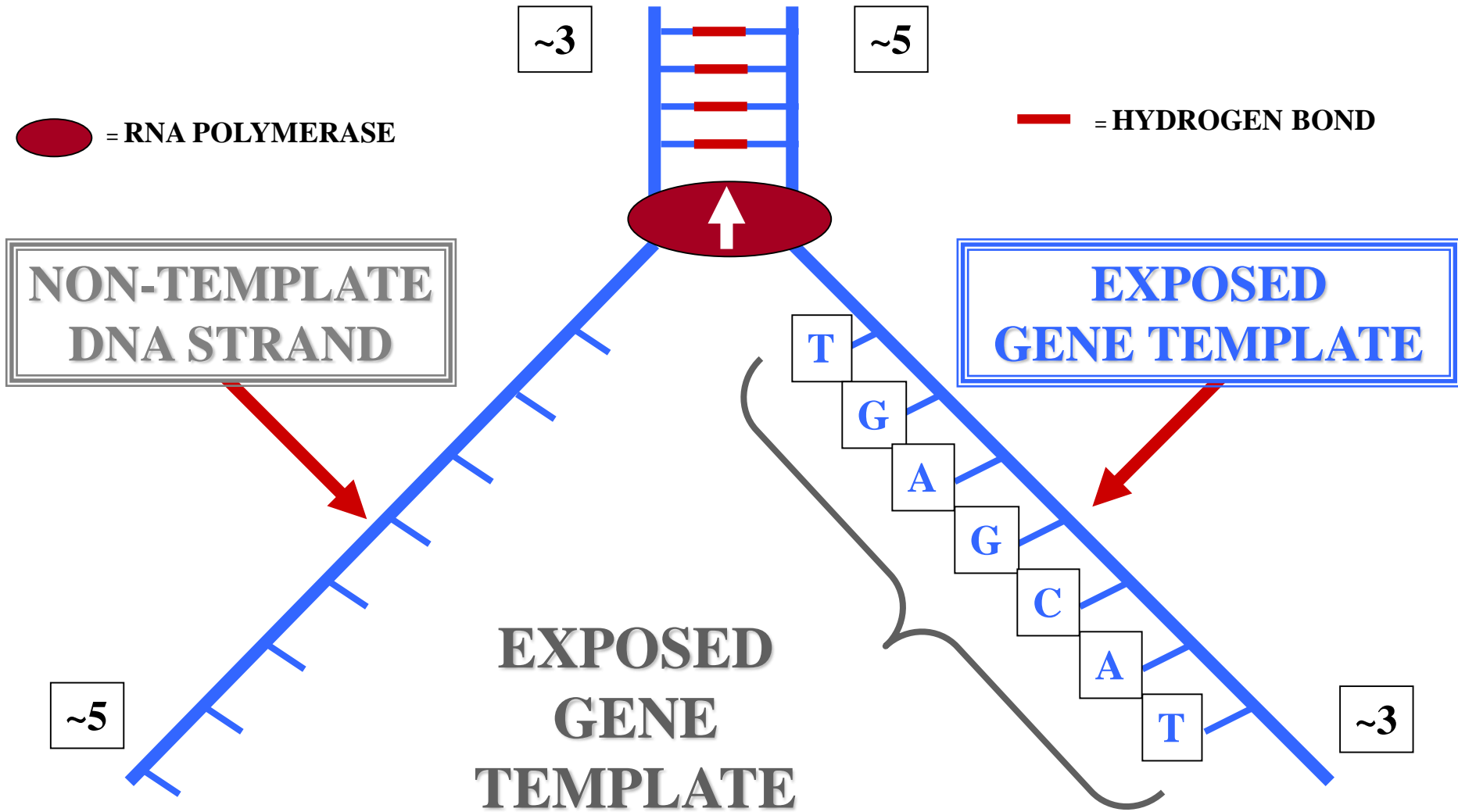


GENE TEMPLATE

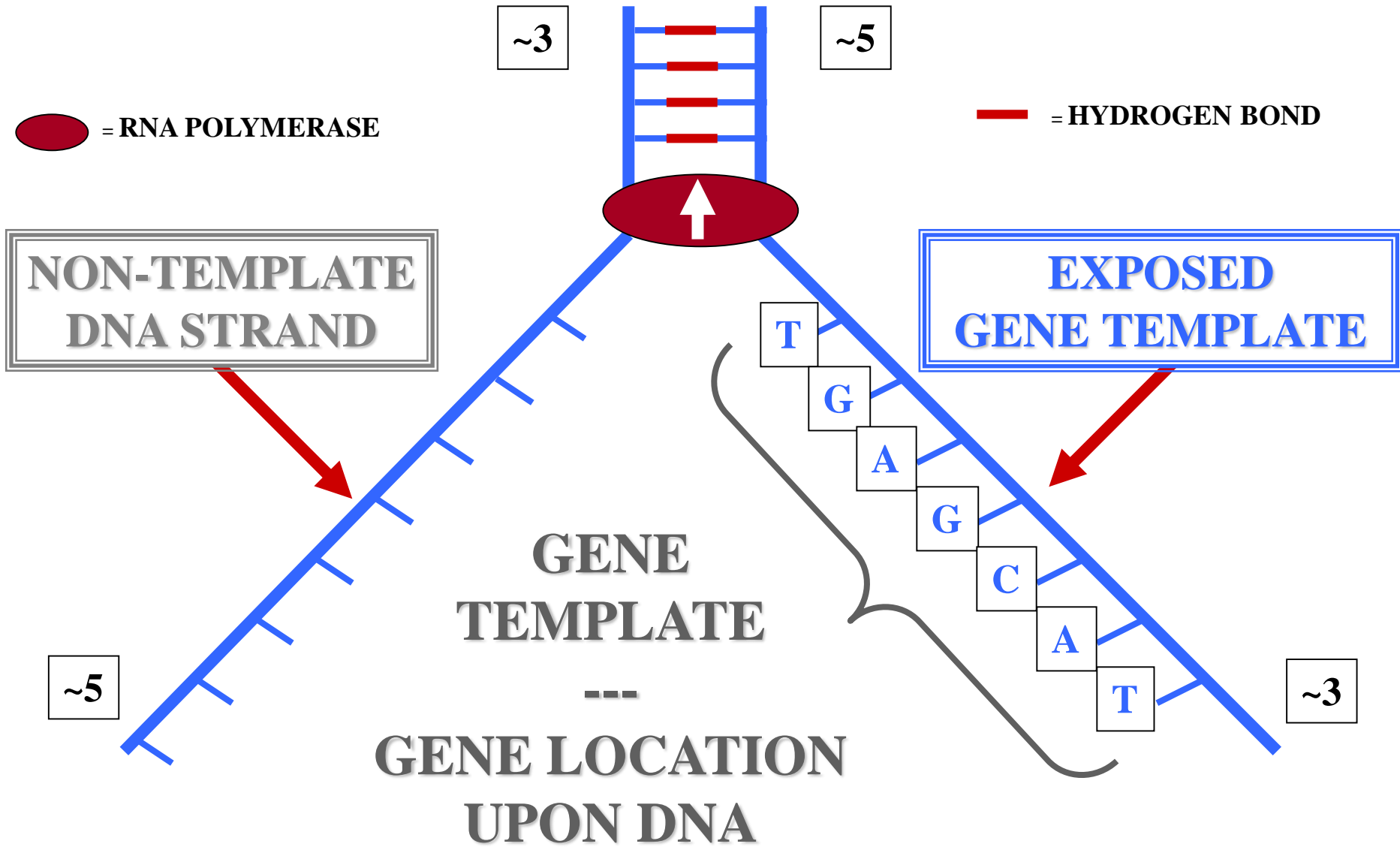
**GENE LOCATION
UPON DNA**

GENE TEMPLATE

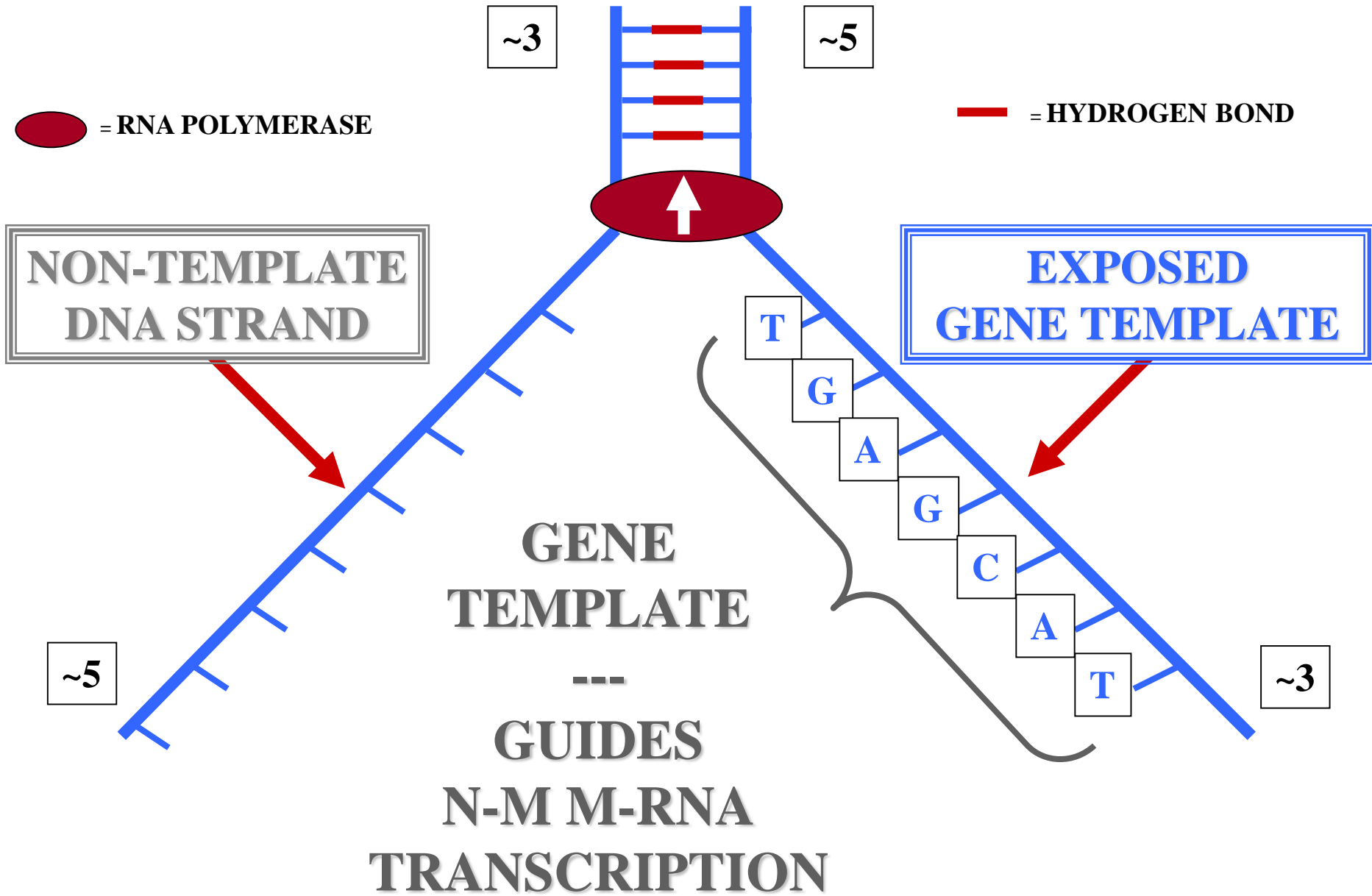
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