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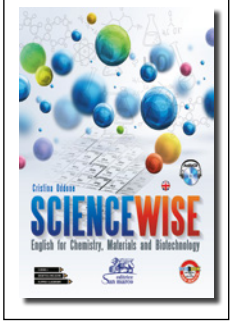
SCIENCEWISE
English for Chemistry, Materials and Biotechnology

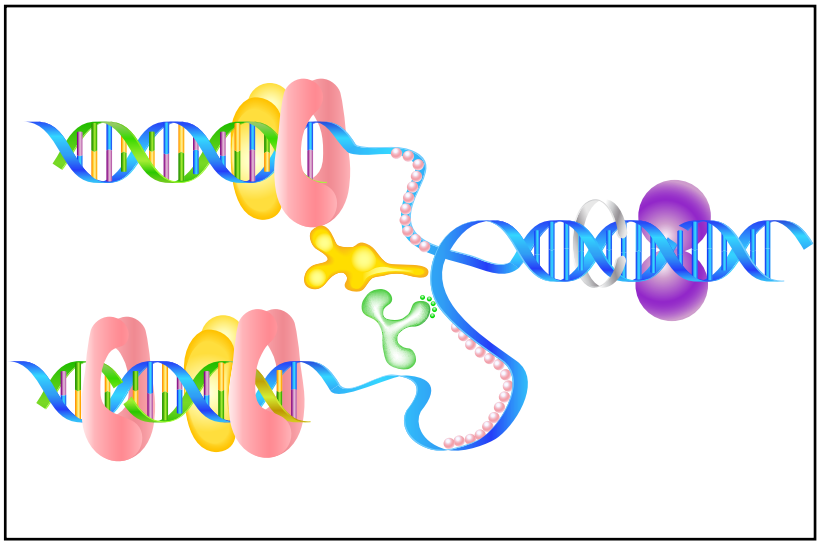


DNA replication

Prior to cell division, the DNA material in the original cell must be duplicated so that after cell division, each new cell contains the full amount of DNA material. The process of DNA duplication is usually called replication. This process is semi conservative because each new cell contains one strand of original DNA and one newly synthesized strand of DNA. The original polynucleotide strand of DNA serves as a template[1] to guide the synthesis of the new complementary polynucleotide of DNA. The DNA single strand template serves to lead the synthesis of a complementary strand of DNA. Several enzymes and proteins are involved in the replication of DNA. At a specific point, the double helix of DNA is caused to unwind possibly in response to an initial synthesis of a short RNA strand using the enzyme helicase. Proteins are available to hold the unwound DNA strands in position. Each strand of DNA then serves as a template to guide the synthesis of its complementary strand of DNA. DNA polymerase III is used to join the appropriate nucleotide units together. The DNA template guides the formation of a DNA complementary strand – not an exact copy of itself. The replication of DNA is guided by the base pairing principle so that no other heterocyclic amine nucleotide can hydrogen bond and fit correctly with cytosine. The next heterocyclic amine, cytosine (C), guides the incorporation of guanine (G) while similar arguments apply to the other bases. It is so important that the cells duplicate the DNA genetic material exactly, that the sequence of newly synthesized nucleotides is checked by two different polymerase enzymes. The second enzyme can check for and actually correct any mistake of mismatched base pairs in the sequence. The mismatched nucleotides are hydrolyzed and cut out and new correct ones are inserted.

GLOSSARY

1 a guide that may be used for example



ACTIVITIES

1 *Decide if the following statements are true or false and correct the false ones.*

1 DNA replication occurs after cell division. T F
2 This process is semi conservative because the new cell contains only one strand of DNA. T F
3 The original strand of DNA serves as a template for replication. T F
4 Enzymes and proteins are involved in the process. T F
5 The double helix of DNA unwinds because of an enzyme. T F
6 Proteins move the unwound strands outside the nucleus. T F
7 DNA polymerase III is used to unwound the remaining strands. T F
8 DNA replication is guided by the base pair principle. T F
9 DNA materials must be duplicated exactly. T F
10 One polymerase enzyme checks the sequence of the new. T F

2 *Find synonyms for the following words.*

1 Lead .....
2 Unwind .....
3 Join .....
4 Incorporation .....
5 Sequence .....
6 Mismatched .....

2 *Make a list of all the steps of DNA replication then describe this process to a classmate.*