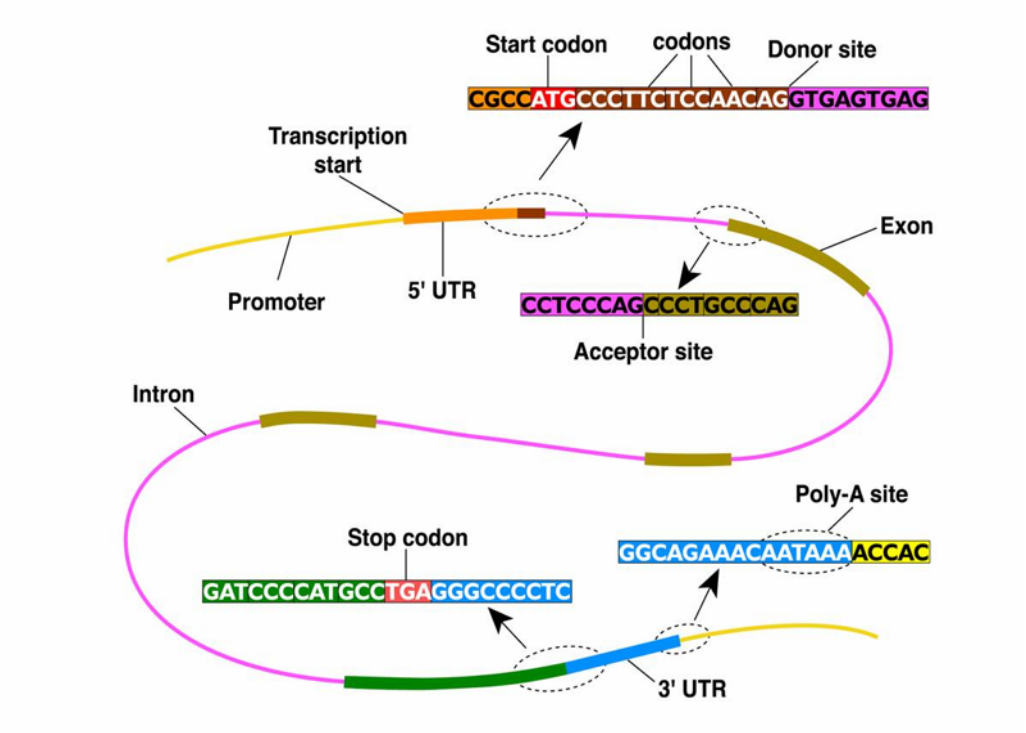
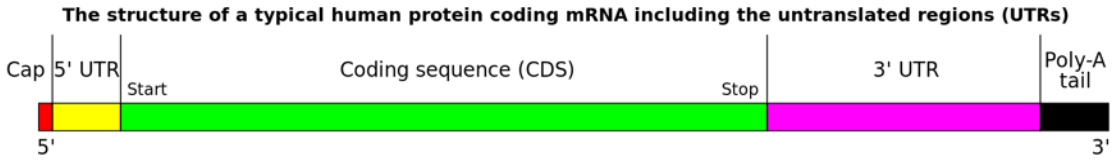
Name:_____

Transcription/Translation Worksheet

Below is a diagram of a gene as it might appear in the chromosome of a eukaryotic cell. The abbreviation UTR stands for “untranslated region.”

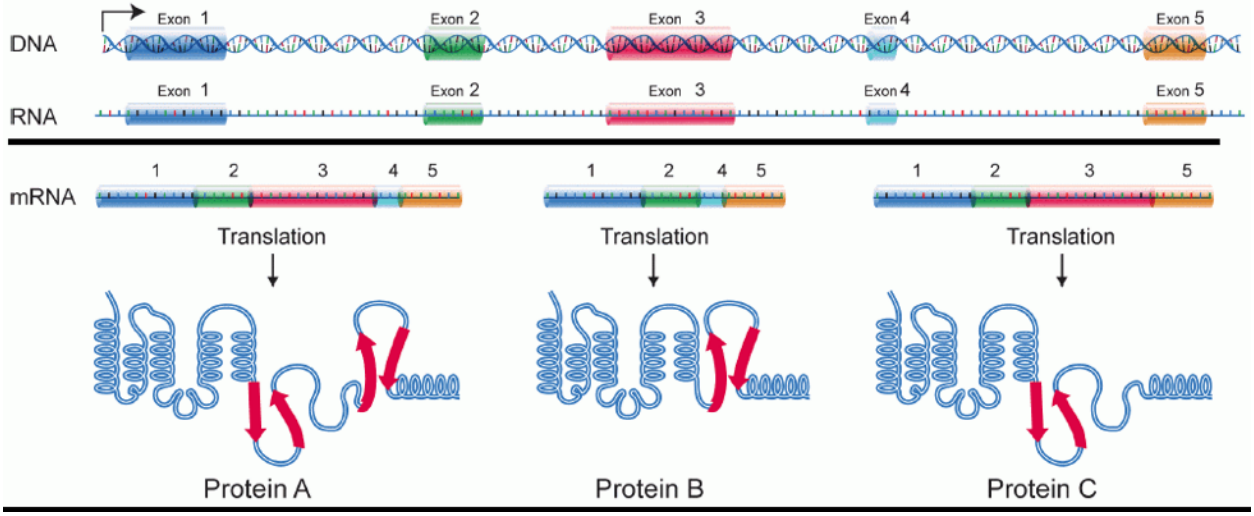


1. Using diagrams as necessary, outline the steps between this form and final mRNA (example below). Be sure to include the names of important components performing each step (e.g. transcription factors, RNA Polymerase etc.).



2. What is missing from this diagram that is necessary for strong transcription?
3. What are the first two and the last two amino acids of the protein encoded? There is a codon table on the board.

1. Transcription factors bind to the promoter area. These could be “general” transcription factors that regulate genes all cells need, or may be specific factors that allow cells to respond to signals (an example would be a steroid receptor bound by a hormone such as estrogen would bind to the DNA at a specialized site called a “steroid response element”). After the polymerase and other factors assemble, “activator proteins” bound at a distant enhancer interact with the complex and allow the polymerase to be released and transcribe the gene (“reading” the template strand 3´ to 5´ and making RNA that “looks like” the coding strand).
   At the Poly-A signal, enzymes cut the pre-mRNA and add a run of “A’s” to the end. The polymerase stops transcribing. The poly-A tail prevents degradation of the end and also is involved in transporting the mRNA out of the nucleus. A “GTP cap” is added to the 5´end to prevent degradation from that end.
   The “spliceosome” assembles (snRNPs plus the intron) to remove the introns and splice exons together.
   The mature mRNA is transported out of the nucleus.
2. What is missing is the enhancer and the activator proteins
3. The first two codons are AUG and CCC which code for Methionine and Proline respectively The last two are CAU are GCC, which encode Histidine and Alanine. The UGA is a “stop” codon and does not encode an amino acid.



Briefly explain how the single gene shown can result in 3 different proteins?

Alternative splicing allows introns to be included or omitted to create related, but different proteins. For example, protein “B” omits exon 3, which encodes two beta-strands and a long loop.