



Building DNA Structure and Making Proteins

Target Grades

9-12

Time

Two 50 minute class periods

Objective

▪Students will be construct models of DNA, demonstrate the process of protein synthesis.

Materials

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|---------------------|-----------------------------------|------------------------|
| ▪4 Cytosine –blue | ▪1 Ribosome –purple | ▪3 tRNA –gray |
| ▪5 Thymine –green | ▪20 phosphate groups –white tube | ▪3 amino acids –black |
| ▪5 Adenine –Orange | ▪18 Deoxyribose sugar –black | ▪2 peptide bonds –gray |
| ▪4 Guanine –yellow | ▪9 Hydrogen bonds –white rod | |
| ▪5 Uracil –lavender | ▪9 ribose sugars –purple pentagon | |

Procedure

1. Construct a strand of DNA with 9 pairs of nucleotides.
2. Unzip the DNA and make a complementary copy of mRNA.
3. Unzip the mRNA from the DNA and rejoin the two DNA strands.
4. Move the mRNA outside of the nucleus to the ribosome.
5. Construct the tRNA by matching the 3 base pairs that are complementary to the mRNA
6. Attach the tRNA to the specific amino acid.
7. Bring the tRNA with the amino acid to the codon of the matching mRNA.
8. Attach covalent peptide bonds to join the amino acids.
9. Disconnect the Peptide molecule from the tRNA.
10. Disconnect the tRNA from the mRNA molecule.
11. Both are available to make new protein molecules..

Observations

▪Students will be able to build models of DNA that demonstrate the pairing of the nitrogen bases and how the sequence of DNA codes for certain amino acids which builds proteins.

Conclusions

▪DNA codes for proteins which serves not only as the structural component of a living cell but also as the metabolic enzymes that act as catalyst in all the chemical reactions that occur in the living cell. Hence, any damage done to DNA can greatly affect the performance of that cell/organism and if damage occurs in the egg or sperm is passed to future generations.

Class Discussion Questions

- Compare the phosphates, sugars, and bases of DNA and RNA.
- Compare the general appearance of the DNA and RNA molecule.
- What is produced during transcription?
- What is produced during translation?
- If a DNA triplet code is TAC, what is the complementary code of mRNA?
- If mRNA codons are AUG, GGU, CAG, what three codons of tRNA will attach?
- What is the source of free amino acids in the cytoplasm?
- In an analogy between a factory and a cell: If DNA is the superintendent and mRNA is the order to the assembly line (ribosomes), what might be the role of tRNA?
- If the DNA analysis of a gene shows 20% adenine bases, what would be the percentage of thymine, cytosine, guanine, and uracil?
- List by order of size the following : gene, cell, chromosome, atom, nucleus, base subunit, and nucleotides.
- What are two general uses of proteins in an organism?
- What might be the result of a mutation of DNA in which a triplet code such CAC now says CTC?

Additional Resources

http://store.schoolspecialtyonline.net/OA_HTML/ibeCCtptmDspRte.jsp?item=35932&minisite=10029