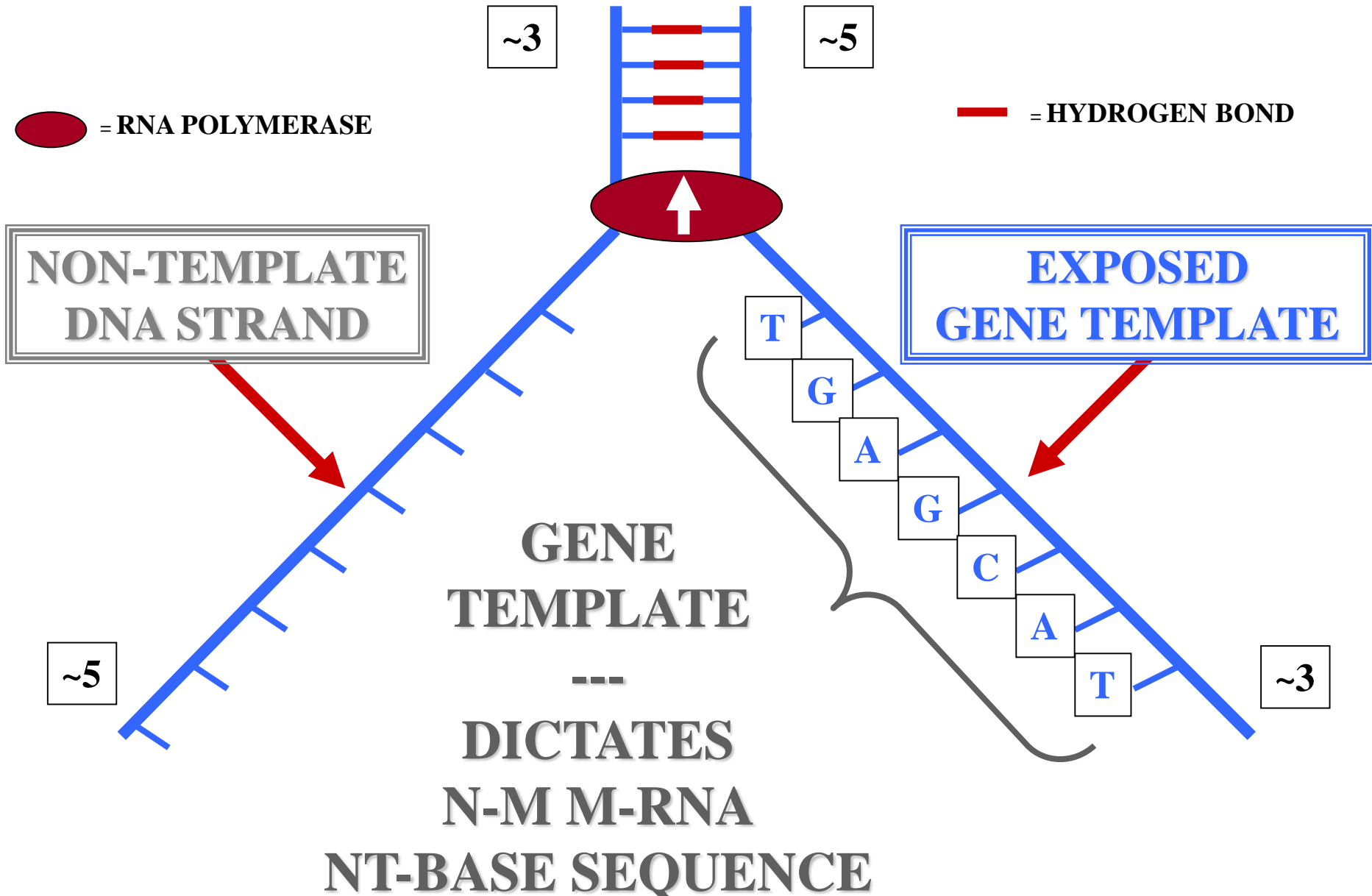
TRANSCRIPTION



TRANSCRIPTION



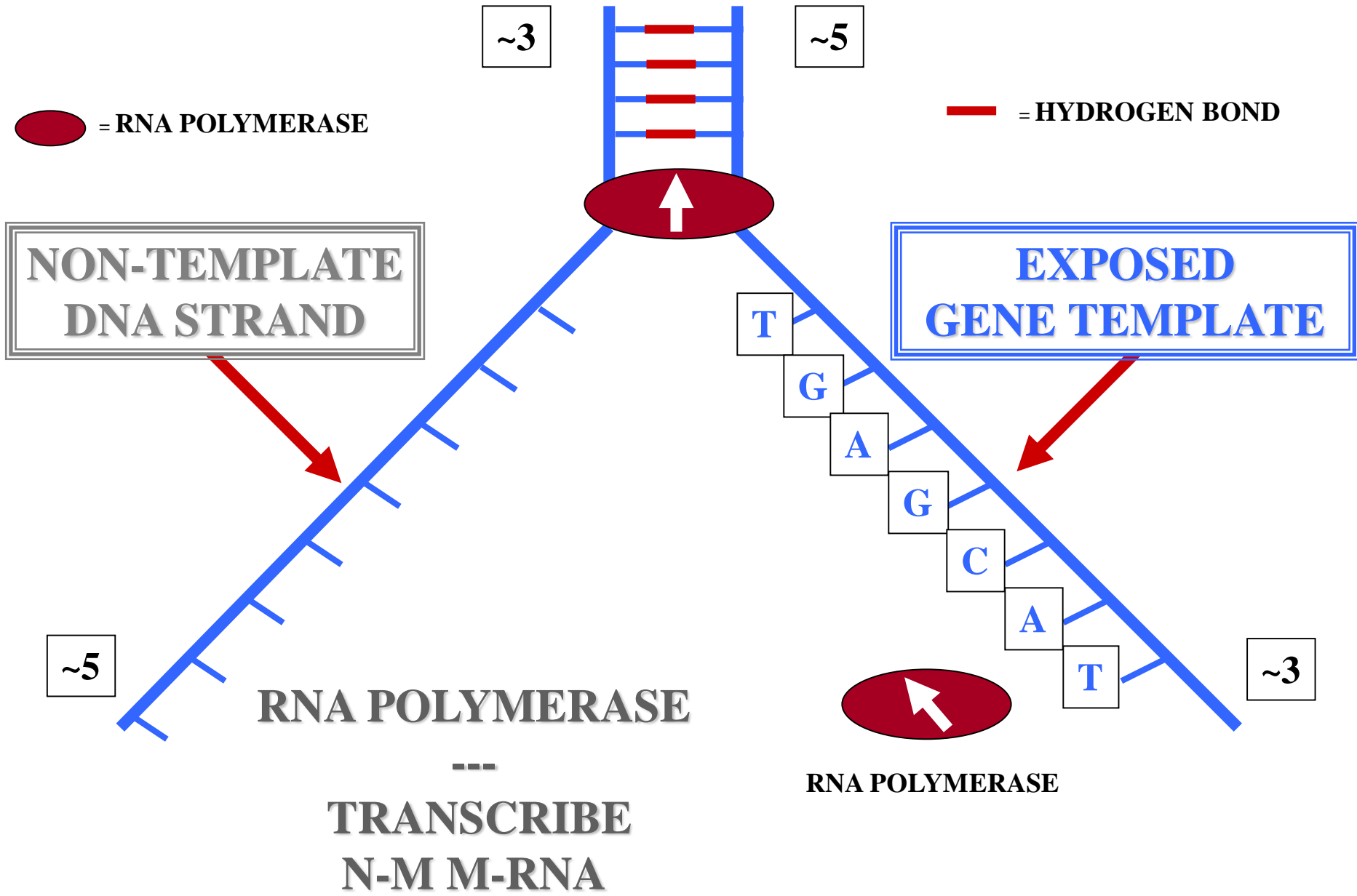
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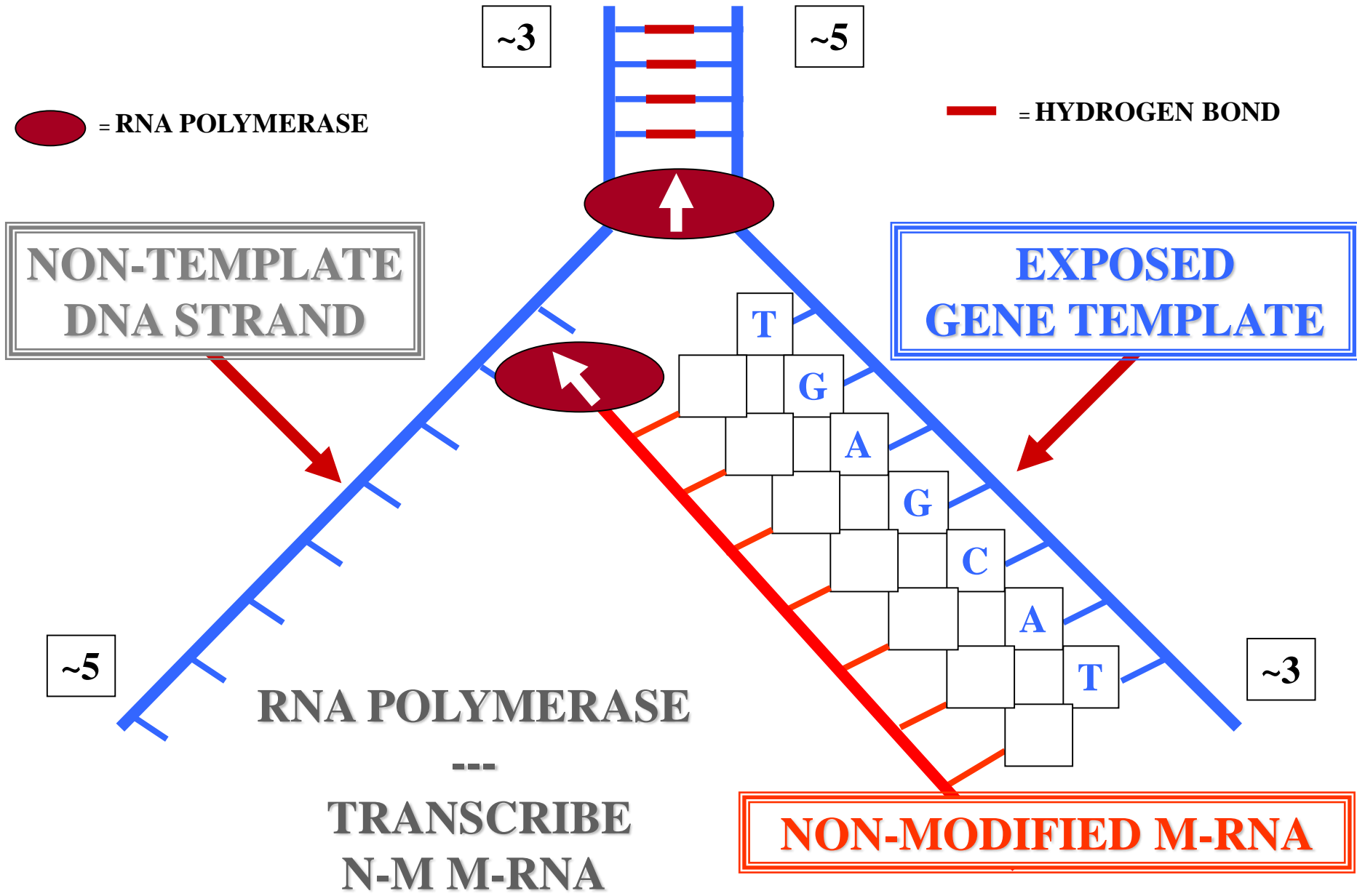


