Protein Synthesis & Words

Background

As you know, protein synthesis is the process by which cells create proteins. This activity follows the rule of the Central Dogma. In the first step, transcription, a portion of the cell's DNA, called a gene, is used to create an mRNA (messenger RNA) molecule, which then travels to the ribosome, the site of translation. The ribosome searches for the start codon (AUG) on the mRNA to begin translation. Locating the start codon establishes the reading frame: from that point forward, the ribosome "reads" the mRNA in groups of three nucleotides – one codon. Transfer RNA (tRNA) molecules, carrying amino acids, base pair with their anti-codons to the complimentary mRNA codon. Amino acids are joined together by peptide bonds to form a protein.

Objective(s)

- ✓ to act out the roles/purpose of DNA and RNA polymerase, mRNA, tRNA, amino acids and the ribosomes
- ✓ to be able to explain the roles/purpose of DNA and RNA polymerase, mRNA, tRNA, amino acids, and the ribosomes
- ✓ to explore the effect(s) of possible mutations on polypeptides/proteins

Materials

- "Protein Synthesis & Words" Worksheet
- pencil

Pre-Lab Questions

★ *There are no Pre-Lab Questions for this activity.*

Safety

★ *There are no special safety precautions for this activity.*

Procedure

1. In groups of four, these are the roles you will assume for the first sentence. These roles will switch for every sentence.
   a. **DNA polymerase** – copies DNA non-template and template strand
   b. **RNA polymerase** – creates mRNA strand
   c. **ribosome** – locates start codon, determines appropriate tRNA anti-codons
   d. **tRNA** – locates appropriate tRNA card and communicates word to ribosome
2. The DNA polymerase person will enter the nucleus and write the non-template DNA on the group paper, then create a complimentary DNA template strand.
3. Next, RNA polymerase will create an mRNA molecule, **in the nucleus**, using the DNA template strand. He/she will deliver this paper, with the complete mRNA, to the ribosome.
4. The ribosome will search for the start codon – AUG – to establish the mRNA's reading frame. (Note: the start codon has no word associated with it – it is just used to show the beginning of the sentence) Once the reading frame is established, the ribosome will tell the tRNA which card (with anti-codons) to search for. The tRNA will locate the correct card and read the word and tell the ribosome what the word is. ★ Hint: You should do this quietly so as not to allow other groups to hear the words or sentences!
5. You should complete the "Protein Synthesis & Words Worksheet" for each sentence as instructed.
6. If the sentence looks complete and grammatically correct, check with the teacher. If it's incorrect, the group must find and fix their error(s). When it **is** correct, the group will move on to the next sentence.
7. Groups must rotate roles for each sentence as instructed.

Clean Up

- ✓ everything returned to its original location