# ENZYMES ACTING IN REPLICATION, TRANSLATION AND TRANSCRIPTION

**TRANSCRIPTION**

**Transcription** is the process in which a particular segment of DNA is copied into RNA (mRNA) with the help of an enzyme.

**Enzymes:**

1. **RNA polymerase:** Synthesis of RNA from a DNA template. RNA polymerase is associated with sigma factor, which helps it bind to the promoter region of the DNA segment that needs to be transcribed.

**TRANSLATION**

**Translation** is the synthesis of a protein from an mRNA template where the code in the mRNA is converted into an amino acid sequence in a protein.

**Enzymes:**

1. **Helicase:** It opens the double helix/ unzips the DNA strands Single-strand binding proteins prevent the two strands from re-joining.
2. **Topoisomerase:** Pressure of coiling on double helix in released.
3. **Ligase:** It joins the fragments together on the lagging strand.
4. **DNA polymerase:** It reads the original DNA strand and brings in the complementary base pairs.
5. **fMet-tRNA:** Synthetase (only for prokaryotes) , attaches N-Formylmethionine to tRNA.
6. **Aminoacyl-tRNA:**  Synthetase (attach amino acid to transfer-RNA).

**REPLICATION**

The process of making an identical copy of double strands of DNA, using existing DNA as a template for the synthesis of new DNA strands.

**Enzymes:**

1. **Primase:**

It polymerizes nucleotide triphosphates in a 5' to 3' direction. The enzyme synthesizes RNA primers to act as a template.

1. **DNA Polymerase III:**

Synthesizing nucleotides onto the leading end in the classic 5' to 3' direction.

1. **Helicase:**

It uses the hydrolysis of ATP to "unzip" or unwind the DNA helix at the replication fork to allow the resulting single strands to be copied.

1. **DNA Polymerase I:**

Synthesize nucleotides onto primers on the lagging strand, forming Okazaki fragments. Cannot synthesize all the nucleotides.

1. **Ligase:**

This enzyme is in charge of "gluing" together Okazaki fragments, an area that DNA polymerase I is unable to synthesize.

1. **Telomerase:**

This enzyme catalyzes the lengthening of telomeres; the enzyme includes a molecule of RNA that serves as a template for new telomere segments.

1. **Nuclease:**

This enzyme is in charge of excising, or cutting out, unwanted or defective segments of nucleotides in a DNA sequence.