

BIOLOGY: DNA, RNA, PROTEIN SYNTHESIS, AND MUTATIONS UNIT GUIDE

Read: Chapter 8

UNIT TEST: December 12th

Watch (Supplemental Resource):

- DNA structure and replication: Crash Course Biology #10
- Bozeman Science – DNA and RNA parts 1 and 2
- Use your username and password to get to the biology book or
Username: astudents602 Password: n2s7v

What the state of Texas wants you to know!

3F: Research and describe the history of biology and contributions of scientists.

4B: Investigate and explain cellular processes, including the synthesis of new molecules.

6A: Identify components of DNA, and describe how information for specifying traits of an organism is carried in the DNA.

6B: Recognize that components that make up the genetic code are common to all organisms.

6C: Explain the purpose and process of transcription and translation using models of DNA and RNA.

6E: Identify and illustrate changes in DNA and evaluate the significance of these changes.

Listen and Look: Here is a list of key terms you will hear and see during the reading and video. Get to know them! Using one of the foldable examples demonstrated in class, define each term in words and draw a picture to help you to learn the definitions. (socratic – room number = wheatleybiology)

DNA, RNA, Protein Synthesis

Vocab DNA Set 1 Due December 5th, 2014

- Nucleus
- DNA
- RNA
- Nucleotide
- Double Helix
- Replication
- DNA polymerase
- DNA strand
- Complementary side/strand
- Adenine
- Guanine
- Cytosine
- Thymine
- Uracil
- Purine
- Pyrimidine

Vocab DNA set 2 Due December 11th, 2014

- Ribosome
- Identify
- Recognize
- Describe
- Transcription
- Translation
- RNA polymerase
- Messenger RNA
- Ribosomal RNA
- Transfer RNA
- Codon or triplet codon
- Anticodon
- Amino Acid
- Protein

Recall and Review: Use the lecture in the video and your textbook to help you answer the following questions in your BILL.

A. Chapter 8 (Section 1) – complete by 12/3/14

1. Transform means “to change.” **Predict** why Griffith called the mystery material the “transforming principle”?

Because the bacteria became pathogenic when it was mixed with other pathogenic bacteria even though it was not harmful before.

2. **State** three reasons Avery concluded that the mystery material was DNA, not protein.

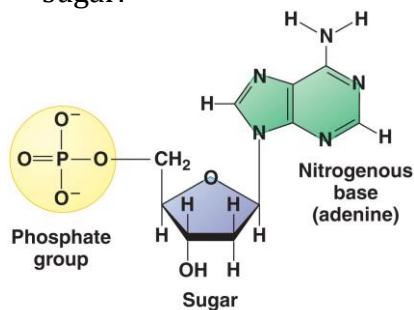
DO NOT WORRY ABOUT THIS ONE!!!!

3. **Explain** how Hershey and Chase’s research with bacteriophages helped to confirm that DNA was the genetic material.

They used radioactive isotopes to tag the protein and DNA of a virus cell. They then mixed it with bacteria and watched to see which tag (phosphorus – DNA or sulfur – RNA) ended up in the bacteria cells. When they say it was the phosphorus, they knew DNA had to be the hereditary information.

B. Chapter 8 (Section 2) – complete by 12/5/14

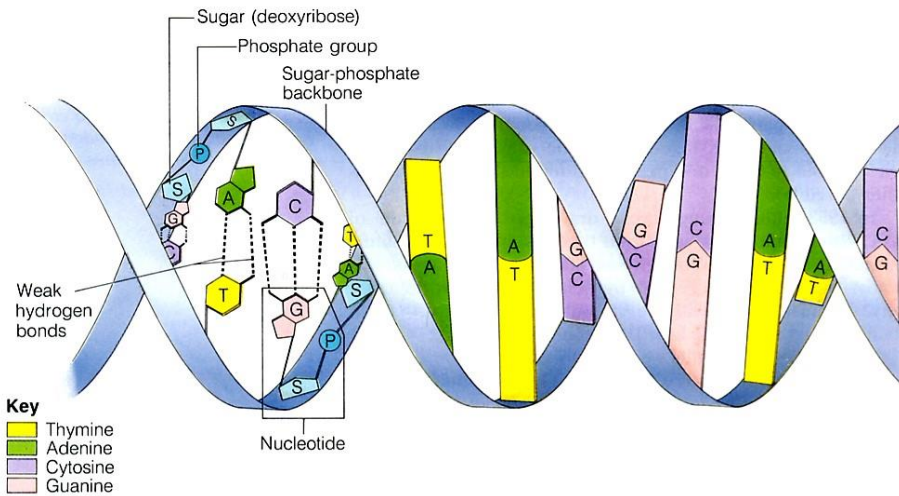
1. **Draw** a nucleotide and label the phosphate group, the nitrogen-containing base, and the deoxyribose sugar.