M-RNA TRANSCRIPTION

TRANSCRIPTION

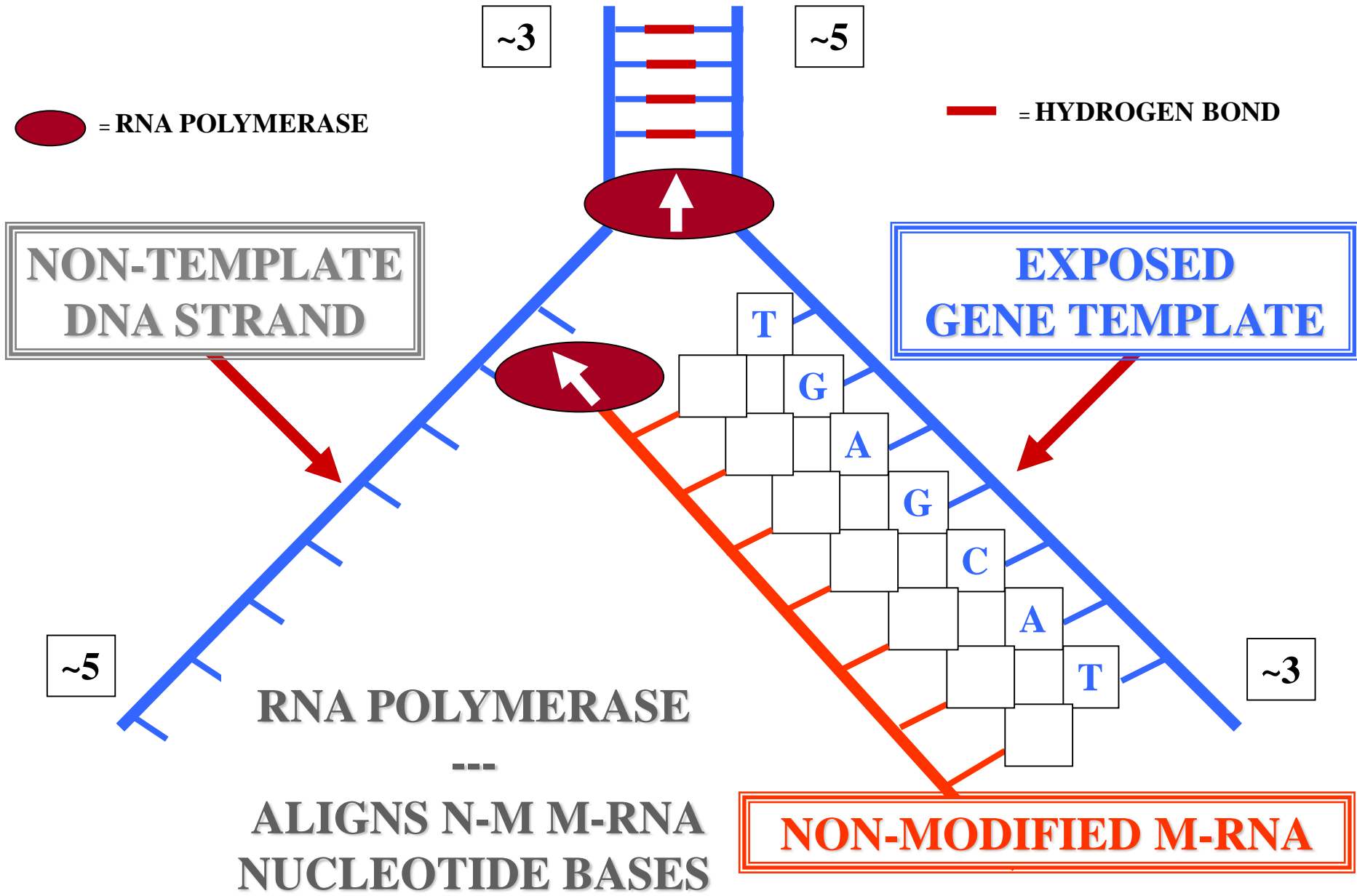


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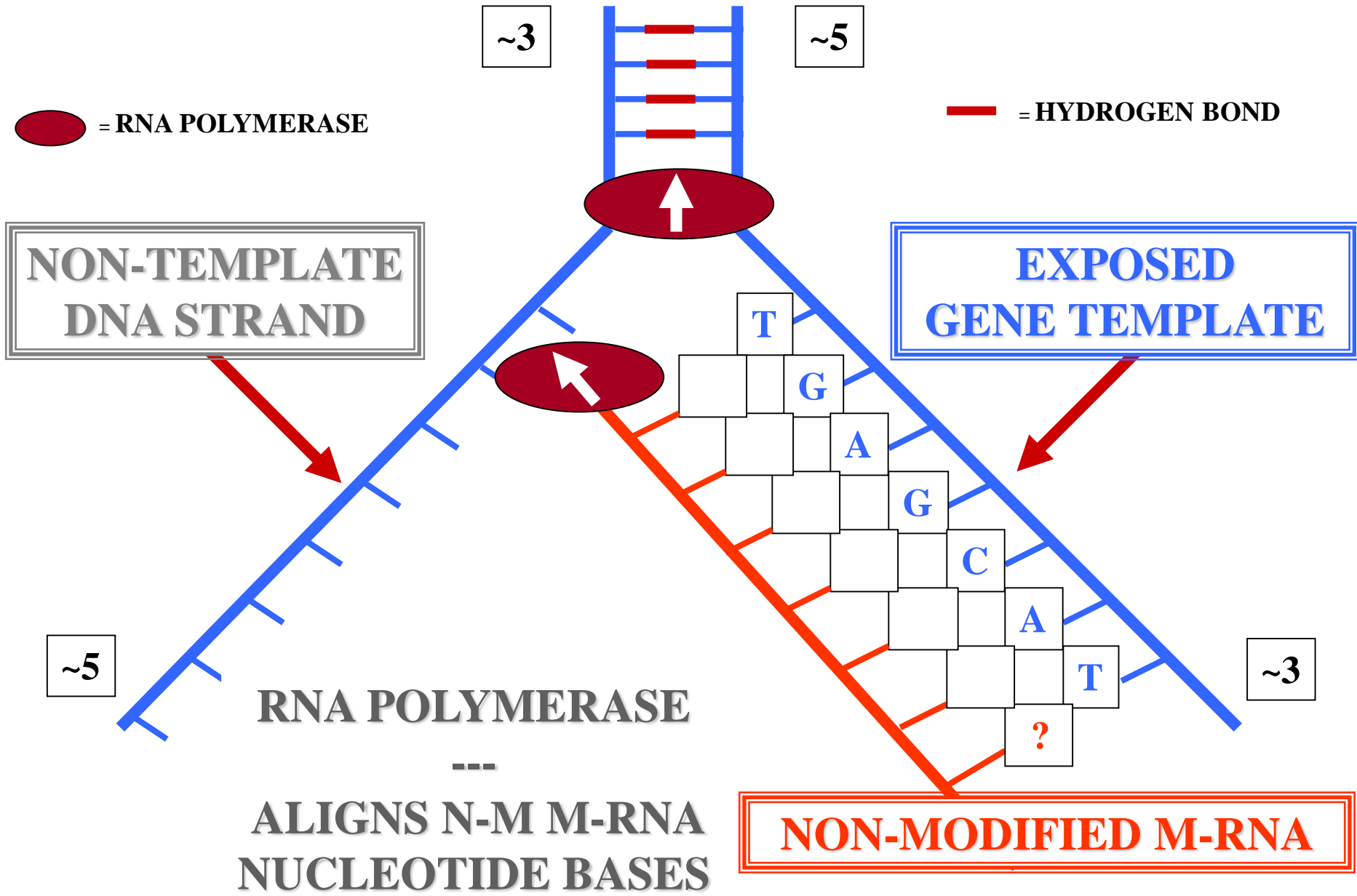




