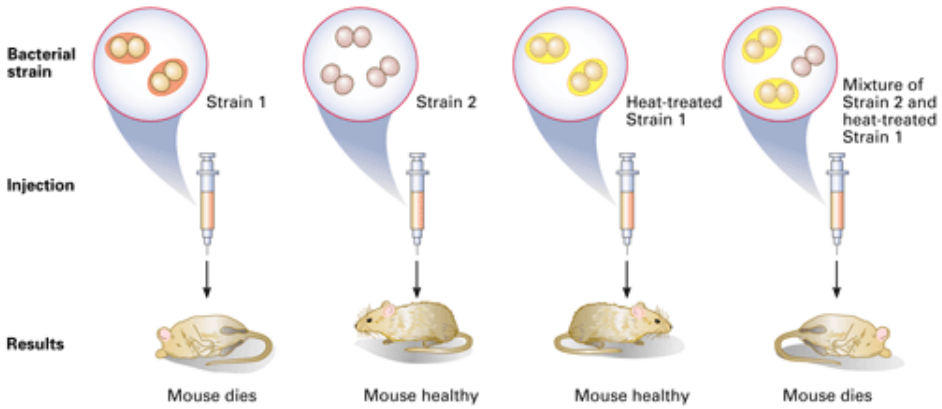
Name-_____ Period-_____
Date-_____

Scientists identified DNA as a chemical in the nucleus of cells more than 100 years ago. Even so, Mendel, Morgan, and other early geneticists did all their work without any knowledge of how DNA played a role in heredity. How biologists learned that DNA is the genetic material is one of the great stories of science.

Griffith's "Transforming Factor" Is the Genetic Material

The story opens in 1928. British biologist _____ was studying two forms, or _____, of a bacterial species: one strain caused a kind of _____, while the other strain was _____. When he injected _____ into mice, the mice _____. Heat _____the deadly strain of the bacterium, making it harmless.



Griffith showed that although a deadly strain of bacteria could be made harmless by heating it, some factor in that strain is still able to change other harmless bacteria into deadly ones. He called this the "transforming factor."

Griffith's important discovery came when he injected mice with _____ _____.

Since neither of these treatments on its own could kill the mice, he expected the mice to survive. However, the mixture killed the mice. Some of the harmless bacteria had been _____ becoming deadly. Furthermore, Griffith discovered that all of the _____ of the transformed bacteria inherited _____.

Avery Shows DNA Is the Transforming Factor

Other scientists began to search for this _____. Attention focused on two types of chemicals: _____. These chemicals were the most likely candidates because scientists already knew that _____, which function in inheritance, consist of _____ and _____. In 1944, American biologist Oswald Avery and his colleagues took Griffith's experiments one step further. To test whether _____, they treated Griffith's mixture of heat-treated deadly strain and live harmless strain with _____. The bacterial colonies grown from the mixture were _____. Avery and his colleagues concluded that_____. Next, they treated the mixture with _____.

This time the colonies _____. Avery concluded that _____ is the genetic material of the cell.

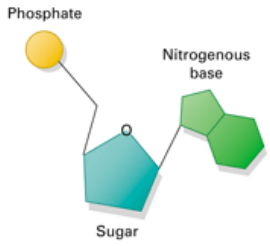
The Building Blocks of DNA

The heritable genetic information of an organism is stored in the molecule called _____. _____ is a kind of _____, a _____ built from many _____ called _____. _____ are the building blocks (the monomers) of nucleic acid polymers. Only _____ of nucleotides make up DNA. Notice below that each nucleotide has _____ parts:

1. _____

   _____

2. _____



A nucleotide has three components: a sugar, a phosphate group, and a nitrogenous base.