2. **Describe** how the four DNA nucleotides differ in structure.

They differ in structure only with the nitrogen bases. There are two different kinds of nitrogen bases, purines (adenine and guanine) and pyrimidines (thymine and cytosine). The phosphate group and sugar are always the same.

3. **Draw** a DNA double helix. Label the sugar-phosphate backbone, the nitrogen-containing bases, and the hydrogen bonds.



4. **State** which part of a DNA molecule carries the genetic instructions that are unique for each individual?
Explain.

The nitrogen bases. There are the only part that differ so therefore have to be the ones responsible as the others are always the same.

C. Chapter 8 (Section 3) – complete by 12/7/14

1. **State** the end product of replication.

2 complete DNA strands. One parent and one daughter in each strand.

2. **Explain.** What does it mean that a DNA strand is used as a template in replication.

DNA replication is semiconservative. This means that the parent strand is split apart and each individual strand is used as a mold or template to build the daughter strands so that you end up with one new and one old strand in each double DNA.

3. **List** two examples of how enzymes and other proteins help in the process of replication.

Helicase is an enzyme that breaks the hydrogen bonds between the nitrogen bases so that the DNA can separate.

Polymerase is an enzyme that adds free nucleotides to the parent strand in order to build the daughter strand.

4. **Infer.** Why is it important that human chromosomes have many origins of replication?

Because it would take a really long time for the chromosomes to be duplicated as each DNA strand is very long and thus cells would never be able to divide so that you can grow.

Chapter 8 (Section 4) – complete by 12/8/14

1. Compare DNA and RNA.

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	DNA	RNA
Sugar	Deoxyribose	Ribose
Bases	Adenine, guanine, thymine, cytosine	Adenine, guanine, uracil, cytosine
Strands	Double-stranded with base pairing	Single-stranded
Helix	Yes	No

2. Explain why transcription occurs in the nucleus of eukaryotes.

Because transcription is the process when DNA codes for mRNA (messenger RNA). DNA is only located in the nucleus.

3. Compare transcription and replication.

Replication involves one strand of DNA splitting and each side acting as a template to build the daughter strands. Transcription also involves the DNA splitting. However, only one side is used to build the mRNA molecule. The other side waits until the process is done then the DNA recombines.

4. Apply. If a DNA segment has the nucleotides AGCTTAT, predict the sequence of the mRNA strand that results after transcription.

UCGAAUA

Chapter 8 (Section 5) - complete by 12/9/14

1. Explain the relationship between a codon and an amino acid.

A codon codes for an amino acid. A codon is the name given to every three nucleotides on an mRNA molecule. The ribosome reads the codon and then tells what amino acid it is coding for so that the protein can be built.

2. Calculate. Suppose an mRNA molecule in the cytoplasm had 300 nucleotides. How many amino acids would be in the resulting protein?

100 (300 nucleotides / 3 nucleotides per codon)

3. Explain the role of tRNA in translation.

The role of tRNA is to serve as the transporter for the amino acid. It brings the amino acid to the ribosome.

Chapter 8 (Section 7) - complete by 12/10/14 THIS SECTION WILL NOT BE ON THE DNA AND PROTEIN SYNTHESIS TEST!!! WE WILL COVER IT AFTER THE BREAK!

1. Differentiate between gene and chromosome mutations. Provide an example of each

2. Explain the difference between a point and frameshift mutation.

3. Describe one mutation that would not have an effect on an organism's phenotype.