

Extra Credit Reading
THE DOUBLE HELIX

Name: _____

1. Describe Francis Crick's personality and approach to science.
2. What results of O.T. Avery's experiments indicated that genes were not special types of protein molecules? How did this contradict Erwin Schrodinger's theory about genes?
3. There was skepticism on the part of some scientists regarding DNA as the composition of genes. What information did Crick think DNA would provide about genes?
4. When did Watson become interested in DNA? How did he pursue his interest?
5. What did Watson learn from Maurice Wilkins' talk in Naples? Why did Watson want to associate himself with Wilkins?
6. Describe Linus Pauling's explanation of the alpha-helix. What did Watson observe about Pauling's discovery of the helix?
7. Based upon X-ray data, what hypothesis about the nature of DNA did Wilkins share with Crick?
8. How did Wilkins differ from Watson and Crick in their approach to solving the DNA problem? What prevented Wilkins from continuing his approach to research?
9. Rosalind Franklin's early X-ray data showed the DNA molecule to be compatible with two, three or four polynucleotide chains, or strands. How did Crick determine that there were a small number of solutions that corroborated information with which he and Watson were working? Why could no clear determination about the number of strands be made at this point?

10. When attempting to determine what neutralized the negative charges of the phosphate groups of the DNA backbone, Pauling had an edge over the Watson-Crick team. Why?

11. Describe the first DNA-model attempts that Watson and Crick made.

12. Why did Watson choose to work on the structure of TMV? What did he learn from TMV that he could apply to his DNA search?

13. What error did Watson discover in Pauling's DNA model that was composed of a three-chain helix with the sugar-phosphate backbone in the center?

14. What was wrong with Watson's hypothesis that gene replication could be achieved if each base in the newly synthesized chain hydrogen-bonded to an identical base? How did he solve the problem?

15. Give examples of the competition that developed as the scientists worked to solve the problem of DNA structure.

16. How did Pauling's discovery of the alpha-helix and subsequent work on DNA affect the work of Watson and Crick?

17. Why did Watson choose to follow Pauling's example of model-building for his work on DNA? How did he use additional X-ray data?

18. What new dramatic elements were introduced into Watson's story when Linus Pauling's son, Peter, came to Cambridge?

19. Once the helical structure of DNA was established by X-ray photos, there was still the question of how many strands composed the helix. What led Watson to believe that the DNA molecule might consist of two chains?

20. Why were Watson and Crick concerned about releasing their DNA findings before the model was built?

21. How did Watson and Crick feel about their mistakes and difficulties while working on the DNA structure?

22. What was the main difference between Pauling's attempts to build the DNA structure and the final, successful attempt of Watson and Crick?

23. Give some examples of Watson's desire to be the first scientist to solve DNA. How did this desire affect his work?

24. By the time they were finished, Watson and Crick had used elements of biology, chemistry, mathematics, engineering, and common sense to discover the structure of DNA. Why did the structure of a single molecule require all of these areas?

25. Explain the importance of hydrogen bonding to the structure of DNA.

26. Did you like this book? Why or why not?

27. What did you learn about the scientific process by reading this book?