_____

_____

_____

_____

3. _____

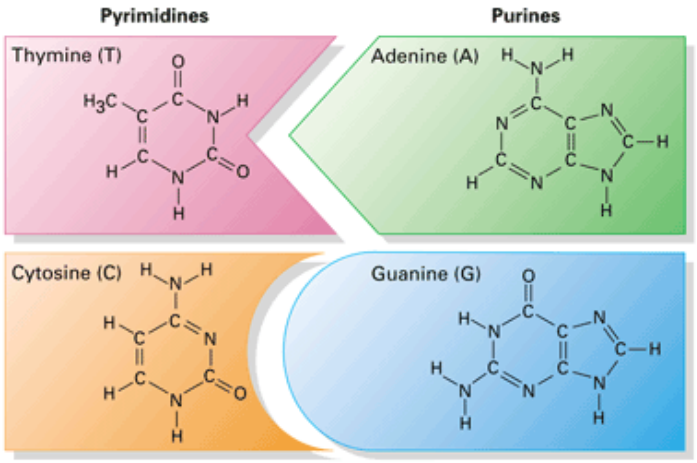
_____

_____

_____

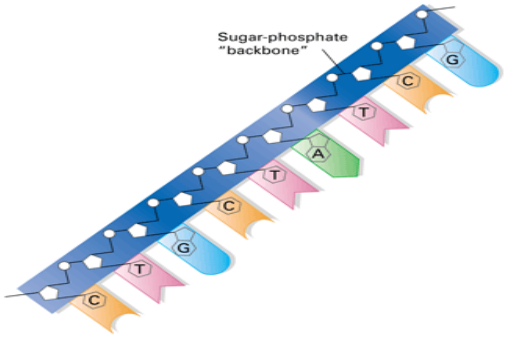
Nitrogenous Bases The four nucleotides found in DNA differ only in their _____, called bases for short. The bases _____ (T) and _____ (C) are _____ called _____(py RIM uh deenz). _____(A) and _____ (G) are larger, _____ called _____ (PYOOR eenz). The one-letter abbreviations stand for both the bases alone and for the nucleotides containing them.

DNA Strands Nucleotides are joined to one another by _____ bonds that connect the _____ of one nucleotide to the _____ of the next. This repeating pattern of sugar-phosphate-sugar-phosphate is called a _____.



DNA contains four different nitrogenous bases. Thymine and cytosine have single-ring structures. Adenine and guanine have double-ring structures.

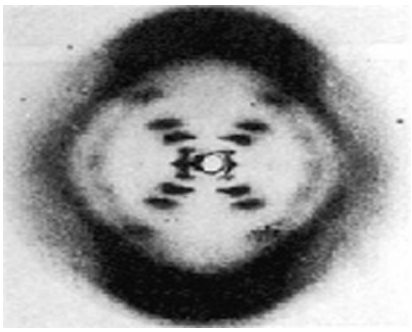
The _____ of a _____ can combine in _____. For example, the part of a _____ shown below has _____ nucleotides arranged in the order CTGCTATCG.



Nucleotide monomers join together by covalent bonds between the sugar of one nucleotide and the phosphate of the next, forming a sugar-phosphate backbone.

DNA's Structure

In the early 1950s, scientists _____ and _____ produced some _____ using a method called _____. The photographs showed the basic shape of DNA to be a _____, and revealed the basic _____ of the helix.



Rosalind Franklin's X-ray diffraction photograph of DNA

Rosalind Franklin

The Double Helix Meanwhile, scientists _____ and _____ modeled DNA's structure with tin and wire. Their early models failed to explain DNA's _____. Then one day, Watson saw one of Franklin's _____ of DNA. Using the clues provided by _____ work, _____ and _____ created a new model in which _____ wound about each other. This formed a twisting shape called a _____. Their model placed the _____ on the _____ of the _____ and the _____ on the _____. They hypothesized that the _____ aligned across the two strands and bonded to each other via _____. This new model successfully represented a DNA molecule.

Complementary Base Pairs _____ and _____ realized that the individual _____ occurred in very specific _____. They found _____ pairs with _____, and _____ pairs with _____. In the biologist's shorthand, _____ pairs with _____, and _____ pairs

with _____. In other words _____ is "_____" to ____, and _____ is _____ to _____. This is known as the _____. The _____ rules set the stage for understanding how the information in DNA is passed through to generations.

The bases pair up between the two intertwined sugar-phosphate backbones, forming the double helix discovered by Watson and Crick. A pairs with T, and G pairs with C.

DNA Replication

Have you ever had additional copies of a favorite photo made from a photo negative? Even if you've lost your negative, a new negative can be made from your print, from which more prints can be made. In this section, you'll read how this same principle enables a cell to make a copy of its genetic material.

