

## Web Quest: DNA & Protein Synthesis

Name:

Biology 1

### TO ACCESS THE WEBSITES IN THIS WEB QUEST *WITHOUT* HAVING TO TYPE IN ALL OF THE URLS:

1. Go to [alkire.weebly.com](http://alkire.weebly.com)
2. Mouse over "Biology 1"
3. Click on "Online Activities"
4. Find the DNA & Protein Synthesis Web Quest and click on "Download File"
5. Click on the web addresses in the document

### Activity 1: Frederick Griffith's discovery of Transformation

1. Go to <http://nortonbooks.com/college/biology/animations/ch12a01.htm>
2. Follow the prompts to move through the animation.
3. Answer the following questions as you move through the tutorial:
  - a. Does the rough strain of streptococcus bacteria cause pneumonia in rats? YES or NO
  - b. Does the smooth strain of streptococcus bacteria cause pneumonia in rats? YES or NO
  - c. Do heat-killed smooth bacteria cause pneumonia in rats? YES or NO
  - d. What happened to the rats when Griffith injected them with a combination of living rough and heat-killed smooth bacteria?
  - e. How did Griffith explain these results?

### Activity 2: Hershey & Chase Experiment

1. Go to <http://nortonbooks.com/college/biology/animations/ch12a02.htm>
2. Read the introduction and then click on "Step-Through." (If you have headphones you may click "Narrated.")
3. Answer the following questions as you move through the tutorial:
  - a. Hershey & Chase used a very simple virus. What are the two components of the virus?
  - b. Hershey & Chase used radioactive sulfur to label the *DNA / protein coat*. (Circle one)
  - c. Hershey & Chase used radioactive phosphorus to label the *DNA / protein coat*. (Circle one)

Hershey & Chase then allowed the viruses to inject their genetic material into the host bacterial cells. Then they separated the viruses from the bacteria and looked for the radioactive sulfur and phosphorus.

- d. Where was the radioactive sulfur found? *Inside the bacteria* or *In the liquid* (Circle one)
  
- e. Where was the radioactive phosphorus found? *Inside the bacteria* or *In the liquid* (Circle one)
  
- f. This proves that \_\_\_\_\_ is the genetic material.

### Activity 3: DNA Structure

1. Go to [http://www.phschool.com/science/biology\\_place/biocoach/dnarep/intro.html](http://www.phschool.com/science/biology_place/biocoach/dnarep/intro.html)
2. Read the introduction and then click on "Next Concept" to go to Concept 1: Nucleotide.

- a. What is the basic building block of DNA?
  
- b. Click on the purple "review" button. What are the three parts of a DNA nucleotide?

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- c. Click on the blue button that says "A Closer Look." What are the four bases found in DNA?

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3. Close the pop-up window to go back to the main screen. Click on “next concept” to go to Concept 2: DNA Double Helix.

a. How many strands (polynucleotide chains) make up a molecule of DNA?

Click on the purple “review” button. Notice that the backbone of the DNA molecule is made by connecting the phosphates and the bases (shown on the diagram by the purple arrow). The bases stick out off to one side. This is where the other strand of the DNA molecule will join together.

b. Click on the “Complementary Base Pairing” link. How do the bases in one strand pair up with the bases in the other strand?

- Adenine pairs with \_\_\_\_\_
- Cytosine pairs with \_\_\_\_\_

#### Activity 4: Building a DNA Strand

1. Go to <http://nortonbooks.com/college/biology/animations/ch12a03.htm>
2. Using your new knowledge about base pairing rules (A-T, C-G), build the complementary strand of DNA that matches up with the existing strand. *Record the sequence of bases (from top to bottom) of the new strand that you just built here:*

#### Activity 5: DNA Replication

1. Go to <http://nortonbooks.com/college/biology/animations/ch12a04.htm>
2. Read the introduction and then click on “Step-Through.” (If you have headphones you may click “Narrated.”)
3. Answer the following questions as you move through the tutorial:
  - a. What must happen in order for the two strands of a DNA molecule to unwind and separate?
  - b. What is the name of the enzyme that adds the new nucleotides (shown in yellow) to create the new, complementary strands of DNA?

