

3.6 THE CENTRAL DOGMA OF MOLECULAR BIOLOGY 3

Based on the scientific observations and discoveries discussed above, by the mid of 20th century it became clear that DNA was a universal genetic material and it was then converted into RNA utilising codons. Furthermore, discoveries of ribosome structure, translation of proteins from the RNA was also confirmed suggesting that genetic information flows only in one direction, from DNA, to RNA, to protein, or RNA directly to protein and hence responsible for the phenotype. This was popularised as “The central dogma of molecular biology”. The term itself was coined by Francis Crick in their landmark lecture in 1958. Now we can say that our genetic material, known as DNA or deoxyribonucleic acid, holds the blueprint for our traits. DNA provides instructions for the production of proteins, which play crucial roles in the structure and function of cells. The structure of a protein is determined by the sequence of amino acids it contains, and these instructions are encoded in DNA. DNA resides in chromosomes, typically within the nucleus of eukaryotic cells, while proteins are synthesized at ribosomes in the cytoplasm. To bridge this gap, another type of nucleic acid called RNA, or ribonucleic acid, steps in. RNA carries the genetic information from DNA in the nucleus to the ribosomes in the cytoplasm, where it assists in assembling proteins. This process and sequence of events summarised as $\text{DNA} \rightarrow \text{RNA} \rightarrow \text{Protein}$, was a major milestone in molecular biology. Much later, another addition was made to this dogma, named Teminism, a theory that explains how RNA can act as a template for DNA formation, also known as **reverse transcription**. Temin and Baltimore discovered Teminism in 1978. Hence the revised central dogma of molecular biology is $\text{DNA} \rightleftharpoons \text{RNA} \rightarrow \text{Protein}$. Our entire unit will now follow detailed discussion on these major events such as replication of DNA, transcription, translation, DNA damage as well as repair mechanisms and transposition.

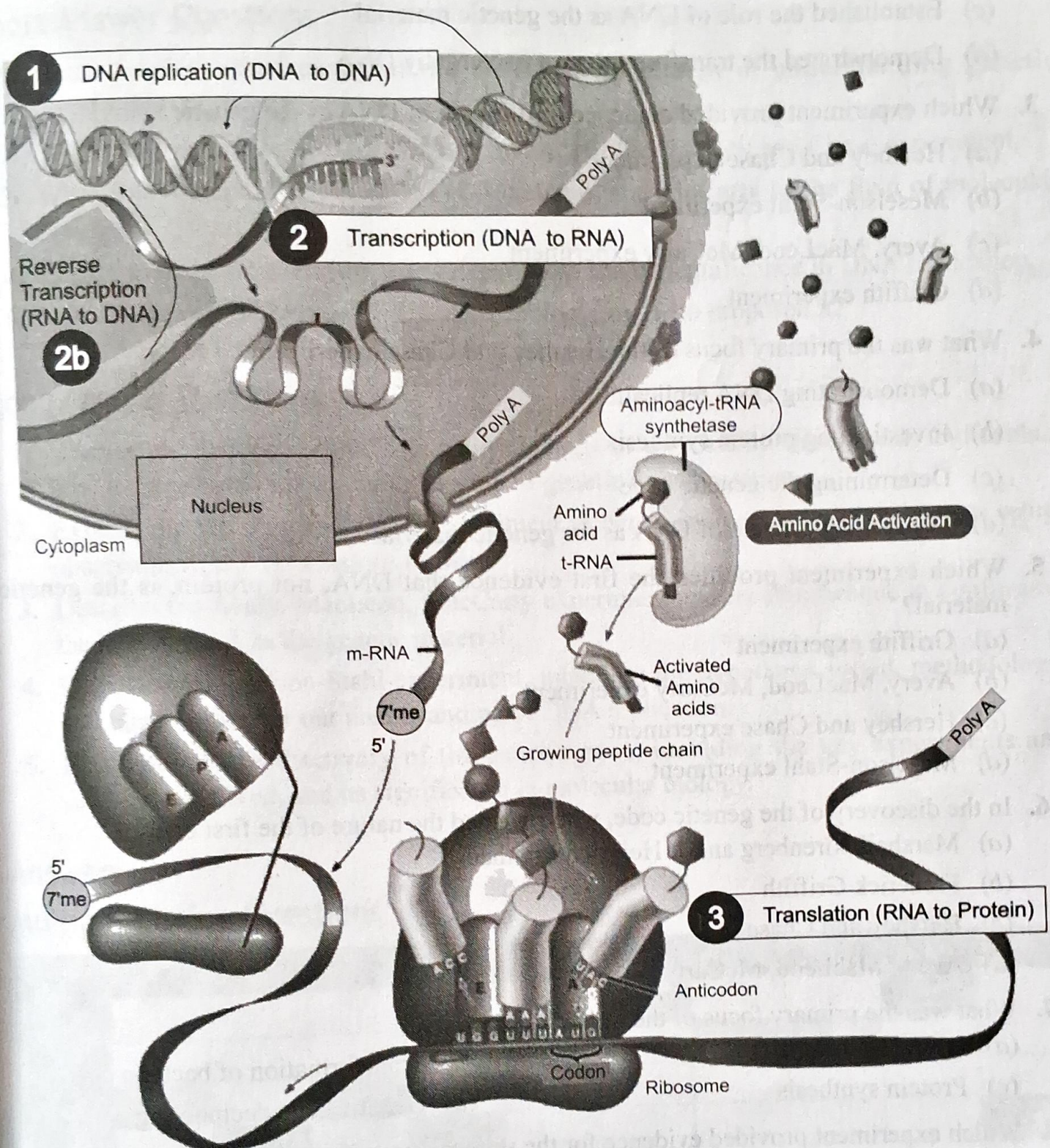


Fig. 3.4. Central Dogma of Molecular Biology.