Lab 1: Strings and Loops

IBCS SL and HL

June 22, 2018

1 DNA Background

In this lab you will practice handling Strings in Java. To do so, you will read in a DNA sequence that is mean to create a pump for a cell membrane. DNA provides a blueprint to create proteins which in turn create all the necessary parts for us to stay alive. This process involves a few steps :

1. DNA starts with one strand and that strand's compliment, forming a two strand double helix.
2. When ready, the DNA will split apart and messenger RNA, or mRNA, will create a copy.
3. The mRNA will then travel into a ribosome, The ribosome will read in the mRNA and create amino acids by reading a section at a time.
4. A chain of amino acids will then form the proteins necessary.
5. Watch this video and this one.

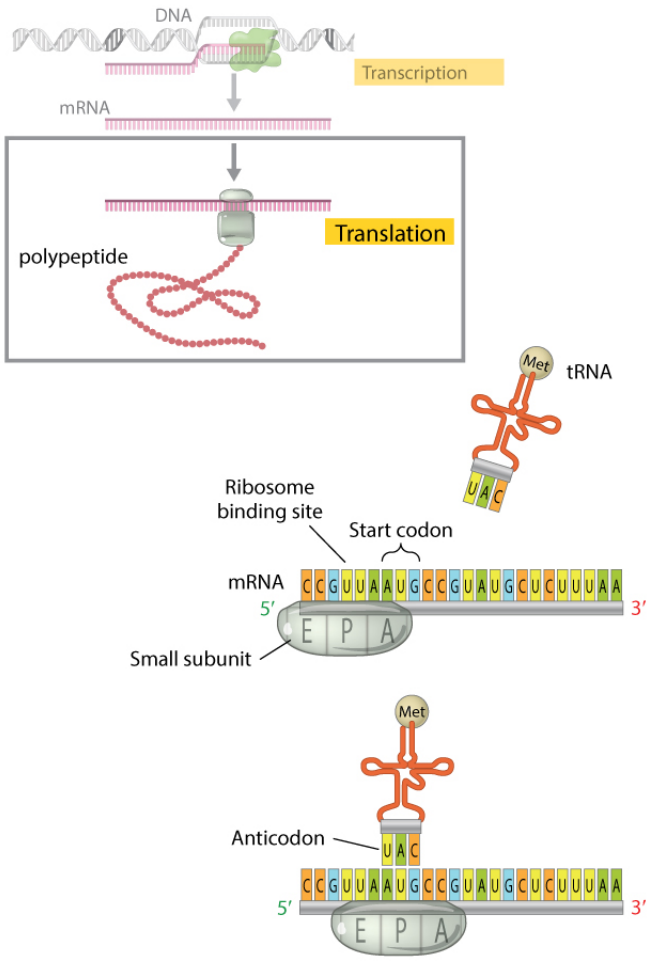

Figure 1: Protein Creation

2 Assignment

1. Create a DNAStrand class.
   (a) Create a method, ***readDNA***, that reads in the dna sequence file by looping through each line. Store the sequence in an Arraylist.
   (b) Create another method, ***createCompliment***, which uses the read-in sequence, iterates through it, and creates its compliment by checking each letter. Store the compliment in an Arraylist. Remember that the compliment to "A" is "T" and "C" is "G". HINT: Use the .replace method for strings.
   (c) Create ***getCompliment*** and ***getDnaSequence*** methods that return the corresponding Arraylist. So ***getCompliment*** should return the Arraylist created in createCompliment.
   (d) Create a ***mutateDna*** method that will loop through the DNA sequence and change it in any way that you want. You can get creative on how this changes the DNA.
   (e) Create a ***printPeptide*** method that loops through an Arraylist of amino acids and prints the sequence inside of it.
2. Create Mrna class.
   (a) Create a ***createCopy*** method that reads in a DNA arraylist and stores the copy in an Arraylist. Remember that mRNA doesn't use "T", but instead the compliment to "A" is "U".
   (b) Create a ***getMessengerDnaCopy*** that returns the arraylist with the copy of the DNA.
3. Create a Ribosome class.
   (a) Create a ***createProtein*** static method that returns an ArrayList of amino acids. This should take in an Arraylist as a parameter.

3 HL Extension

1. Create a Medicine class.
   (a) Create a ***cancerCure*** method that checks if a sequence is the same as the original sequence from the txt file and then returns a fixed Arraylist with the correct sequence.