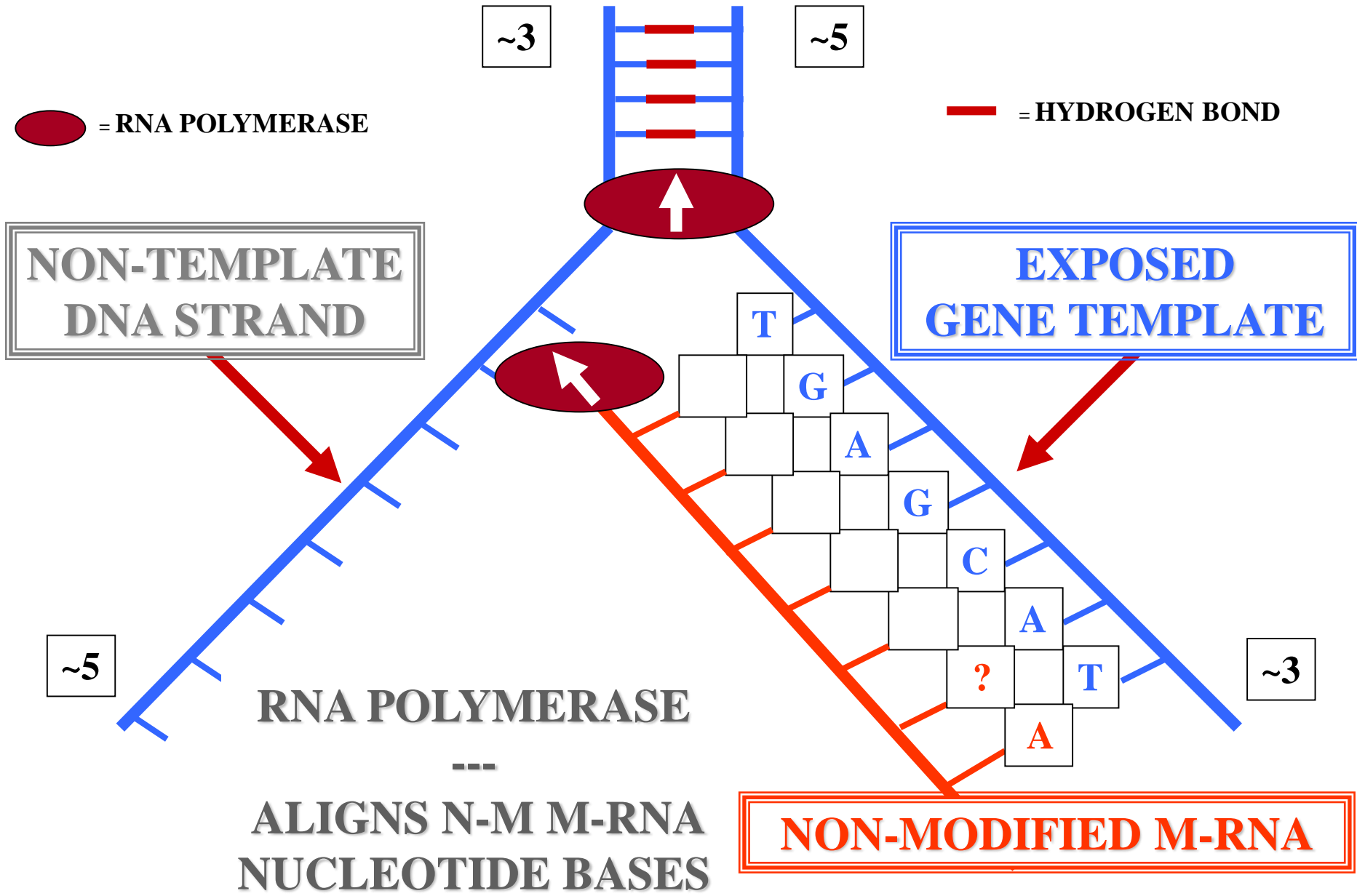
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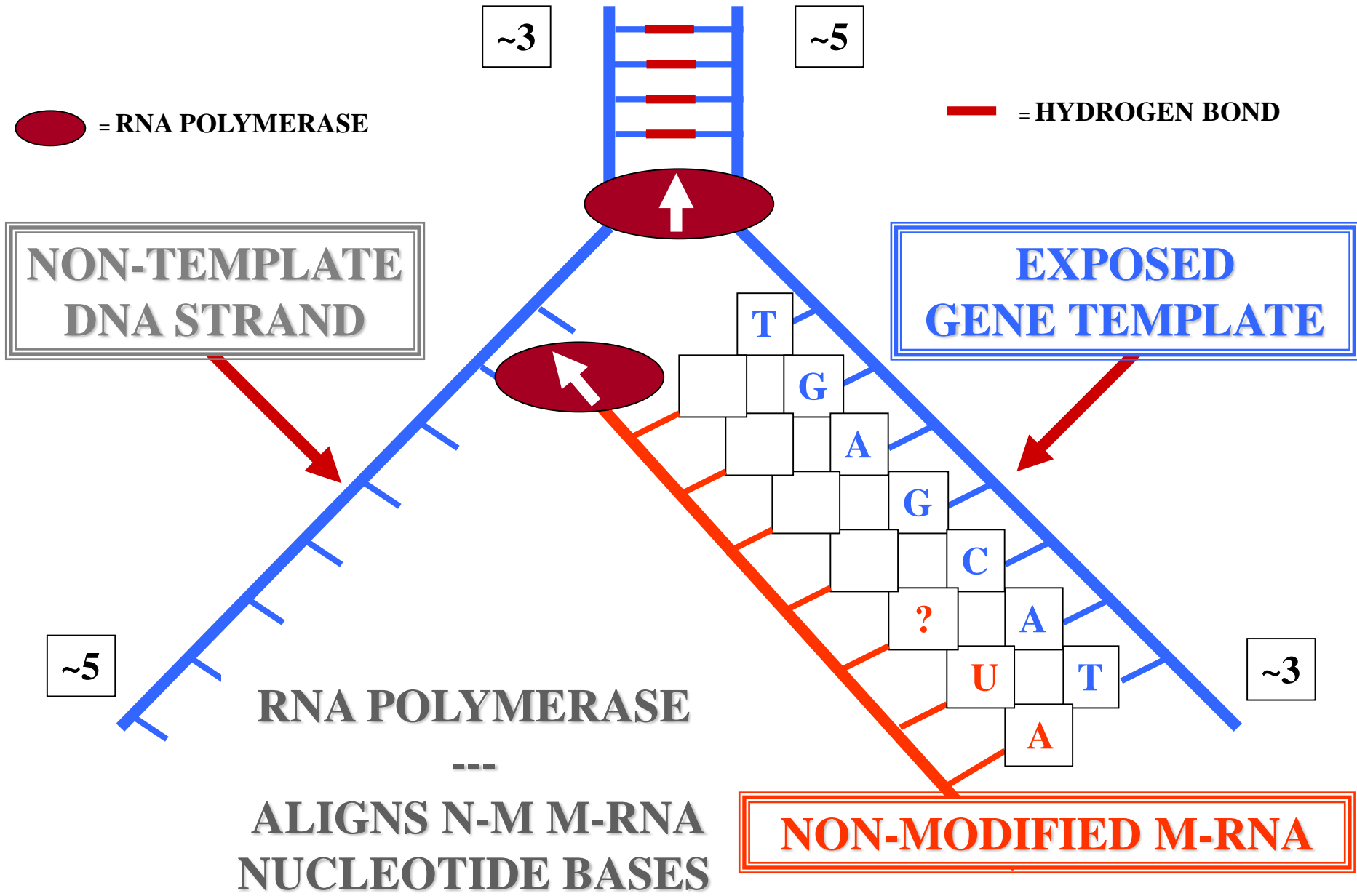
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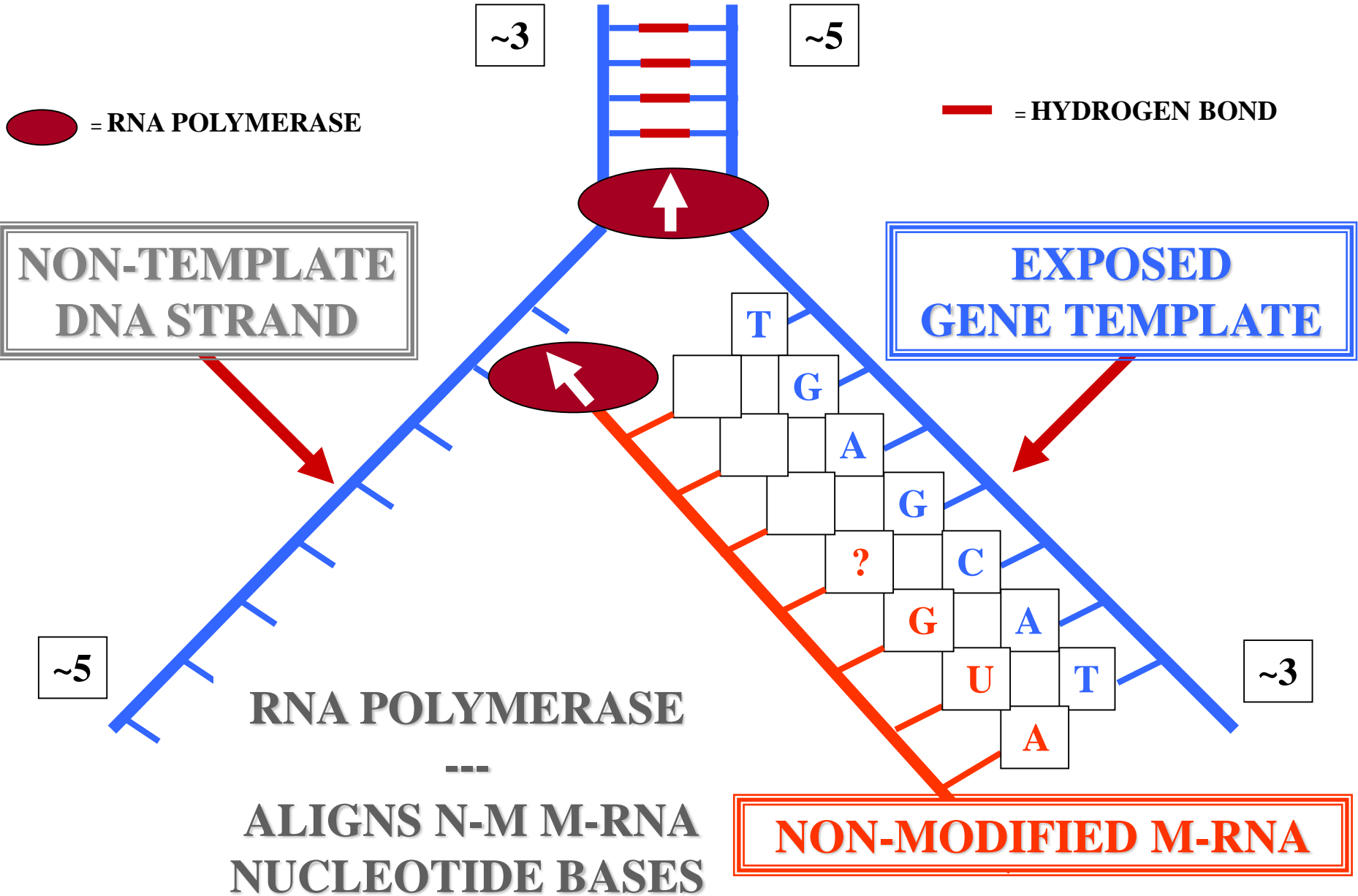
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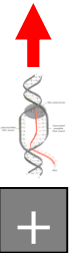
TRANSCRIPTION



