Introduction to Synthetic biology, HW 2

1. Transcription
   a) What are the roles of the five subunits of RNA polymerase during transcription?
   b) Genomic DNA is double stranded but RNA polymerase needs a single-stranded template. Explain why these statements are compatible.
   c) In a few sentences each, explain what happens during the initiation, elongation and termination steps of transcription.

2. In class we introduced the central dogma of molecular biology stating that information flows from DNA to RNA to protein. Does it have to be this way?
   a) What are retro-viruses?
   b) What is the RNA world hypothesis?
   c) What are the implications for synthetic biology?

3. Making a functional gene.
   a) Make a simple sketch of all the sequence and structural elements that need to be encoded in the DNA for a gene to be correctly transcribed and translated. Indicate how these elements are ordered with respect to each other and provide sequences where possible.
   b) The Biobricks Foundation is an organization that maintains a registry of biological parts that can be obtained for synthetic biology purposes. The website for the parts registry is located at http://partsregistry.org/Main_Page. Go to this page and find all the parts necessary for expressing a protein (as an example use green fluorescent protein, GFP). Provide the parts numbers that you propose to use and briefly explain your choices.
   c) Based on the parts in b), assemble a sequence for your GFP gene and use a color code to indicate functional components.