

Expectation Sheet - unit 6

Protein Synthesis & Mutations

Test is Friday 11/22/19

NAME: _____

VOCABULARY

- Protein Synthesis
- Transcription
- Translation
- Gene Expression
- Traits
- Uracil
- Protein
- Amino Acids
- Codon
- Nucleotides
- Nitrogenous Bases
- mRNA
- tRNA
- DNA
- Ribosomes
- Cytoplasm
- Mutation
- Deletion Mutation
- Insertion Mutation
- Substitution Mutation
- Environmental factors

PROTEIN SYNTHESIS

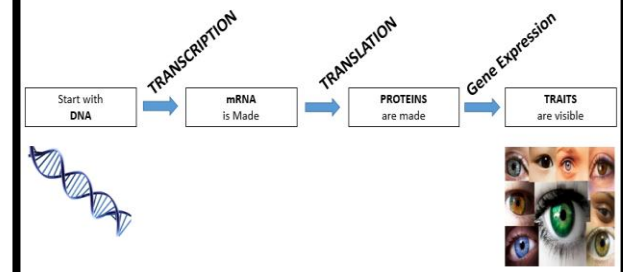
Protein Synthesis:

- To make new proteins.
- Proteins will need to be correctly formed and fully functional in order for traits to be expressed.

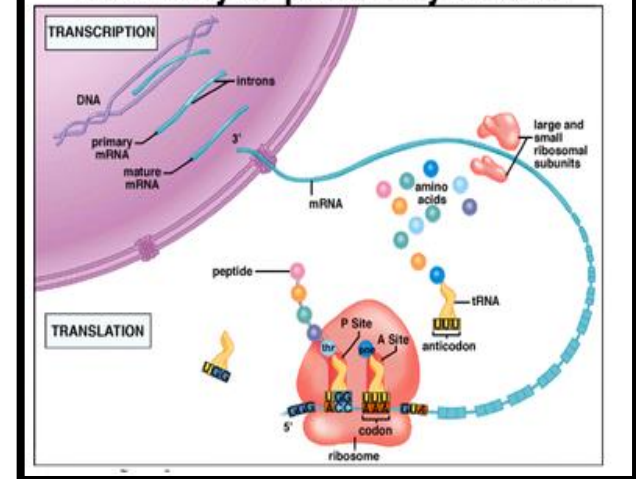
STEPS

- **Transcription:**
 - Happens In the **Nucleus:**
 - **DNA → mRNA**
 - mRNA then leaves the **nucleus** through the **nuclear membrane.**
- **Translation:**
 - Happens in the **ribosomes** that are floating around in the cytoplasm.
 - **mRNA → Amino Acids** link up with the help of **tRNA.**
 - Chains of amino acids make **proteins.**
- **Gene Expression**
 - Traits will be expressed from the newly formed proteins.
 - **Environmental factors** can also activate the genes present in the DNA – Ex: **Temperature & Light**

PROCESS of PROTEIN SYNTHESIS

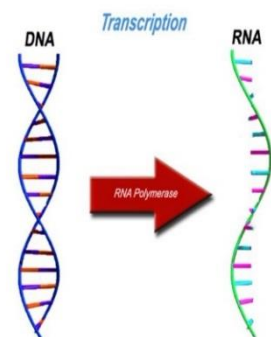


Summary of protein synthesis



mRNA

- **Messenger RNA**
- Single stranded
- Made from the **template strand** of DNA inside the nucleus with the help of the **RNA polymerase enzyme.**
- mRNA is always read in 3s called a **CODON.** (1 codon codes for 1 amino acid which can be found in a Codon Chart)
- There is no Thymine in mRNA
- **Uracil** replaces Thymine.
- **A - U** **G - C**
- **Ribose** replaces **Deoxyribose**

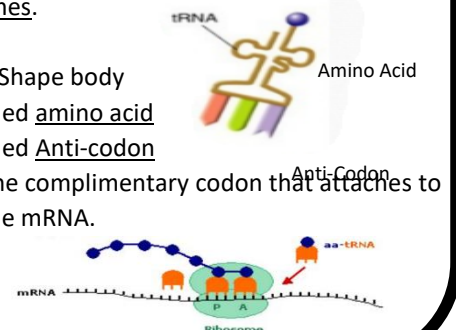


Using an enzyme known as RNA polymerase genetic information in DNA is converted, or "transcribed", into RNA

RNA STRUCTURE

tRNA

- **Transfer RNA**
- It is the Deliverer of the Amino Acids within the **ribosomes.**
- **3 parts**
 - The T-Shape body
 - Attached **amino acid**
 - Attached **Anti-codon**
 - The complimentary codon that attaches to the mRNA.