TRANSCRIPTION

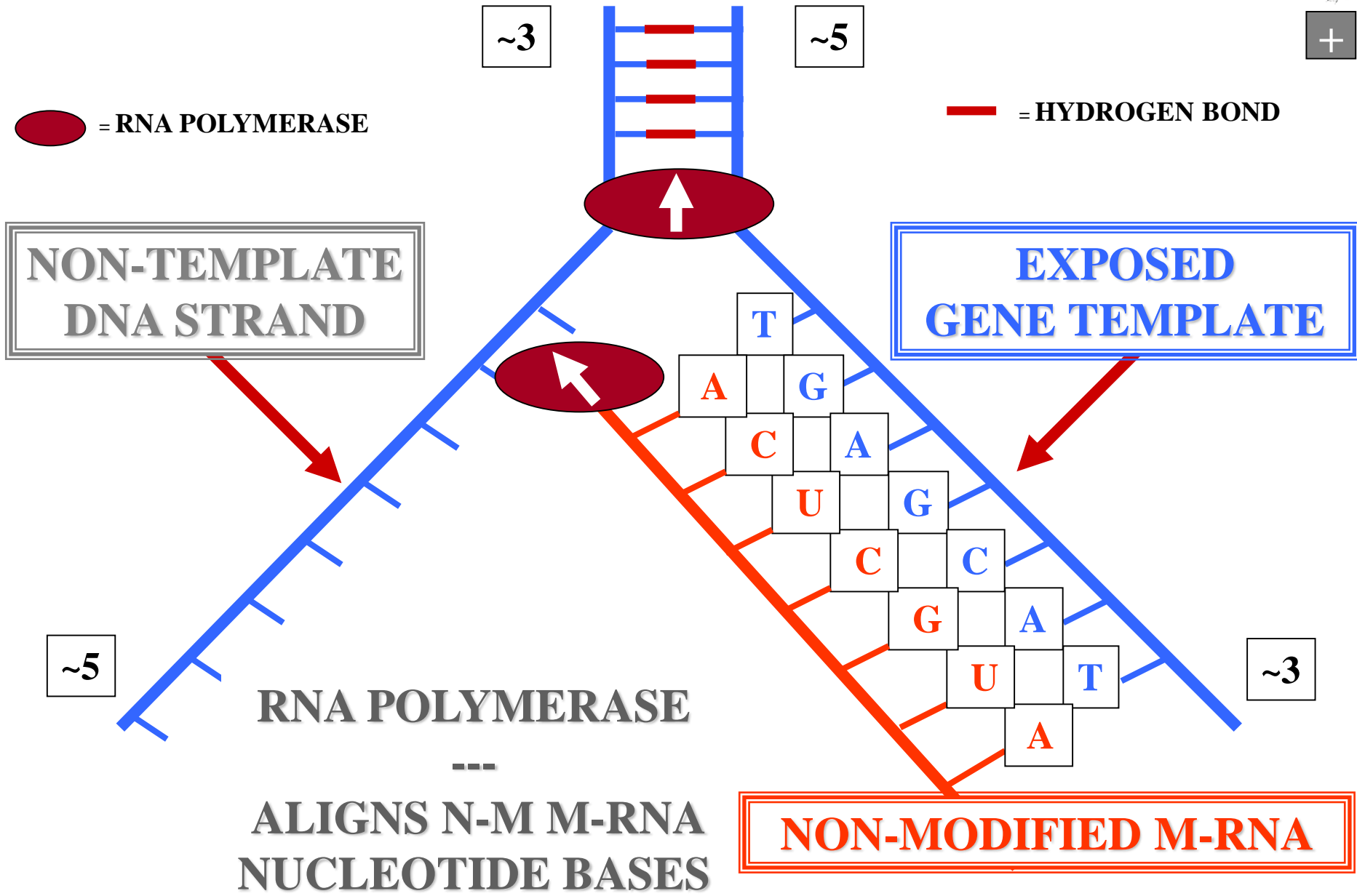


TRANSCRIPTION



= RNA POLYMERASE

= HYDROGEN BOND



**NON-TEMPLATE
DNA STRAND**

**EXPOSED
GENE TEMPLATE**

~5

~3

RNA POLYMERASE

**ALIGNS N-M M-RNA
NUCLEOTIDE BASES**

NON-MODIFIED M-RNA

TRANSCRIPTION T

RNA POLYMERASE
CONTINUES
TRANSCRIPTION
ALONG GENE TEMPLATE

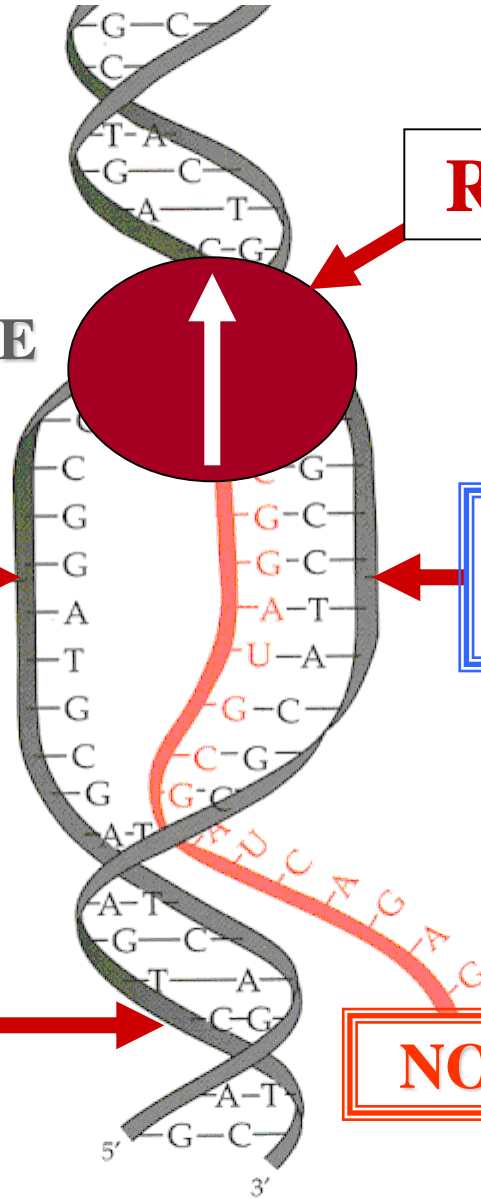
RNA POLYMERASE

**NON-TEMPLATE
DNA STRAND**

**GENE
TEMPLATE**

PROMOTER SITE

NON-MODIFIED M-RNA



TRANSCRIPTION



TERMINATION SITE

RNA POLYMERASE
ENDS TRANSCRIPTION
AT TERMINATION SITE

