Protein synthesis

**Structure of RNA**

Molecules of RNA are built up from nucleotides containing the 5-carbon sugar ribose and are always single-stranded, although the strand may be folded back on itself to give an apparently double-stranded structure. All cells contain three important types of RNA.

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| 1. Messenger RNA, or mRNA, is produced in the nucleus from coded instructions in the DNA. Molecules of mRNA are 75 – 3000 nucleotides long and are not folded in any special way.
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| 1. Transfer RNA, or tRNA. These are small RNA molecules containing 75 – 90 nucleotides. All cells have at least 20 different kinds of tRNA molecules, all of which are very similar in shape. Each molecule is held together by a precise base-pairing arrangement between different parts of the RNA strand. When the molecule is “flattened out”, it has a clover-leaf shape.
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| 1. Ribosomal RNA or rRNA, is made inside the nucleus (within the nucleoli) and is a major component of ribosomes. Ribosomes consist of rRNA together with a number of proteins. They attach to the end of the mRNA and travel along it, allowing the tRNAs to decode the message. Ribosomal RNA molecules are very large, containing thousands of nucleotides.
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Very useful table on page 210 of your textbook compares structures of DNA, mRNA and tRNA

The Process of Protein Synthesis

The genome is ……………………………………………………………………

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The proteome is…………………………………………………………………..

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1. Transcription

The cell’s DNA is found in the nucleus. Protein synthesis occurs mainly in the cytoplasm. For this to be possible, there must be some way of transferring coded information from the chromosomal DNA across the nuclear membranes and into the cytoplasm where the assembly of protein molecules takes place. This function is carried out by messenger RNA (mRNA).

The first step in the process is to make a molecule called pre-mRNA. This is manufactured in the nucleus directly from the template provided by the coding strand of the DNA molecule.

Pre-mRNA is then spliced. This is necessary because DNA includes sections called introns that do not code for proteins (as well as the exons which do).



1. Translation

In the next stage of protein synthesis the coded instructions in a molecule of mRNA must be translated into a sequence of amino acids forming a protein chain. This process requires transfer RNA (tRNA) molecules of various kinds and can only take place when the mRNA molecule is attached to a ribosome.



The following diagrams show stages in translation. Write a caption for each

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Now draw one further diagram to illustrate the role of ATP in the process

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| Further reading and questionsSections 8.3-8.5 of your textbook. Try summary questions.Genetic code application page 210\*\*\*Read about experiments page 216\*\*\* |