

DNA Web Quest

Name _____ Per _____

Part 1 - Introduction, History, DNA Structure, DNA Replication

Introduction

Go to <http://science.howstuffworks.com/cell4.htm>

Read the text. As you read fill in the blanks below.

As long as a _____ membrane is intact and _____ is making all of _____ enzymes it needs to _____ properly, the cell is _____. The enzymes it needs _____ function properly allow the _____ to create energy from _____ construct the pieces that _____ up its cell wall, _____ and, of course, produce _____ enzymes. So where do _____ of these enzymes come _____? And how does the _____ produce them when it _____ them? If a cell _____ just a collection of _____ causing chemical reactions that _____ the cell do what _____ does, then how can _____ set of chemical reactions _____ the enzymes it needs, _____ how can the cell _____? Where does the miracle _____ life come from? The _____ to these questions lies _____ the DNA or deoxyribonucleic _____ You have certainly heard _____ DNA, chromosomes and genes. _____ guides the cell in _____ production of new enzymes. _____ DNA in a cell _____ really just a pattern _____ up of four different _____ called nucleotides or bases. _____ a set of blocks _____ has only four different _____ or an alphabet that _____ only four different letters. _____ is a long string _____ blocks or letters. In _____ E. coli cell, the _____ pattern is about 4 _____ blocks long. If you _____ to stretch out this _____ stand of DNA, it _____ be 1.36 mm long _____ pretty long considering the _____ itself is 1,000 times _____. In bacteria, the DNA _____ is like a wadded-up _____ of string. Imagine taking _____ feet (300 meters) of _____ thin thread and wadding _____ up -- you could _____ hold it in you _____ a human's DNA is about 3 billion blocks long, or almost 1,000 times longer than an E. coli's. Human DNA is so long that the wadded-up approach does not work. Instead, human DNA is tightly wrapped into 23 structures called chromosomes to pack it more tightly and fit it inside a cell. The amazing thing about _____ is this: DNA is _____ more than a pattern _____ tells the cell how _____ make proteins! That is _____ that DNA does. The _____ million bases in an _____ coli cell's DNA tell _____ cell how to make _____ 1,000 or so enzymes _____ an E. coli cell _____ to live its life. _____ gene is simply a _____ of DNA that acts _____ a template to form _____ enzyme. Let's look at _____ entire process of how _____ is turned into an _____ so you can understand _____ it works. You have _____ heard of the DNA _____ referred to as the _____ DNA is like two _____ twisted together in a _____ spiral. DNA is found _____ all cells as base _____ made of four different _____. Each base pair is _____ from two complementary nucleotides _____ together. The four bases _____ DNA's alphabet are: _____ Cytosine, Guanine, Thymine, Adenine _____ and thymine always bond _____ as a pair, and _____ and guanine bond together _____ a pair. The pairs _____ together like rungs in _____ ladder. In an E. _____ bacterium, this ladder is _____ 4 million base pairs _____ The two ends link _____ to form a ring, _____ then the ring gets _____ up to fit inside _____ cell. The entire ring _____ known as the genome, _____ scientists have completely decoded _____ That is, scientists know _____ 4 million of the _____ pairs needed to form _____ E. coli bacterium's DNA _____. The human genome project _____ in the process of _____ all 3 billion or _____ of the base pairs _____ a typical human's DNA.

Stop!

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DNA History

Go to <http://www.dnafb.org/dnafb/1/concept/index.html>

Read the text and answer the following questions.

1. What have people wondered since the beginning of human history?

2. Who discovered that individual traits are passed on from one generation to the next? In what year? _____

On the menu at the right click on number 15 "DNA & proteins are key"

3. When was DNA discovered as a major chemical of the nucleus of cells? _____

4. In the early 1900s what molecule was considered to be a better candidate to transmit hereditary information from one generation to the next? _____.