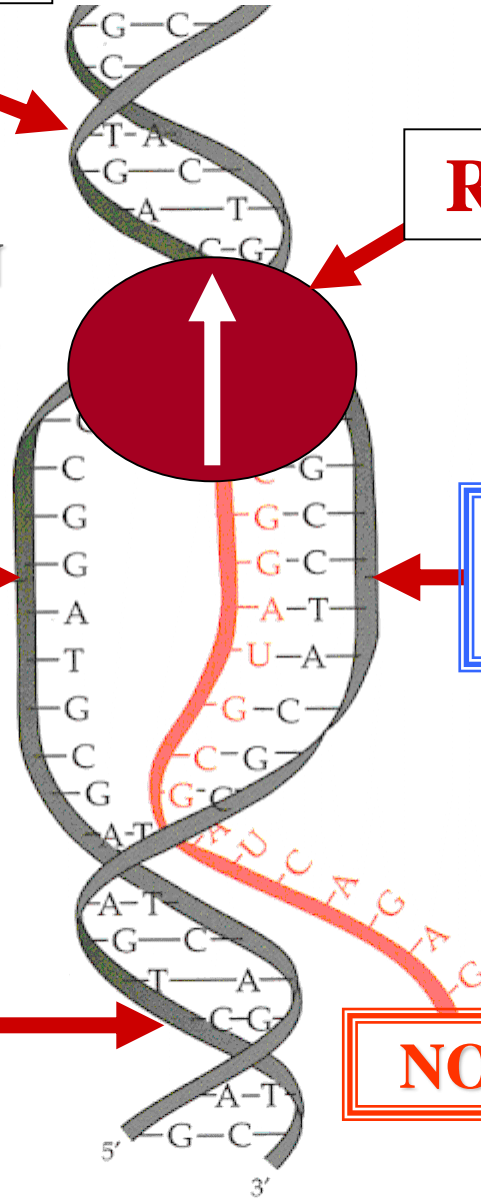
RNA POLYMERASE

**NON-TEMPLATE
DNA STRAND**

**GENE
TEMPLATE**

PROMOTER SITE

NON-MODIFIED M-RNA



TERMINATION SITE

TERMINATION SITE



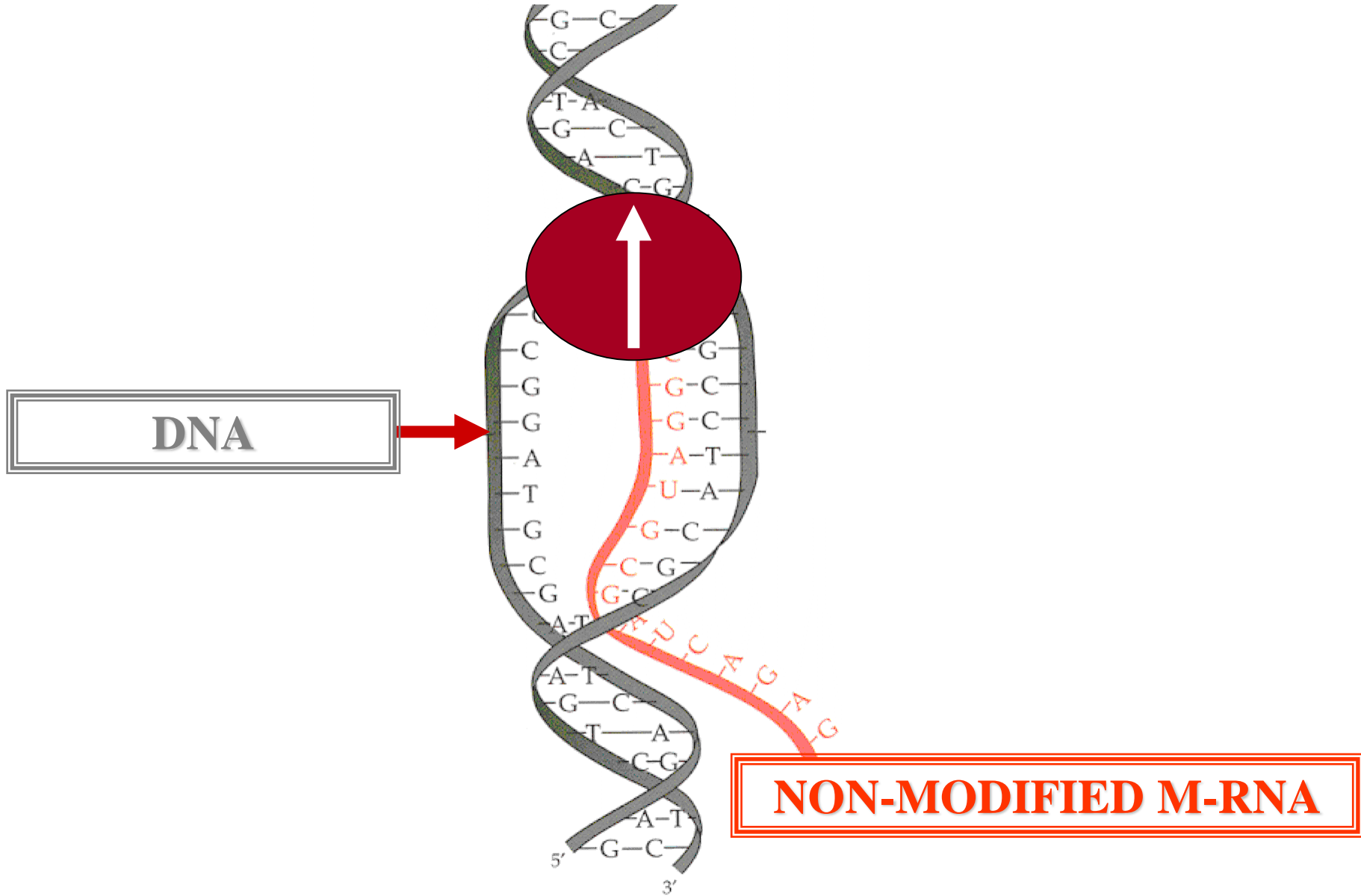
TERMINATION SITE

SIGNALS GENE

END POINT UPON DNA

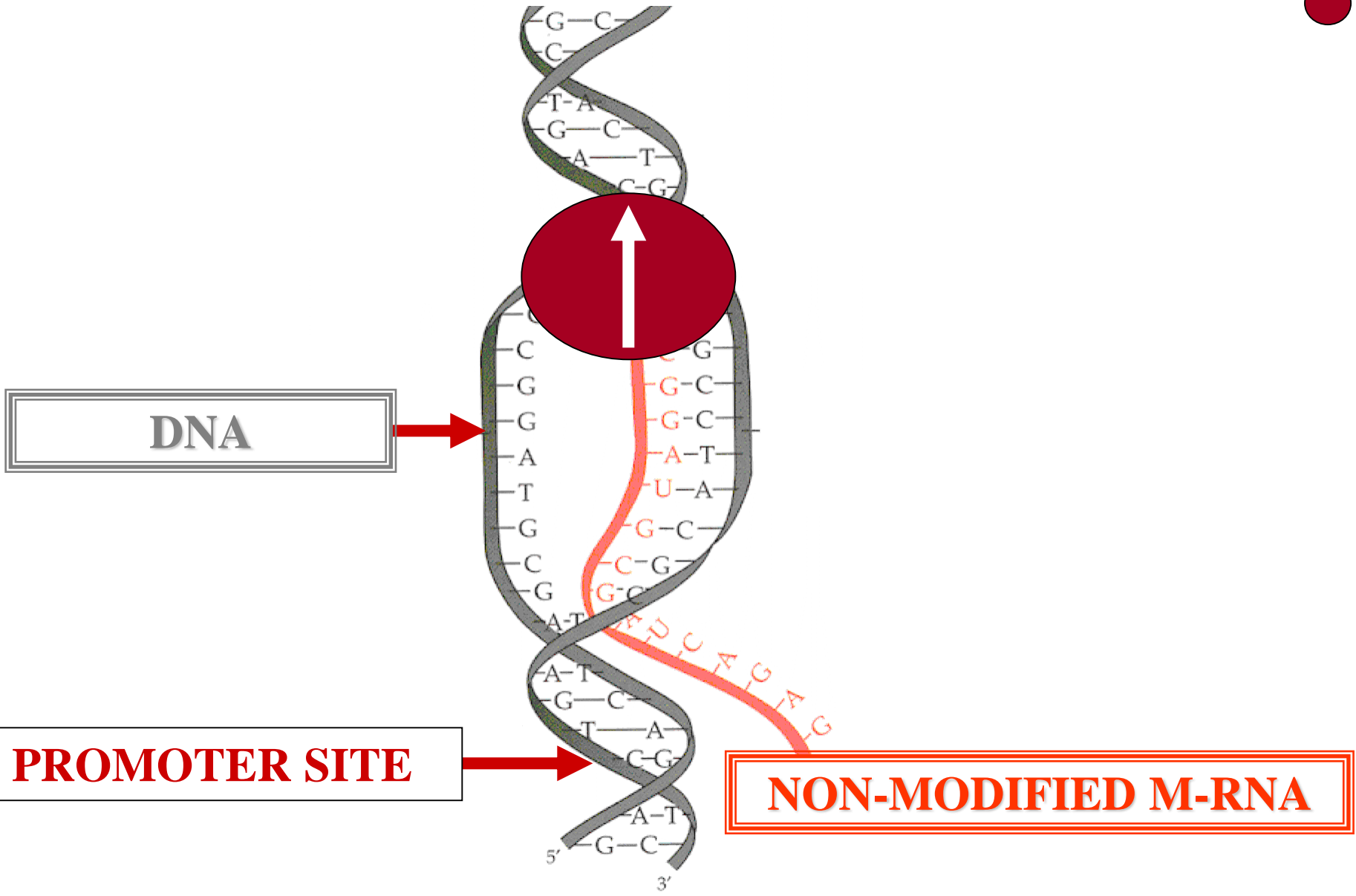
TERMINATION SITE

TRANSCRIPTION P

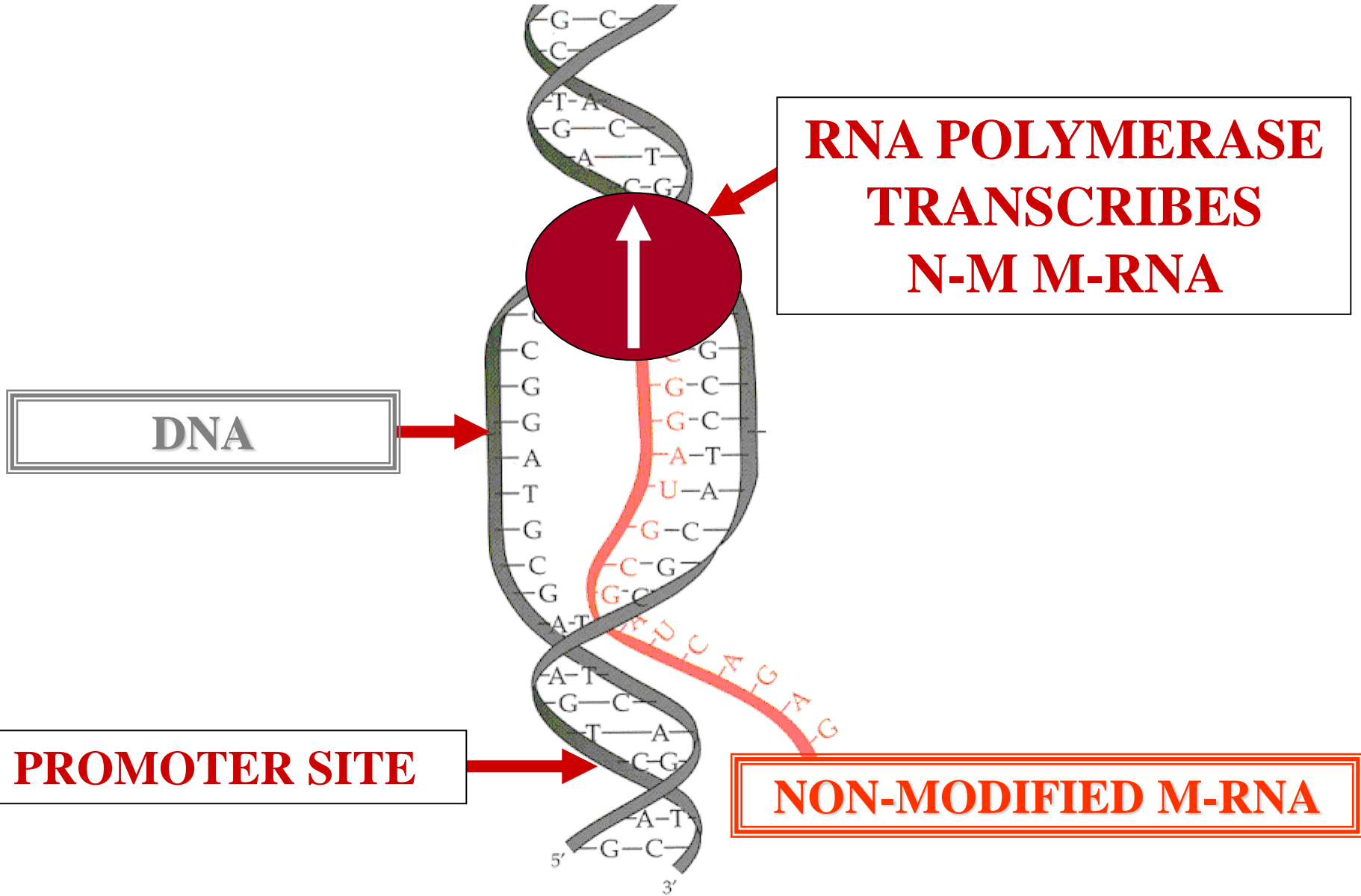


TRANSCRIPTION

R



TRANSCRIPTION T



TRANSCRIPTION S

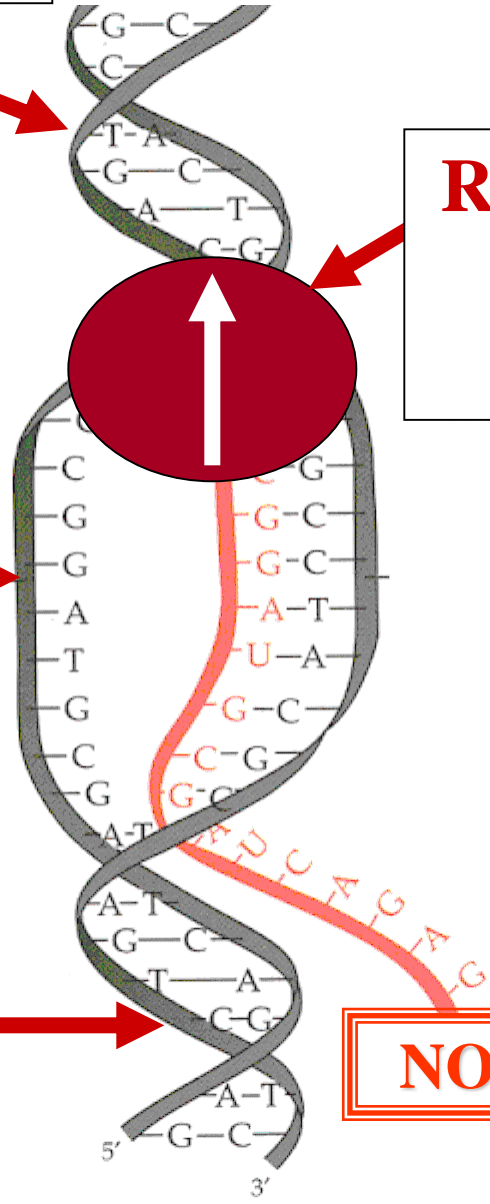
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**RNA POLYMERASE
TRANSCRIBES
