

**Common Core State Standards for English Language Arts: K-12 Close Reading Task**

**Text grade band placement:**  
9-10 Biology

| Text                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Text Complexity Analysis                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
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| <p><b>Title:</b> “Molecular Structure of Nucleic Acids: A Structure for Deoxyribose Nucleic Acid”</p> <p><b>Author:</b> Dr. James D. Watson &amp; Dr. Francis H. C. Crick</p> <p><b>Citation/Publication info:</b> Watson, J. D., &amp; Crick, F. H. C. (1953). A structure for deoxyribose nucleic acid. <i>Nature</i>, (171), 737-738.</p> <p><b>Link:</b> <a href="http://www.nature.com/nature/dna50/watsoncrick.pdf">http://www.nature.com/nature/dna50/watsoncrick.pdf</a></p> | <p><b>Quantitative:</b><br/>Lexile : 1100L*</p> <p>*Most domain-specific vocabulary left intact for analysis. Score would be lower without words such as Van der Waals, deoxyribose nucleic acid, phosphate di-esters, purines, pyrimidines, tautomeric, and hydrogen bonds.</p> <hr/> <p><b>Qualitative:</b></p> <p>Knowledge demands – requires students to have a working prior knowledge of the structure of DNA, and terms associated. Several opposing viewpoints presented – students will have to differentiate between the proposed working model and those theories being dismissed.</p> <p>Language features – challenging domain-specific vocabulary (see above in Quantitative section) and academic language will need some scaffolding. (e.g. – postulated, helical, dyad, configuration, plausible)</p> <hr/> <p><b>Reader and Task:</b></p> <p>The shorter article length will help prevent students from disengaging with the text before they start. The text will challenge students to interpret the scientific theories presented. Heavy use of scientific wording will pose difficulty to struggling learners—see scaffolds &amp; supports below. Readers will need practice &amp; help to visualize the models discussed. This text will be challenging for struggling readers to work past the demands of the scientific details, but will further propel students’ working knowledge of the structure of DNA through the use of a primary source.</p> <hr/> <p><b>Overall notes for this section:</b></p> <p>This task is intended to follow lessons on DNA structure, but to precede instruction covering DNA replication.</p> |

**ELA/Literacy Common Core Standards addressed by task**

[CCSS.ELA-Literacy.RST.9-10.1](#) Cite specific textual evidence to support analysis of science and technical texts, attending to the precise details of explanations or descriptions.

CCSS.ELA-Literacy.RST.9-10.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to *grades 9–10 texts and topics*.

CCSS.ELA-Literacy.RST.9-10.5 Analyze the structure of the relationships among concepts in a text, including relationships among key terms (e.g., *force, friction, reaction force, energy*).

CCSS.ELA-Literacy.RST.9-10.8 Assess the extent to which the reasoning and evidence in a text support the author’s claim or a recommendation for solving a scientific or technical problem.

CCSS.ELA-Literacy.WHST.9-10.2 Write informative/explanatory texts, including the narration of historical events, scientific procedures/ experiments, or technical processes.

CCSS.ELA-Literacy.WHST.9-10.4 Produce clear and coherent writing in which the development, organization, and style are appropriate to task, purpose, and audience.

CCSS.ELA-Literacy.WHST.9-10.9 Draw evidence from informational texts to support analysis, reflection, and research.

### What key insights should students take from this text?

1. Science is an ongoing, collaborative endeavor. Watson & Crick developed their theories thanks to the contributing efforts of numerous other scientists’ work.
2. Develop students’ understanding of the complexity of DNA through domain-specific vocabulary and detailed scientific discussion.
3. Application of scientific method

### Text-Dependent Questions

1. The article is titled “A Structure for Deoxyribose Nucleic Acid,” although we learned in class that DNA is an abbreviation for Deoxyribonucleic acid. What does the name of DNA say about the molecules contained within it?
2. Based upon your answer to #1, which version of the name for DNA is more correct (Deoxyribose nucleic acid or Deoxyribonucleic acid)? Explain your answer citing evidence from the text to support your choice.
3. In the opening paragraphs of the article, Watson and Crick make short work in dismissing the structures for DNA proposed by Pauling and Corey (1953), Fraser (1953), and Furberg (1952). What was the key issue Watson and Crick deemed unacceptable with each one of the aforementioned structures? (*\*This question also begins preparing students for the writing prompt*)
4. In paragraph 5 (in the second column), Watson and Crick note, “At lower water contents we would expect the bases to tilt so that the structure would become more compact.” Which form of DNA are the scientists describing? Explain the prior knowledge and/or

additional research used to determine your answer.

5. Why do Watson and Crick believe it would be “impossible” to build DNA with a ribose sugar in place of the deoxyribose sugar? Were they correct in this assumption? Back up your response by citing evidence from the article and providing reasoning to support your evidence.
6. **INFER:** Based purely upon classroom discussions and the information included within this article, connect the two following quotes from the article and use them to devise a possible mechanism for DNA replication: “...if only specific pairs of bases can be formed, it follows that if the sequence of bases on one chain is given, then the sequence on the other chain is automatically determined...” and “It has not escaped our notice that the specific pairing we have postulated immediately suggests a possible copying mechanism for the genetic material.”

| Writing Mode            | Writing Prompt                                                                                                                                                                                                                                                                                                                                                                                      |
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| Informative/Explanatory | Many alternative conformations of the structure of DNA were introduced prior to Watson & Crick’s anti-parallel, double-helical structure, and each is discussed in “A Structure for Deoxyribose Nucleic Acid”. <b>Using textual evidence from the article</b> (and your own prior knowledge), explain why Watson & Crick’s model is the most scientifically viable conformation of those presented. |

**Scaffolding and support for special education students, English language learners, and struggling readers:**

Vocabulary scaffolding will be necessary. Students will need clarification on the domain-specific and supporting academic language stated above. Pre-reading activities such as underlining & looking up unknown words will be helpful. 3-D models of the previously learned DNA structure may also help students visualize as they read.

**How this task supports the content standards for relevant subject area courses in this grade band**

- This task is appropriate for high school biology courses.
- This task is appropriate after learning about the known structure of DNA, but prior to learning about DNA replication. Students are asked to dig deeper to develop a more thorough understanding about Watson & Crick’s DNA structure by understanding those theories that were dismissed, and the scientists’ defense of their own theory. Using this deeper understanding will assist with making inferences & predictions regarding the mechanism of DNA replication.