Nucleic Acid and Protein Synthesis: From DNA to Protein This document outlines the processes of ## DNA replication, transcription, and translation, which are fundamental to the creation and function of life. It begins by explaining DNA replication, the process by which a cell duplicates its genetic material. This occurs in a semi-conservative manner, meaning each new DNA molecule contains one original strand and one newly synthesized strand. Several enzymes like helicase, DNA polymerase, and DNA ligase play crucial roles in this process. Replication is also bidirectional, occurring in opposite directions along the DNA molecule. The text further explains the mechanism of semidiscontinuous replication, where the leading strand is synthesized continuously, while the lagging strand is synthesized in short fragments called Okazaki fragments. These fragments are then joined together by DNA ligase. The document then delves into the concept of mutations, permanent changes in the DNA sequence. These changes can be caused by various factors, including environmental mutagens and errors in DNA replication. Mutations can have diverse effects on an organism's health and can be classified based on their effect on structure, function, and fitness. Finally, the text explains the process of protein synthesis, which involves two main steps: transcription and translation. Transcription is the process of copying the genetic code from DNA into messenger RNA (mRNA). This occurs in the nucleus and involves the enzyme RNA polymerase. Translation occurs in the cytoplasm and involves the conversion of the mRNA code into a protein sequence using ribosomes and transfer RNA (tRNA). The document concludes by highlighting .the importance of protein synthesis in the production of essential molecules like hormones and enzymes

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