5. Why was protein considered to be a better candidate as the hereditary molecule than DNA?

On the menu at the right click on number 16 "one gene makes one protein"

6. What was the conclusion made by Beadle & Tatum? What year was this?

On the menu at the right click on number 17 "a gene is made of DNA"

7. What did Oswald Avery's team of scientists conclude from their experiments? In what years?

On the menu at the right click on number 19 "The DNA is shaped like a twisted ladder"

8. What did earlier work on DNA show? _____

9. Who won the race to show the 3-dimensional structure of DNA? _____

10. What year was this? _____

Click on animation at the bottom of your screen (step through the animation and answer the following questions)

11. What makes up a nucleotide? _____

12. How could DNA be an "intelligent molecule" (carry hereditary information)?

13. What was Erwin Chargaff's contribution to the DNA puzzle?

14. What important tool did Linus Pauling use to determine the structure (shape) of proteins?

15. How was this tool used to help discover the shape of DNA?

16. Name the two scientists that made the x-ray diffraction patterns that Watson & Crick used?

17. The distinctive "X" meant the DNA had what pattern? _____

18. Scroll through the rest of the animation and **summarize** the rest of the story.

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DNA Structure

Go to <http://www.pwc.k12.nf.ca/wadey/biotech/dna1.swf>

Draw a DNA molecule 12 base pairs long in the box below (remember to match the nitrogen bases correctly!).



DNA Replication

Go to <http://www.stolaf.edu/people/giannini/flashanimat/molgenetics/dna-rna2.swf>

Answer the following questions as you move through the animation of DNA replication.

Before clicking

1. What class of proteins are the molecules with -ase endings? _____
2. Draw a portion of the DNA molecule on the screen.



Click on the large arrow once. (total of one click)

3. Draw the portion of DNA that has "unzipped"



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More DNA Replication

Click on the large arrow again (total of 2 clicks).

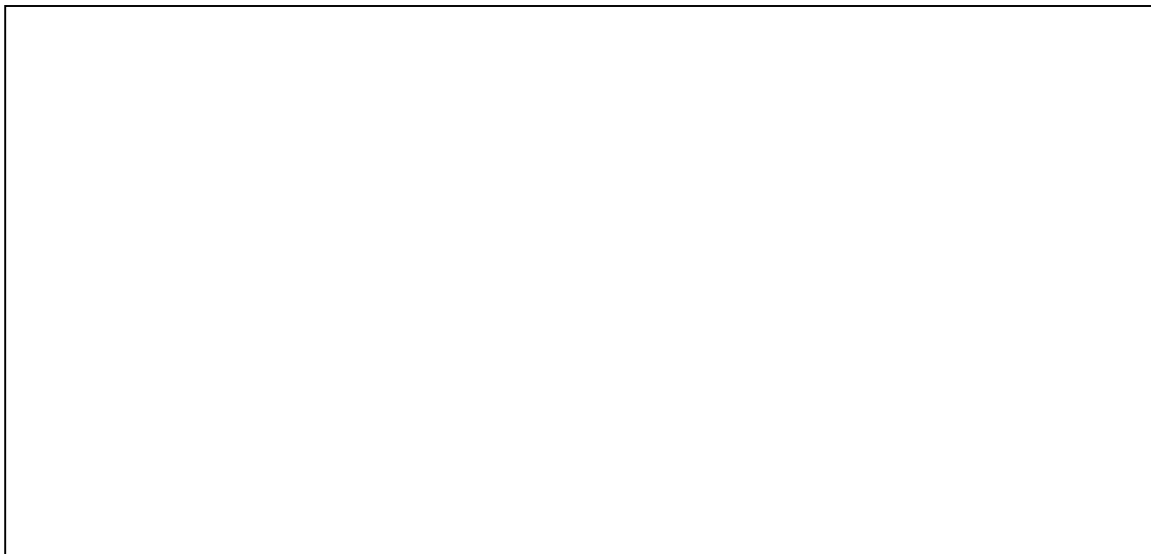
4. What begins to happen on one of the "unzipped" strands?

Click several more times slowly and study what happens.