DNA MUTATION TYPES

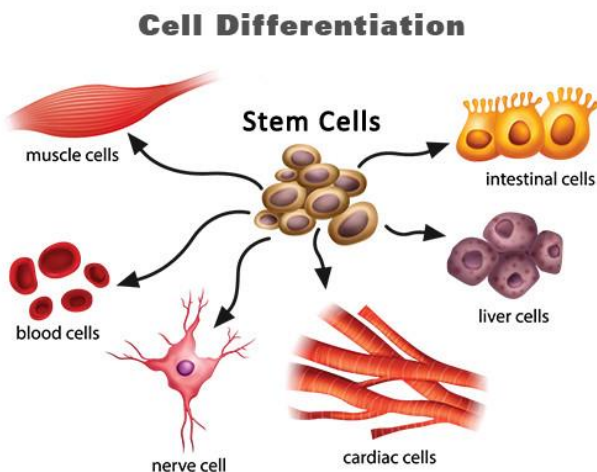
Mutation: A change in the DNA's nitrogenous base sequences (nucleotides) during synthesis causing a change to occur. This change could lead to a different sequence of amino acids, which will create a different type of protein. This could cause the original trait not to be expressed.

- **Frameshift Mutations:**
 - **Deletion Mutation:** Removal of one or more bases.
 - **Insertion Mutation:** Addition of one or more extra bases.
- **Point Mutation/Silent Mutation:**
 - **Substitution Mutation:** (Sometimes known as point mutation) Change in one single base for another.

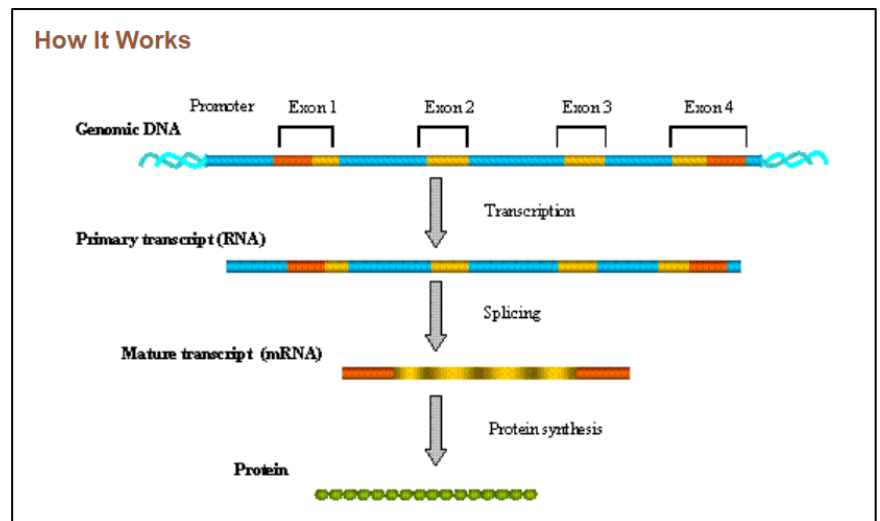


Sometimes Substitution/Point mutations don't change the amino acid and therefore don't change the protein being made.

Cell Differentiation



Gene Expression



Name: _____

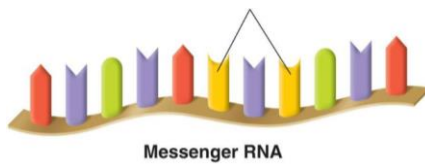
Period: _____

Review Questions for Test:

Have this out on your desk every day and answer the questions as they are covered in class.

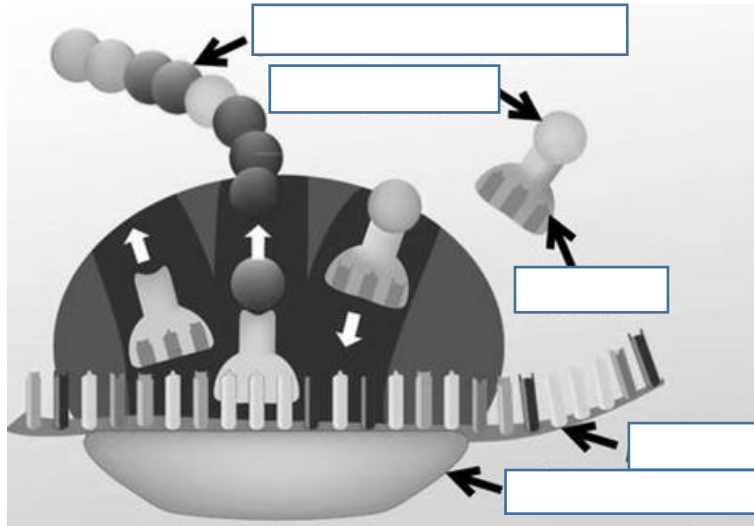
1. Draw a nucleotide and label the parts.
2. Explain the importance of the order of the nucleotides.
3. Identify the number of DNA bases for every amino acid.
4. What is the relationship between DNA and a trait?
5. Define transcription.
6. Explain why mRNA is necessary for transcription.
7. Explain why DNA cannot directly be used to make a protein.
8. Draw a diagram of transcription and label the nucleus, DNA and mRNA.

