## Topic: Protein Synthesis

### Notes

**Objective:** SWBAT explain the process of how proteins are made (Protein Synthesis)

<table>
<thead>
<tr>
<th>Questions/Main Ideas</th>
<th>DNA stores the information for making proteins.</th>
<th>Synthesis= to make DNA → RNA → Protein</th>
</tr>
</thead>
<tbody>
<tr>
<td>What are the parts of Protein Synthesis?</td>
<td>DNA Transcription = the process of producing an RNA molecule from a DNA molecule (DNA→RNA)</td>
<td>Protein Synthesis occurs in two major parts: Transcription and Translation.</td>
</tr>
<tr>
<td>What are the steps of Transcription?</td>
<td><strong>DNA Transcription</strong>= the process of producing an RNA molecule from a DNA molecule (DNA→RNA)</td>
<td>- Occurs in the Nucleus</td>
</tr>
<tr>
<td></td>
<td>- The part of the DNA that is copied is determined by what protein is needed.</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Steps of DNA Transcription:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. The DNA uncoils.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. The DNA unzips using the enzyme helicase. Hydrogen bonds between the nitrogen bases are broken by the enzyme.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Free RNA nucleotides match the complimentary DNA bases.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4. The phosphate of one RNA nucleotide bonds to the ribose of the next RNA nucleotide.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>5. The RNA molecule leaves the nucleus and goes to the ribosome.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6. DNA zips back up- The DNA nitrogen bases bond together again.</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Outcome:</strong> one single stranded RNA (called mRNA).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Example: DNA TAC AAG TTC CCG</td>
<td></td>
</tr>
<tr>
<td></td>
<td>RNA AUG UUC AAG GGC</td>
<td></td>
</tr>
<tr>
<td>What is the structure of RNA?</td>
<td>RNA Nucleotide Structure: (remember PBS)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1. Phosphate</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2. Base (G, C, A, U)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3. Sugar= Ribose</td>
<td></td>
</tr>
<tr>
<td>What is the difference between DNA and RNA?</td>
<td>Compare DNA and RNA:</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>DNA</strong></td>
<td><strong>RNA</strong></td>
</tr>
<tr>
<td></td>
<td>Contains Thymine</td>
<td>Contains Uracil</td>
</tr>
<tr>
<td></td>
<td>Deoxyribose (sugar)</td>
<td>Ribose (sugar)</td>
</tr>
<tr>
<td></td>
<td>Double Strand</td>
<td>Single Strand</td>
</tr>
<tr>
<td></td>
<td>Stays in nucleus</td>
<td>Leaves nucleus</td>
</tr>
<tr>
<td>What is a codon?</td>
<td>Codon= A sequence of 3 nitrogen bases (humans have 64 different codons).</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Types include: DNA codon, mRNA codon, and tRNA anticodon</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Example: GCU (mRNA codon)</td>
<td></td>
</tr>
</tbody>
</table>
### 3 Forms of RNA:

1. **mRNA** = messenger RNA
   - **Function:** Carries code of DNA bases used for protein synthesis (out of nucleus to ribosome)
   - **Structure:** Single strand

2. **tRNA** = transfer RNA
   - **Function:** Picks up amino acids in cytoplasm and brings them to the ribosome.
   - **Structure:** Cloverleaf shape

3. **rRNA** = ribosomal RNA
   - **Function:** Produces the enzymes needed to form peptide bonds. Location of translation.
   - **Structure:** Globular in shape

### DNA Translation

- **DNA Translation** - the process of converting the nitrogen base code of the mRNA into a sequence of Amino Acids (RNA → Protein)
- Occurs on the ribosome in the cytoplasm.
- The tRNA has an anticodon (sequence of 3 bases) on one end and a corresponding amino acid on the other end.
- The tRNA anticodon matches to a codon on the mRNA strand.
- One codon (3 bases) codes for one amino acid.
- The amino acids are bonded together by peptide bonds to form proteins.
- There are 20 different amino acids.
- The proteins are folded and sent to where they are needed in the body.
- These proteins determine the phenotype of an organism.
- **Phenotype** = an organism’s characteristic/ trait (ex= blue eyes)

### Summary: