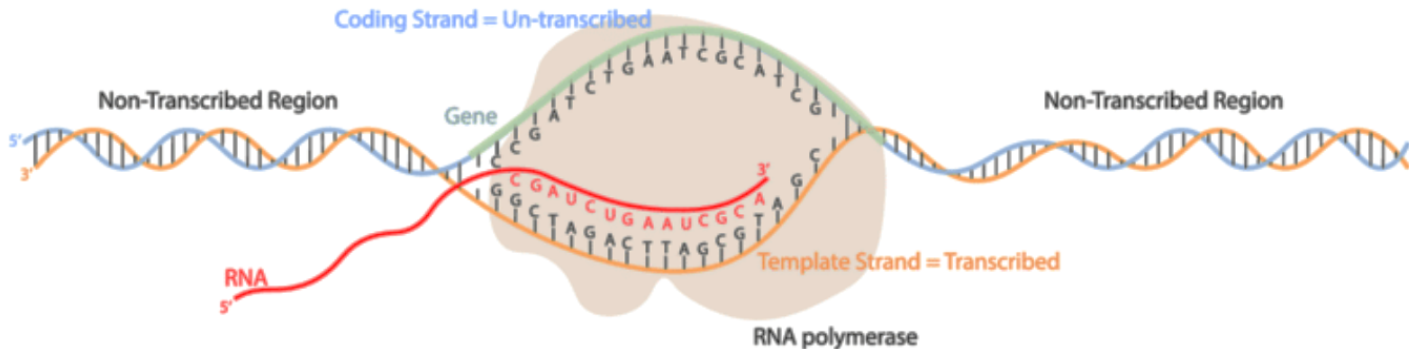


# Transcription and Translation

## The importance of direction (5' to 3')

The **template strand** is used by RNA polymerase to create the complementary mRNA. It is called a 'template' because it acts as the template for the RNA polymerase. The complementary strand that is not transcribed is called the **coding strand** because it matches the mRNA. In other words, the coding strand is called the coding strand because its code matches the code on the mRNA. It is also called the 'sense' strand for the same reason. The template strand is called the "antisense" strand because it does not match the mRNA, rather it is complementary. mRNA is always read 5' to 3' in order to match the codon chart. So in the below questions, if your mRNA is not 5' to 3', you should probably re-write it in the opposite direction of 5' to 3' before you translate with the codon chart.

Label all nucleotide sequences with 5' and 3' ends. Most of these are just fragments of mRNA and they don't show the start or stop codons. Each question has a new trick to it.



- Template strand 3' TAC GAT CAT ATT 5'  
mRNA:  
protein:

- Template strand 5' AGA TTA TGG CGG 3'  
mRNA:  
protein:

- Coding strand 5' ACT ACC ACA ACG 3'  
Template strand:  
mRNA:  
protein:

- Coding strand: 3' TCG GGC ACG GCG 5'  
Template strand:  
mRNA:  
protein:

- Coding strand:  
Template strand:  
mRNA: 5' AUG UCU CAU UGA 3'  
protein:

Always represents 5'-3' on the mRNA  
**Second letter**

| First letter | Second letter                                 |                                      |                                                          |                                                    | Third letter |
|--------------|-----------------------------------------------|--------------------------------------|----------------------------------------------------------|----------------------------------------------------|--------------|
|              | U                                             | C                                    | A                                                        | G                                                  |              |
|              | UUU } Phe<br>UUC }<br>UUA } Leu<br>UUG }      | UCU } Ser<br>UCC }<br>UCA }<br>UCG } | UAU } Tyr<br>UAC }<br><b>UAA Stop</b><br><b>UAG Stop</b> | UGU } Cys<br>UGC }<br><b>UGA Stop</b><br>UGG } Trp |              |
|              | CUU } Leu<br>CUC }<br>CUA }<br>CUG }          | CCU } Pro<br>CCC }<br>CCA }<br>CCG } | CAU } His<br>CAC }<br>CAA } Gln<br>CAG }                 | CGU } Arg<br>CGC }<br>CGA }<br>CGG }               |              |
|              | AUU } Ile<br>AUC }<br>AUA }<br><b>AUG Met</b> | ACU } Thr<br>ACC }<br>ACA }<br>ACG } | AAU } Asn<br>AAC }<br>AAA } Lys<br>AAG }                 | AGU } Ser<br>AGC }<br>AGA } Arg<br>AGG }           |              |
|              | GUU } Val<br>GUC }<br>GUA }<br>GUG }          | GCU } Ala<br>GCC }<br>GCA }<br>GCG } | GAU } Asp<br>GAC }<br>GAA } Glu<br>GAG }                 | GGU } Gly<br>GGC }<br>GGA }<br>GGG }               |              |

6. Coding strand:  
 Template strand:  
 mRNA: 3' ACA ACG AAG UUU 5'  
 Protein:

7. Coding strand: 5' ATG TTT GGG TAA 3'  
 Template strand:  
 mRNA:  
 Protein:  
 Draw each tRNA that includes the anti-codon labeled with 5' and 3' and the amino acid attached.

|              |   | Second letter                                 |                                      |                                                          |                                                  |                  |
|--------------|---|-----------------------------------------------|--------------------------------------|----------------------------------------------------------|--------------------------------------------------|------------------|
|              |   | U                                             | C                                    | A                                                        | G                                                |                  |
| First letter | U | UUU } Phe<br>UUC }<br>UUA } Leu<br>UUG }      | UCU }<br>UCC } Ser<br>UCA }<br>UCG } | UAU } Tyr<br>UAC }<br><b>UAA Stop</b><br><b>UAG Stop</b> | UGU } Cys<br>UGC }<br><b>UGA Stop</b><br>UGG Trp | U<br>C<br>A<br>G |
|              | C | CUU }<br>CUC } Leu<br>CUA }<br>CUG }          | CCU }<br>CCC } Pro<br>CCA }<br>CCG } | CAU } His<br>CAC }<br>CAA } Gln<br>CAG }                 | CGU }<br>CGC } Arg<br>CGA }<br>CGG }             | U<br>C<br>A<br>G |
|              | A | AUU }<br>AUC } Ile<br>AUA }<br><b>AUG Met</b> | ACU }<br>ACC } Thr<br>ACA }<br>ACG } | AAU } Asn<br>AAC }<br>AAA } Lys<br>AAG }                 | AGU } Ser<br>AGC }<br>AGA } Arg<br>AGG }         | U<br>C<br>A<br>G |
|              | G | GUU }<br>GUC } Val<br>GUA }<br>GUG }          | GCU }<br>GCC } Ala<br>GCA }<br>GCG } | GAU } Asp<br>GAC }<br>GAA } Glu<br>GAG }                 | GGU }<br>GGC } Gly<br>GGA }<br>GGG }             | U<br>C<br>A<br>G |

8. Write out the possible mRNA and DNA for this peptide: Met, Leu, His, Ser, Stop  
 Coding strand:  
 Template strand:  
 mRNA