# Lab 1: Strings and Loops

IBCS SL and HL

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## 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.

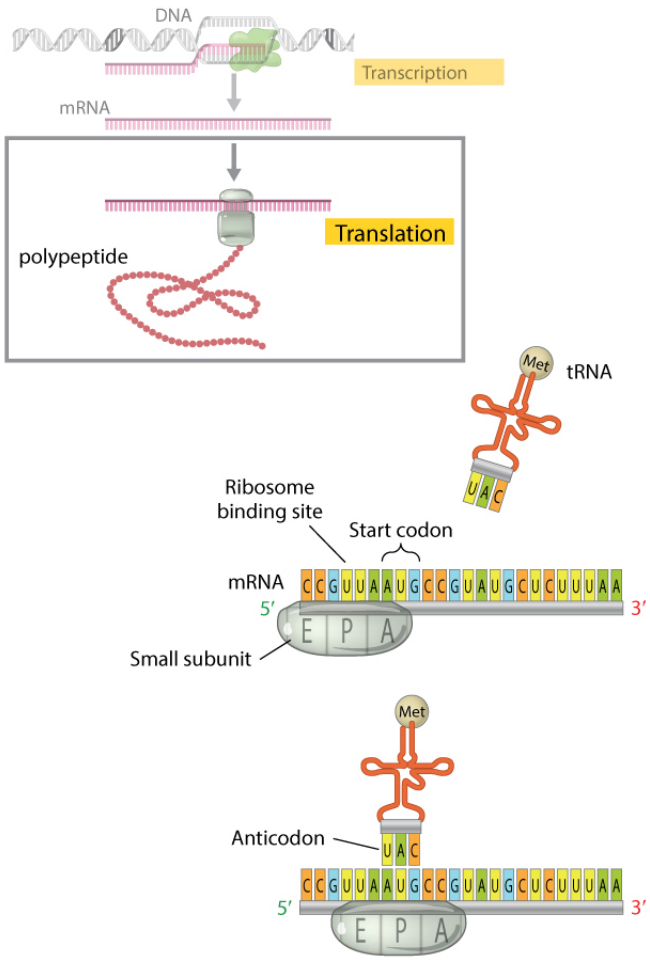


Figure 1: Protein Creation

## 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 and takes in no parameters, 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". **The output should keep all strings as LOWERCASE.** 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 translated copy in an Arraylist. Remember that mRNA doesn't use "T", but instead the translation of "a" is "u". **The output should keep all strings as LOWERCASE.**
   (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.

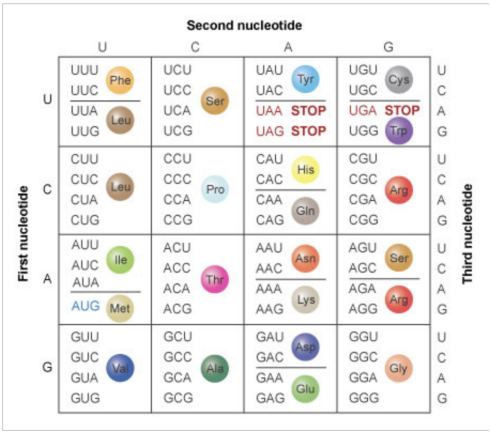


Figure 2: Proteing List For Ribosome

## 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.