Protein Synthesis Notes
DNA to proteins

Connections:
- Know where each stage of protein synthesis occurs in the cell.
- Given a sequence of DNA construct the protein using transcription and translation.
- Understand and demonstrate how start and stop codons effect the synthesis of a protein.

Review
- One of the functions of proteins is to _______________ cellular processes, such as _______________ and cellular _______________.
- DNA are the instructions for _______________.
- Proteins are made up of _______________. DNA tells the body the amino _______________ to create specific proteins.

What is Protein Synthesis?
- Protein synthesis is the process of making _______________ from _______________.
- It has ______ stages
  - Why make mRNA?
  - _______________
- Translation: Ribosomes “read” the mRNA code and create a _______________ by bonding individual _______________ together.

Protein Synthesis
- Transcription: ______ is made from ______
- mRNA leaves the _______________ and goes to the _______________.
  - Why make mRNA?
  - _______________
- Translation: Ribosomes “read” the mRNA code and create a _______________ by bonding individual _______________ together.

mRNA vs DNA
- mRNA is a copy of the ________ that can __________ the nucleus.
- mRNA is a _______________ and made of _______________.
- mRNA is:
  - The sugar ________ instead of deoxyribose
  - _______________
  - It has ________ instead of _______________.

mRNA leaves the _______________ and goes to the _______________.
Transcription
• Transcription happens in the ________________.
• It is where ______ is made from the _______ strand.
• Only ______ side of the DNA strand is used.
  o This is called the ___________ strand.

Transcription Example
• Given the following coding DNA strand perform transcription.
  o C T T A G A G G C
  o __________________________________________

Transcription Example
• Given the following mRNA strand perform reverse transcription.
  o A U G C G A U C A
  o __________________________________________

Transcription Practice
Perform transcription on the DNA template:
1. C A G A G C C T G T
   __________________________________________
2. C T T C T G T G C A
   __________________________________________

Perform reverse transcription on the mRNA sequence
3. C G G A G U G C A U U
   __________________________________________

Translation
• Translation happens in the ________________.
• Translation: The __________ of an ______ message into a ____________.
  o Protein is a long chain of bonded ___________ ____________.
  o The mRNA tells the ribosome what the sequence of amino acids is for that protein.
• During translation, the cell uses information from messenger RNA (mRNA) to produce ____________.

How does the ribosome “read” mRNA?
• The “language” of mRNA instructions is called the ____________ ________.
• All living organisms use the __________ same ________ nucleotides for their DNA.
  o A sequence of fish DNA can be read just like a sequence of human DNA.
• mRNA is made up of _____, _____, _____, and ______.
• Notice there are no ______ in mRNA.

The Genetic Code

• The genetic code is read __________ letters at a time.
  o So, each “word” in mRNA is known as a __________.
• So, each “word” in mRNA is known as a ____________.
• Codon: __________ consecutive _______________________ that specify a __________ amino acid that is to be added to the protein.
  o Example: __________
• The amino acids that each ____________ codes for can be found using the genetic code table.
  o All codons code for the ____________ same amino acid in ____ living organisms.

The Genetic Code Table

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<th>Second letter</th>
<th>Third letter</th>
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</tbody>
</table>

Translation

• Consider the following mRNA sequence:
  _______________________________________________________
• This sequence would be read three bases at a time as:
  _______________________________________________________
• The codons represent the different amino acids:
  _______________________________________________________
Translation Problem

- mRNA sequence:
  AUG CGU ACC UUA CAG GGG
- Amino Acid Sequence:
  __________ - __________ - __________ - __________ - __________ - __________

Translation Problem

- Write a possible mRNA sequence for following protein:
  Isoleucine (Ile) - Alanine (Ala) - Tyrosine (Tyr) - Leucine (Leu)
- Possible mRNA sequence:
  ______ - ______ - ______ - ______

Start Codon

- The ribosome will _____ start to construct a protein until it reads a certain mRNA sequence called the ___________ ___________.
- The start codon is: ________ which always codes for ______________________ (______)

Stop Codons

- The ribosome ___________ constructing the protein when it reaches a ___________ ___________.
- The stop codons are: ________, ________, and __________

Protein Synthesis Problems

1. What is the protein constructed from the following strand of DNA:
   TAC GGA TTC AGA
   - Step 1: Transcription
     ______ - ______ - ______ - ______
   - Step 2: Translation
     __________ - __________ - __________ - __________ - __________ - __________

2. What is the protein constructed from the following strand of DNA:
   CCG TAC GGA TTC ACT AGA
   - Step 1: Transcription
     ______ - ______ - ______ - ______ - ______ - ______ - ______
   - Step 2: Translation
     __________ - __________ - __________ - __________ - __________ - __________ - __________
Start Codon Continued

• The __________ reads the mRNA until it finds a __________ codon sequence.
• The start codon may be __________ among the mRNA. The ribosome will read through until it finds it.

Find the Start Codon

• Here is an mRNA sequence. Find where the protein starts to be made and circle it
  C G G U A U G A C U C C U A A C A
• Perform translation on the sequence

• What is the DNA sequence that made this mRNA?