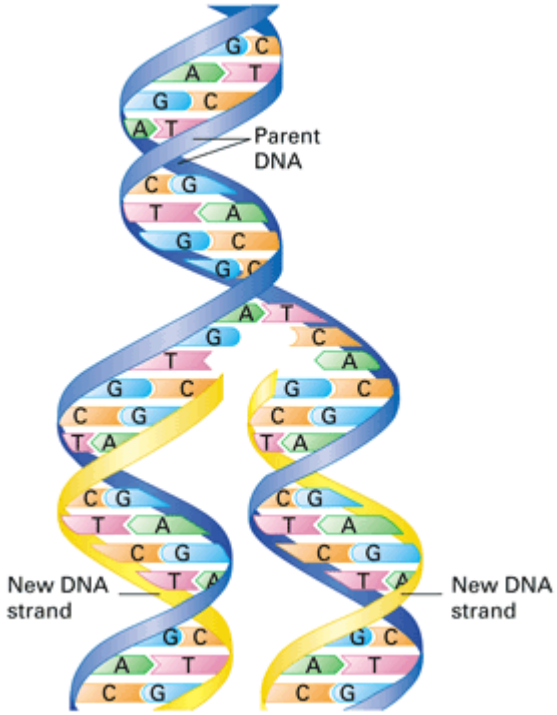
The Template Mechanism

When a cell divides to form new cells, a complete set of _____ is generated for each _____. And when an organism _____, _____ pass from _____. For this to occur there must be a means of _____. Long

before DNA was identified as the genetic material, some people proposed that gene-copying must be based on a _____. A _____ works like the negative and photograph example described. The cell somehow uses a "negative" of the _____ to make more _____.

_____ and _____ model for _____ immediately suggested to them that _____ involved a_____. Their hypothesis was based on the specific _____ of complementary bases: _____ pairs with _____, and ____ pairs with _____. If you know the sequence of bases on one strand of DNA, you can determine _____ on the other by applying these rules.

During DNA _____, the two strands of the double helix first _____. Each single strand acts as a "negative" for producing a new, _____ strand. _____ line up one at a time across from the existing strand as predicted by the _____. _____ link the nucleotides together and form the two new _____, called _____.



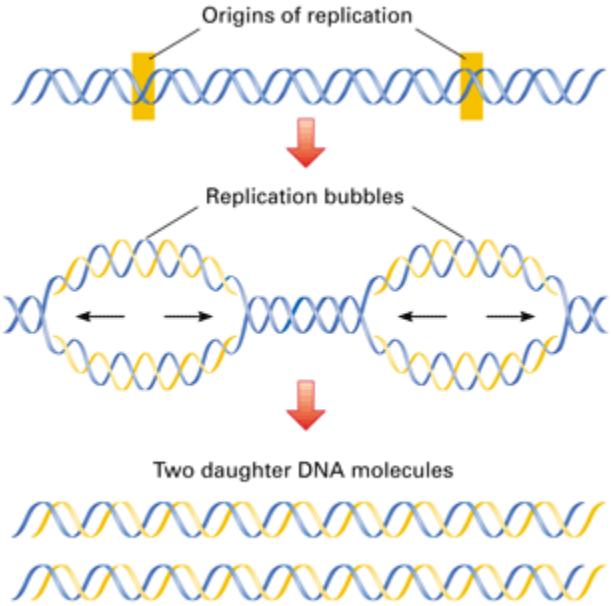
During DNA replication, the two strands of the original parent DNA molecule, shown in blue, each serve as a template for making a new strand, shown in yellow. Replication results in two daughter DNA molecules, each consisting of one original strand and one new strand.

Replication of the Double Helix

More than a dozen enzymes are involved in _____. Each "incoming" nucleotide pairs with its _____ on the parent strand. Enzymes called _____ (PAHL ih mur ayz ez) make the _____ between the nucleotides of the new DNA strand. The process is fast and amazingly accurate—an error occurs in only about one of a billion nucleotides.

DNA replication begins at specific sites called origins of replication. The copying precedes _____ in both directions creating replication _____. The parent DNA strands open up as

_____ strands grow on both sides of each bubble. Eventually, all the bubbles merge, yielding two double-stranded DNA molecules, each with one new and one old strand.



DNA replication begins at origins of replication and proceeds in both directions, producing "bubbles." Eventually, all the bubbles merge, resulting in two separate daughter DNA molecules.

DNA replication occurs before a _____, ensuring that the cells all carry the _____. It is also the mechanism for producing the DNA copies that _____ inherit from parents during reproduction.

For Homework:
Read section 10-1 for homework
On an index card, write one question that you may have from the reading. This will be due tomorrow.
Outline Section 10-1 from your text book. This will be due Thursday.