5. What do you think the molecules are with the -ase endings on them?

6. Can you hypothesize what function they could have in this process?

7. Explain in your own words & draw a diagram of the process of DNA replication (include what you start and end with & what happens in between)



Explanation

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Part 2 – RNA, Transcription, Translation

RNA

Go to <http://www.dnafb.org/dnafb/21/concept/index.html>

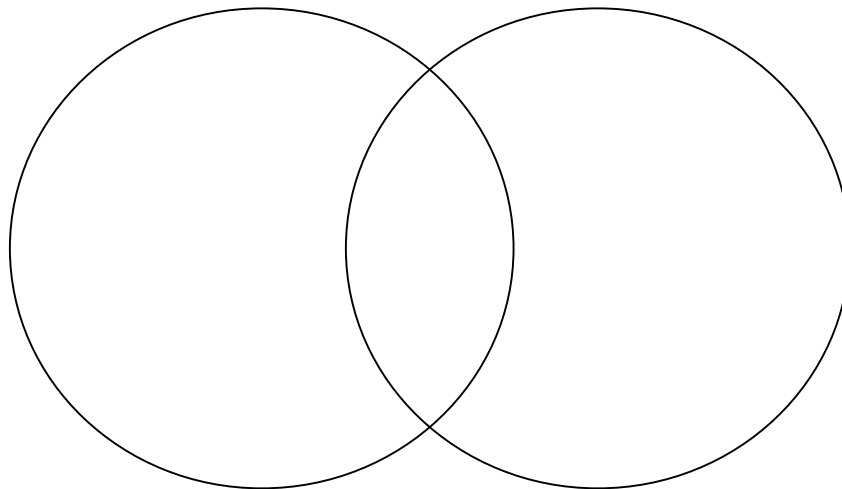
Read the text and answer the following questions

1. Where is RNA commonly found? _____
2. Describe what is meant by the "central dogma" in biology.

-
-
3. Name the 3 types of RNA and the general roles they play in the making of protein.
-
-

Click on the animation button below. Step through the animation and compare and contrast the structure of RNA to DNA. Use the Venn diagram to compare and contrast. Then do a sketch of an RNA molecule (at least 10 nucleotides long using the all the appropriate nitrogen bases at least twice).

DNA



RNA

RNA Sketch (at least 10 nucleotides long with appropriate nitrogen bases)

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Transcription (DNA → RNA)

Go to <http://www.stolaf.edu/people/giannini/flashanimat/molgenetics/transcription.swf>

Answer the following questions as you move through the animation of Transcription

Before clicking

1. The diagram represents what type of molecule? _____

Click once

2. What type of molecule is the RNA polymerase? _____

Click again

3. What function does the RNA polymerase have? _____

4. Where in the cell do you think this is taking place? _____

5. Explain how the mRNA molecule forms.

6. What nitrogen base replaces thymine on the RNA molecule? _____

Translation (mRNA → protein)

Go to <http://www.stolaf.edu/people/giannini/flashanimat/molgenetics/translation.swf>

Answer the following questions as you move through the animation of Translation

Before clicking

1. The diagram represents what type of molecule? _____

Click once

2. Where in cell in this taking place? _____

Click again

3. What type of molecule is the tRNA (transfer RNA) bringing to the mRNA? _____

4. Explain (in terms of nitrogen bases) how the tRNA docks on the mRNA ?

Click until the end watching the process of translation

5. As the tRNAs dock on the mRNA bringing amino acids with them what type of molecule is created

Start the animation over

6. What are the 3 nitrogen bases on the tRNA carrying the amino acid "Met"? _____

7. What are the 3 nitrogen bases on the mRNA that the "Met"-tRNA docks upon? _____

8. Check out the next tRNA with its 3 nitrogen bases and see where it docks on the mRNA. Can you detect a pattern. If there are 20 amino acids then what is the minimum number of tRNAs that must exist. _____

9. Write a summary of translation using words and a sketch