N-M M-RNA**

DNA

PROMOTER SITE

NON-MODIFIED M-RNA



TRANSCRIPTION e

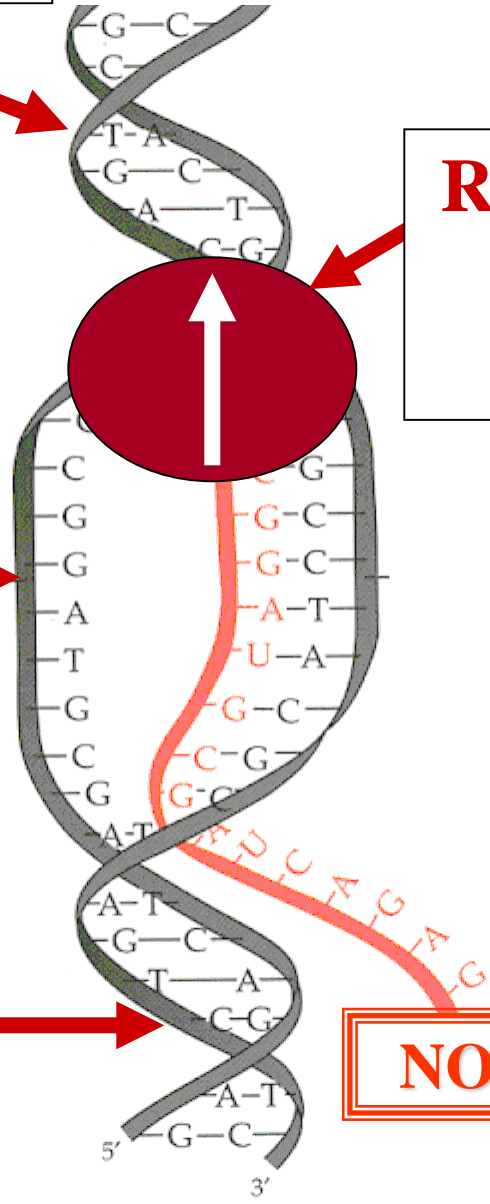
TERMINATION SITE

**RNA POLYMERASE
TRANSCRIBES
N-M M-RNA**

DNA

**PROMOTER SITE
GENE START POINT**

NON-MODIFIED M-RNA



TRANSCRIPTION



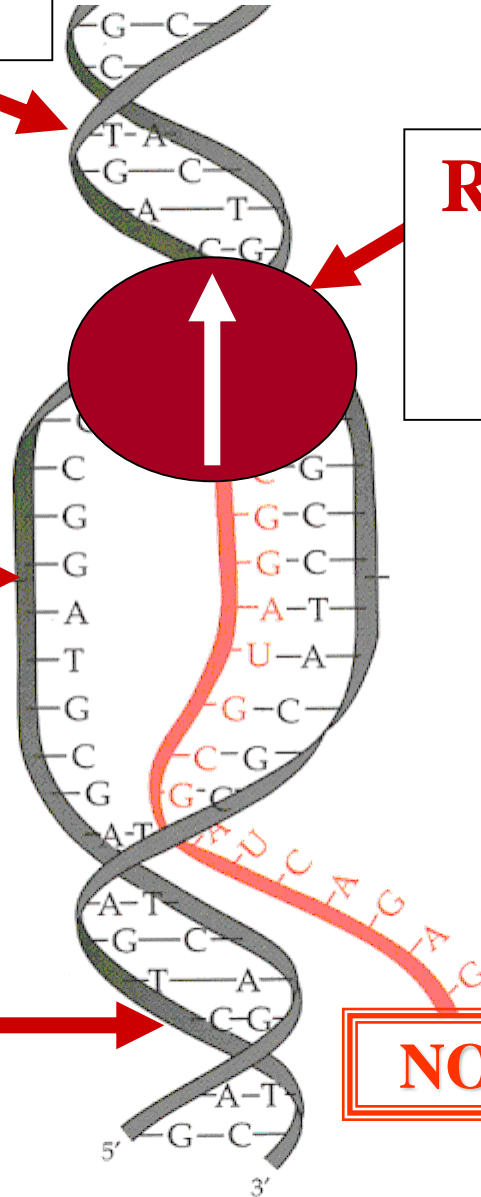
TERMINATION SITE
GENE END POINT

**RNA POLYMERASE
TRANSCRIBES
N-M M-RNA**

DNA

PROMOTER SITE
GENE START POINT

NON-MODIFIED M-RNA



TRANSCRIPTION G

TERMINATION SITE
GENE END POINT

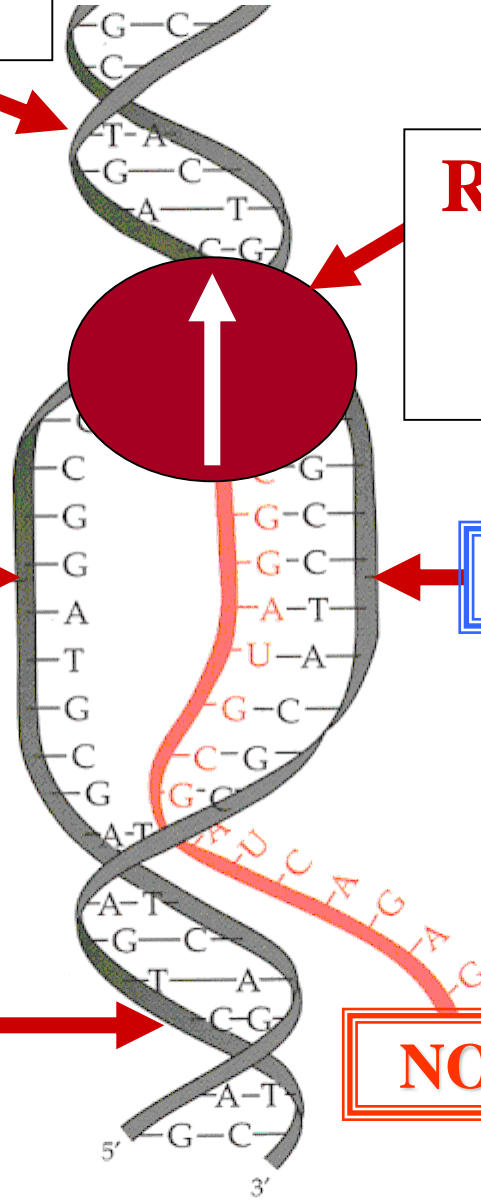
RNA POLYMERASE
TRANSCRIBES
N-M M-RNA

DNA

?

