

Mr. F's DNA Model Challenge!

I. Introduction. It's in all of us. It contains the operator's manual for everything you know and don't know that you do! The color of your hair and skin, the behavior you exhibit, and the chemistry of your body is given directions from your DNA. Watson and Crick used the ball and stick to represent their groundbreaking model of the double helix of DNA. Your task is to demonstrate your understanding of the structure of DNA by constructing a 3-dimensional model with a new design twist.... It will hang from the ceiling!

II. The Questions: How will a 3-D model of DNA help me to understand the helical structure of the molecule? What is the correct orientation of DNA's antiparallel strands and how will I build them? How do the purines and pyrimidines "zip" up in the middle of the molecule? What does a 3-D sugar-phosphate backbone look like? These are just a sample of what you'll be able to answer from this activity!

III. Objective: to build a 3 dimensional model of DNA that will demonstrate a student's full understanding of its structure. You will include the following items in your model:

hydrogen bonds	3' end of each strand
nitrogenous bases	5' end of each strand
phosphodiester bonds	a key to what the colors represent
glycosidic bonds	sugar-phosphate backbone

IV. Materials that will be provided by Mr. F

14 Large foam balls	glue guns & hot glue
31 Small foam balls	string to hang model from above
Wooden skewers	

V. Directions & Criteria

You must construct an original blueprint of the DNA structure on paper, labeling all sugars, phosphate groups, and nucleotides specific to the ratios of your chosen species from Chargaff's DNA Data worksheet.

Construct the 3D model that correctly represents the nature of the molecule with the correct bonding pattern for bases, sugars, and phosphate groups. This model must include correct antiparallel arrangement of the two strands

The model must include at least 7 base pairs and represent the ratios seen in the Chargaff worksheet.

On your information card (*info card must be able to fit on half a sheet of printer paper*).

Side one of info card:

- information card about the base ratios in your species
- how the ratios in your species prove Chargaff's Rule
- your species common and scientific names
- a small picture of your species
- where it's found in the world, and how large its territory is
- it size and weight
- what it eats
- what groups of species it's related to genetically

Side two of info card:

- a key to indicate the colors of the bonds and/or molecules of your model

VI. Two page paper criteria:

The paper must include the following information on the discovery of DNA and each contribution from the scientists we studied (below). You can use the PowerPoint presentation and the reading in your packet to assist you as well as the internet's broad resources. ANY internet source MUST BE referenced correctly. This means that "Author last name (year of publication)" must follow the material you use in the body of your paper and a correctly cited APA citation in the references cited page that will go at the end of your paper.

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|-------------------------|--------------------|
| Griffith | Watson & Crick |
| Avery, McCarty & McLeod | Chargaff |
| Hershey & Chase | Wilkins & Franklin |

A verbal summary of what was done in the study

The conclusion the study provided

Why the study was deemed important to the discovery of DNA

VII. Project Rubric:

_____ / 10 points	Original paper blueprint of DNA molecule with material/theme identified, all base pairs sugars, and phosphate groups labeled. Base ratios correctly added.
_____ / 7.5 points	Key attached to the DNA model with each individual piece represented (side 2)
_____ / 7.5 points	Info card detailing your chosen species (side 1)
_____ / 10 points	Model: labels for sugar, phosphate group, adenine, thymine, guanine, cytosine and set of hydrogen bonds correctly identified.
_____ / 7.5 points	Model: "Backbones" of alternating sugar and phosphates in correct arrangement
_____ / 15 points	Model: 7 base pairs attached to sugars (each sugar has a base) and each base is attached to the correct base pair
_____ / 7.5 points	The 3 types of bonds present are correctly labeled and represented in the key
_____ / 5 points	The model is 3D, sturdy, and displayable.
_____ / 30 points	Two page paper on the six key studies and scientists that lead to the discovery of the structure of DNA
_____ / 100 points	TOTAL SCORE