- c. What are the base pairing rules that are used to make the complementary strands of DNA?
- d. When replication is complete, there are two molecules of DNA, each with two strands. Which of the following is true? (Circle the correct answer.)
- One DNA molecule consists of the two old strands; the other consists of the two new strands.
  - Each DNA molecule consists of one new DNA strand and one old DNA strand.

### Activity 6: Introduction to Protein Synthesis

1. Go to [http://www.phschool.com/science/biology\\_place/biocoach/transcription/intro.html](http://www.phschool.com/science/biology_place/biocoach/transcription/intro.html)
2. Read the introduction and then click on the blue “next concept” button to go to Concept 1: Overview: The Central Dogma.
  - a. Transcription copies the information from DNA into a molecule of \_\_\_\_\_.
  - b. Translation uses the information stored in the RNA molecule to make a \_\_\_\_\_.
3. Click on the blue “next concept” button to go to Concept 2. Read this information. Continue to Concept 3. Read this information. Continue to Concept 4: Basic Structure of a Protein-Coding Gene.
  - a. What is the promoter?
  - b. What is the terminator?
4. Click on the blue “next concept” button to go to Concept 5: The RNA molecule. While RNA is similar to DNA, there are some differences between the two molecules.
  - a. The name of the sugar molecule in DNA is \_\_\_\_\_.

The name of the sugar molecule in RNA is \_\_\_\_\_.

Click on the purple “review” button to access the information needed to answer the next question.

- b. The four bases in DNA are adenine, thymine, cytosine, and guanine. RNA has three of the same bases (adenine, cytosine, and guanine), but instead of having the base thymine, RNA has \_\_\_\_\_.
5. Close the pop-up window to go back to the main screen. Click on the blue “next concept” button to go to Concept 6: The Transcription Process. Notice how one of the DNA strands serves as a template for making the RNA molecule. Look at the way the bases match up in the diagram.
- a. If there is a “C” on the DNA template, what matches up with it on the RNA strand?
  - b. If there is a “G” on the DNA template, what matches up with it on the RNA strand?
  - c. If there is a “T” on the DNA template, what matches up with it on the RNA strand?
  - d. If there is a “A” on the DNA template, what matches up with it on the RNA strand?

#### Activity 7: Transcription (The first step in protein synthesis)

1. Go to <http://nortonbooks.com/college/biology/animations/ch13a03.htm>
2. Read the introduction and then click on “Step-Through.” (If you have headphones you may click “Narrated.”)
3. Answer the following questions as you move through the tutorial:
  - a. What is the name of the enzyme that makes the RNA strand?
  - b. Like you figured out earlier, RNA contains the base uracil instead of thymine. So, if there is an adenine base in the DNA template strand, *what will match up with it in the new RNA strand?*
  - c. As the new RNA strand forms, it detaches from the DNA molecule. What does the DNA molecule do at this point?

Activity 8: Translation (The second step in protein synthesis)

1. Go to [http://www-class.unl.edu/biochem/gp2/m\\_biology/animation/gene/gene\\_a3.html](http://www-class.unl.edu/biochem/gp2/m_biology/animation/gene/gene_a3.html)
2. Click on the flashing arrow to move through the animation. Answer the following questions:
  - a. The first step of protein synthesis is called \_\_\_\_\_. During this step, the information from DNA is copied into a molecule called \_\_\_\_\_.
  - b. The mRNA carries the information from the nucleus out into the \_\_\_\_\_.
  - c. The second step of protein synthesis is called \_\_\_\_\_. During this step, the information in mRNA is used to join amino acids together to make a \_\_\_\_\_.
  - d. The ribosome reads the sequence of mRNA nucleotides in groups of \_\_\_\_\_. This group is called a \_\_\_\_\_.
  - e. Amino acids are carried over to the ribosome by molecules of \_\_\_\_\_.
  - f. The \_\_\_\_\_ on the tRNA molecule matches up with the \_\_\_\_\_ on the mRNA molecule to put the amino acid in the correct place.
  - g. The end product of protein synthesis is a chain of amino acids. What has to happen to the chain to make it into a protein that can actually do work in the cell?