9. Label the parts of mRNA below.



10. Define translation.
11. How do mRNA, tRNA and ribosomes relate in translation.
12. What is the final product of translation?
13. Provide another name for a protein.
14. Explain how translation is related to the traits of an organism.
15. Differentiate between a codon and an anti-codon.

16. Label the tRNA, mRNA, ribosome, amino acid, and polypeptide in the diagram of translation.



17. How does mRNA determine the amino acid sequence?

18. Define a codon.

19. Circle the DNA strands below:

ATGGCTAATGCC

AGCUCUAGCGCU

ATTCGGCTTAGG

AGUUCAAGCU

20. Complete an mRNA strand based on the DNA strand: T T A C G G C A A T T G

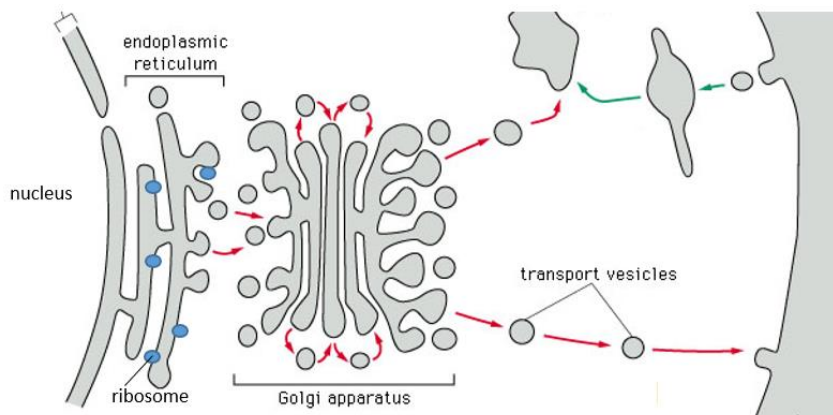
21. Use a codon chart to find the amino acid for the mRNA codons below:

AUG _____ CCU _____ GGA _____

22. Use a codon chart to find the amino acid for DNA triplets:

TTA _____ CCT _____ AGG _____

23. Describe the role of the nucleus, ribosomes, endoplasmic reticulum, Golgi, and a vesicle in the image below of protein transport.



24. Define cell differentiation.

25. Explain why all cells of the same organism have the same genetic material but the cells have different functions.

26. Explain the relationship between DNA, activated and deactivated genes, and cell differentiation.

27. Explain how temperature and light affect cell differentiation and gene expression.

28. Define a mutation as it relates to DNA.

29. How does a mutation in DNA affect traits?

30. Define a point or substitution mutation.

31. How does a point or substitution mutation affect the protein?

32. How does a silent mutation affect a protein?

33. How does a frameshift mutation, including an insertion or deletion, affect the protein?

34. Identify the mutations below as a point, substitution, frameshift, insertion and/or deletion mutation.

Normal DNA	TAT CAT CCT AAG GTA
	└┘ └┘ └┘ └┘ └┘
Protein →	Tyr His Pro Lys Val
<input type="text"/>	TAT CAT CGT AAG GTA
	└┘ └┘ └┘ └┘ └┘
	Tyr His Arg Lys Val
<input type="text"/>	TAT CAT CGC TAA GGT A
	└┘ └┘ └┘ └┘ └┘
	Tyr His Arg Stop Gly
<input type="text"/>	TAT C_TC CTA AGG TA
	└┘ └┘ └┘ └┘ └┘
	Tyr Leu Leu Arg ...

The diagram shows three DNA sequences with arrows pointing to their corresponding protein products:

- Point Mutation:** A single nucleotide change (G to C) in the third codon (CGT) results in a different amino acid (Arg instead of Pro).
- Frameshift Deletion:** The deletion of a single nucleotide (G) from the second codon (CAT) shifts the subsequent nucleotides, changing all amino acids from that point onwards (His becomes Arg, Pro becomes Stop, Lys becomes Gly).
- Frameshift Insertion:** The insertion of a single nucleotide (C) into the second codon (CAT) shifts the subsequent nucleotides, changing all amino acids from that point onwards (His becomes Leu, Pro becomes Leu, Lys becomes Arg).