

Computer Lab Activity for the History of DNA

Target audience: 9-12

Notes: DNAi is an interactive website with many worksheets and animations related to the history and function of DNA. Included here is a short lesson with questions generated from the website.

Knowledge and skills:

- Students should know how to use a computer.
- Students should be able to travel within a website to work interactive animations and answer questions from the assigned worksheet

Fundamental understanding:

- Science is a cooperative activity.
- Central Dogma: DNA → RNA → Protein

Essential Questions:

- Why do scientist need to share their discoveries?
- What is the Central Dogma in Biotechnology?

National standard (s):

- *Content Standard C:* As a result of their activities in grades 9-12, all students should develop an understanding of the Molecular basis of heredity and Biological evolution.
- *Content Standard G:* As a result of their activities in grades 5-12, all students should develop an understanding that Science is a human endeavor, understand the nature of science, and learn the history of science.

State Standard(s):

- North Carolina Standard Course of Study for Biology:
- *Competency Goal 2:* The learner will develop an understanding of the continuity of life and the changes of organisms over time.
- *Competency Goal 3:* The learner will develop an understanding of the unity and diversity of life.

References and Resources:

Books:

1. Kreuzer, Helen and Massey, Adrienne. "Recombinant DNA and Biotechnology: A Guide for Teachers." American Society for Microbiology Press. 1325 Massachusetts Avenue, N.W. Washington D.C. 20005. Copyright 1996. ISBN: 1-55581-101-9
2. Micklos, David A. and Freyer, Greg, A., "DNA Science": A First Course in Recombinant DNATechnology. Cold Spring Harbor Press and Carolina Biological Supply Company. 1990. ISBN 0-89278-411-3

Website

<http://www.dnai.org/index.htm> (a DNA interactive website with many student and teacher friendly activities)

Name _____
Date _____

My DNAi

Go to: <http://www.dnai.org/index.htm>

Select Code on left side or at top of dnai homepage;

Find information to answer the questions about the following topics below:

- i. Finding the Structure
- ii. Copying the Code
- iii. Reading the Code
- iv. Controlling the Code

I. Finding the Structure:

1. What is the problem? _____

Players and Finding the Structure:

1. What was Chargaff responsible for? _____,
2. What did Rosalind Franklin do? _____
3. What did Raymond Gosling say about Franklin's work?

4. Who was Maurice Wilkins and what role did he play in determining the DNA Structure?

5. Where did Maurice Wilkins get his DNA to study? _____
6. Who was Linus Pauling? _____
7. What structure did Linus Pauling determine? _____
8. In what type of molecule? _____

Pieces of the puzzle:

1. What is X-Ray Diffraction? _____
2. Who created the X-Ray Diffraction picture of DNA? _____
3. Who was responsible for the triple helix model? _____
4. What are some reasons a triple helix would not work?

5. What did Watson first use to create a model for DNA?

6. What are Chargaff's ratios? _____

Putting it together:

1. Show me (the teacher) the base pairs lined up on your computer. Then, draw them on this worksheet.

II. Copying the Code: (RNA)

1. What is the problem? _____

2. Who were the principal investigators?

3. From the Brenner interview, how long is the DNA in a bacterium? _____

4. How does Brenner relate DNA to snakes? _____

5. Who were François Jacob and Jacob Monod and their influence on protein synthesis?

6. What was the beautiful experiment by Meselson and Stahl?

Draw the traditional semi-conservative model of DNA replication below:

Pieces of the Puzzle (Copying the Code):

7. What is the central dogma?

8. Sydney Brenner, François Jacob and Matt Meselson's experiment showed that

9. Matt Meselson and Frank Stahl's experiment show that DNA is replicated

10. Three different models of DNA replication were proposed. Matt Meselson and Frank Stahl's experiment supported only one of the models.

11. What enzyme did Arthur Kornberg isolate:

12. DNA's most extraordinary secret is _____

13. What is the interactive activity? _____

14. Do the interactive activity? _____

III. Reading the Code:

1. What is the problem? _____

The Players:

2. Zamecnik and Hoagland also identified _____

3. Sydney Brenner talks about the gene, and Seymour Benzer's contributions in

4. Marshall Nirenberg talks about his decision to become a

5. There are three bases in DNA corresponding to one amino acid, there are four kinds of bases in DNA, twenty kinds of amino acids in protein. And so, taking them three at a time there are _____ combinations.

6. Marshall Nirenberg talks about decoding the first codon _____.

7. Polyphenylalanine, he says, is extremely insoluble, it doesn't dissolve in many solutions, but it does _____.

8. Chemically similar amino acids have chemically similar _____.

IV. Controlling the Code:

1. What is the problem? ? _____

2. François Jacob and Jacques Monod studied which operon and why?

3. What is the on/off switch for a gene? _____.

Pieces of the Puzzle: (Controlling the Code)

1. What are histones? _____

2. What enzyme is coded by the lac operon? _____

Putting the Puzzle together:

1. What are nucleosomes? _____

2. What is chromatin? _____

Draw the lac operon.