PROMOTER SITE
GENE START POINT

NON-MODIFIED M-RNA



TRANSCRIPTION



TERMINATION SITE
GENE END POINT

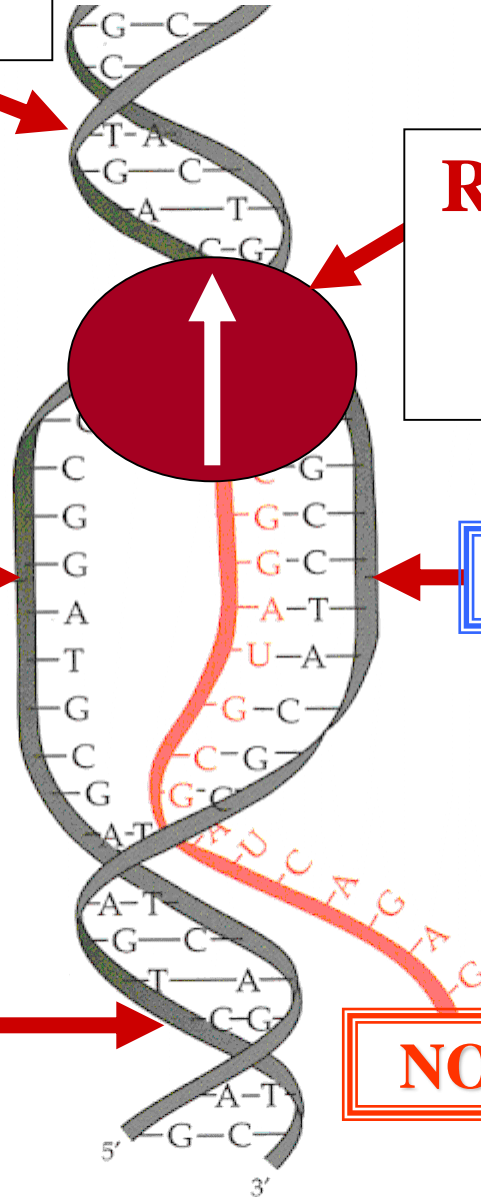
RNA POLYMERASE
TRANSCRIBES
N-M M-RNA

DNA

GENE TEMPLATE

PROMOTER SITE
GENE START POINT

NON-MODIFIED M-RNA



TRANSCRIPTION



TERMINATION SITE
GENE END POINT

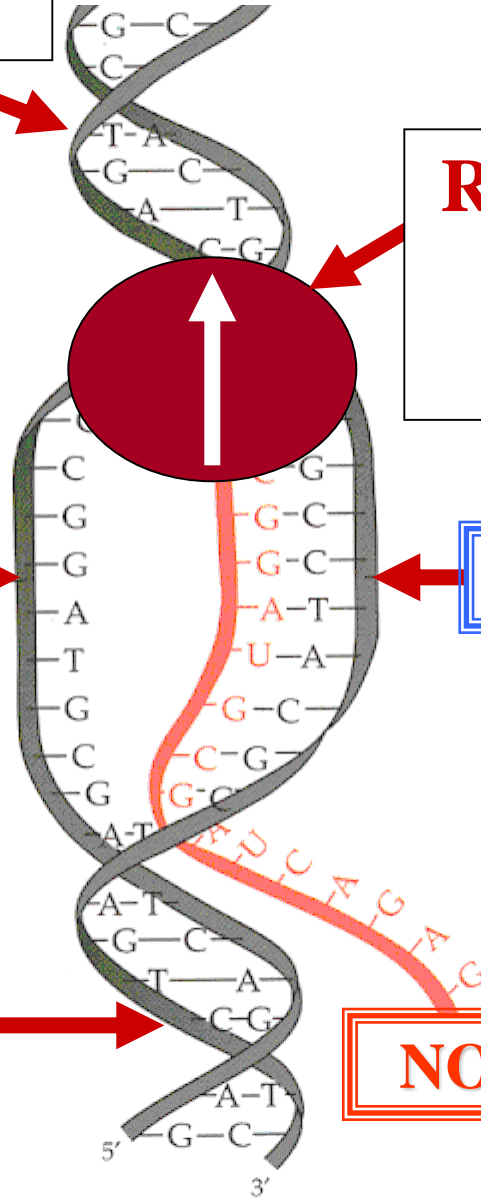
RNA POLYMERASE
TRANSCRIBES
N-M M-RNA

DNA

GENE

PROMOTER SITE
GENE START POINT

NON-MODIFIED M-RNA





TRANSCRIPTION OUTCOME

CELL

PROTEIN / SYNTHESIS

N

NUCLEUS

CHROMOSOME



DNA/GENE

TRANSCRIPTION

OUTCOME

CYTOSOL

CELL

G

PROTEIN / SYNTHESIS

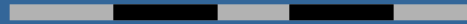
NUCLEUS

CHROMOSOME



DNA/GENE

TRANSCRIPTION



NON-MODIFIED M-RNA

CYTOSOL

CELL

M

PROTEIN / SYNTHESIS

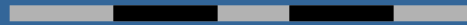
NUCLEUS

CHROMOSOME



DNA/GENE

TRANSCRIPTION



NON-MODIFIED M-RNA

GENETIC INFORMATION
TRANSCRIBED FROM GENE



NON-MODIFIED M-RNA

CYTOSOL

CELL

PROTEIN / SYNTHESIS



NUCLEUS

CHROMOSOME



DNA/GENE

TRANSCRIPTION



NON-MODIFIED M-RNA

MODIFICATION

CYTOSOL



**PROTEIN
SYNTHESIS
SPECIFICS
MODIFICATION**

CELL

PROTEIN / SYNTHESIS

L

NUCLEUS

CHROMOSOME



DNA/GENE

TRANSCRIPTION



CYTOSOL

CELL

PROTEIN / SYNTHESIS

M

NUCLEUS

CHROMOSOME



DNA/GENE

TRANSCRIPTION



LOCATION

CYTOSOL

CELL

PROTEIN / SYNTHESIS

N

NUCLEUS

CHROMOSOME



DNA/GENE

TRANSCRIPTION



MODIFICATION

CYTOSOL

CELL

PROTEIN / SYNTHESIS



NUCLEUS

CHROMOSOME



DNA/GENE

TRANSCRIPTION



NON-MODIFIED M-RNA

MODIFICATION

CYTOSOL

MODIFICATION

NON-MODIFIED M-RNA

A U G C G U C G A U A A U C A A G U C A A A C



MODIFICATION

NON-MODIFIED M-RNA

A U G C G U C G A U A A U C A A G U C A A A C

**EXON
NUCLEOTIDE BASES**

**INTRON
NUCLEOTIDE BASES**

**EXON
NUCLEOTIDES
VS
INTRON
NUCLEOTIDES**

**EXON
NUCLEOTIDES**

EXON NUCLEOTIDES BASES

REQUIRED

TRANSLATION

NUCLEOTIDE BASES

EXON NUCLEOTIDES BASES

INTRON NUCLEOTIDES

INTRON NUCLEOTIDES BASES

**NON-REQUIRED
TRANSLATION
NUCLEOTIDE BASES**

INTRON NUCLEOTIDES BASES

MODIFICATION



DR

NON-MODIFIED M-RNA

A U G C G U C G A U A A U C A A G U C A A A C

EXON
NUCLEOTIDE BASES

INTRON
NUCLEOTIDE BASES

A U G C G U C G A U A A U C A A G U C A A A C

EXON & INTRON NUCLEOTIDE BASES
INTERSPACED WITHIN THE
NON-MODIFIED M-RNA

MODIFICATION

I

X

NON-MODIFIED M-RNA

A U G C G U C G A U A A U C A A G U C A A A C

EXON
NUCLEOTIDE BASES

INTRON
NUCLEOTIDE BASES

A U G C G U C G A U A A U C A A G U C A A A C

DURING N-M M-RNA MODIFICATION:

MODIFICATION

NON-MODIFIED M-RNA

A U G C G U C G A U A A U C A A G U C A A A C

EXON
NUCLEOTIDE BASES

INTRON
NUCLEOTIDE BASES

A U G C G U C G A U A A U C A A G U C A A A C

**DURING N-M M-RNA MODIFICATION:
INTRON NT-BASES MUST BE
EXCISED FROM N-M M-RNA**

SPLICEOSOME ENZYMES



SPLICEOSOME ENZYMES

**EXCISE INTRON
NUCLEOTIDE BASES**

SPLICESOME ENZYMES

MODIFICATION



NON-MODIFIED M-RNA

A U G C G U C G A U A A U C A A G U C A A A C

EXON
NUCLEOTIDE BASES

INTRON
NUCLEOTIDE BASES

A U G C G U C G A U A A U C A A G U C A A A C

 = SPLICEOSOME ENZYMES

SPLICEOSOME ENZYMES
RECOGNIZE INTRON NT-BASES

MODIFICATION

NON-MODIFIED M-RNA

A U G C G U C G A U A A U C A A G U C A A A C

EXON
NUCLEOTIDE BASES

INTRON
NUCLEOTIDE BASES

A U G ● U C ● U A A ● C A A G ● A A A C

● = SPLICEOSOME ENZYMES

SPLICEOSOME ENZYMES
RECOGNIZE INTRON NT-BASES

MODIFICATION

NON-MODIFIED M-RNA

A U G C G U C G A U A A U C A A G U C A A A C

EXON
NUCLEOTIDE BASES

INTRON
NUCLEOTIDE BASES

A U G ● ● U A A ● ● A A A C

● = SPLICEOSOME ENZYMES

SPLICEOSOME ENZYMES
RECOGNIZE INTRON NT-BASES
EXCISE INTRON NT-BASES