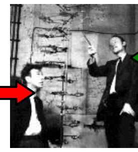
A.P. Biology   Name ______________________________

Campbell – Chapter 16 – The Molecular Basis of Inheritance 305-310

Who are these dudes?

A. ____________  B. _______________

What distinguishes DNA from all other molecules? __________________________________

What does the adage "Like begets like" mean? ______________________________________

DNA As The Genetic Material

In what grade did you first learn about DNA? _____

The discovery that genes are located on chromosomes is attributed to _______________.

What was the laboratory subject that was used to determine this? ___________

Evidence That DNA Can Transform Bacteria

When Frederick Griffith injected R strain bacteria into mice, the mice ____________.

When Frederick Griffith injected S strain bacteria into mice, the mice ____________.

When Frederick Griffith injected heat-killed S strain bacteria into mice, the mice __________.

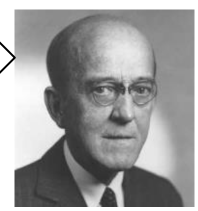
When Frederick Griffith injected non-pathogenic R strain bacteria mixed with heat-killed S strain bacteria into mice, the mice ______________.

Did these "transformed" bacteria have *transformed* or *non-transformed* offspring? ________________

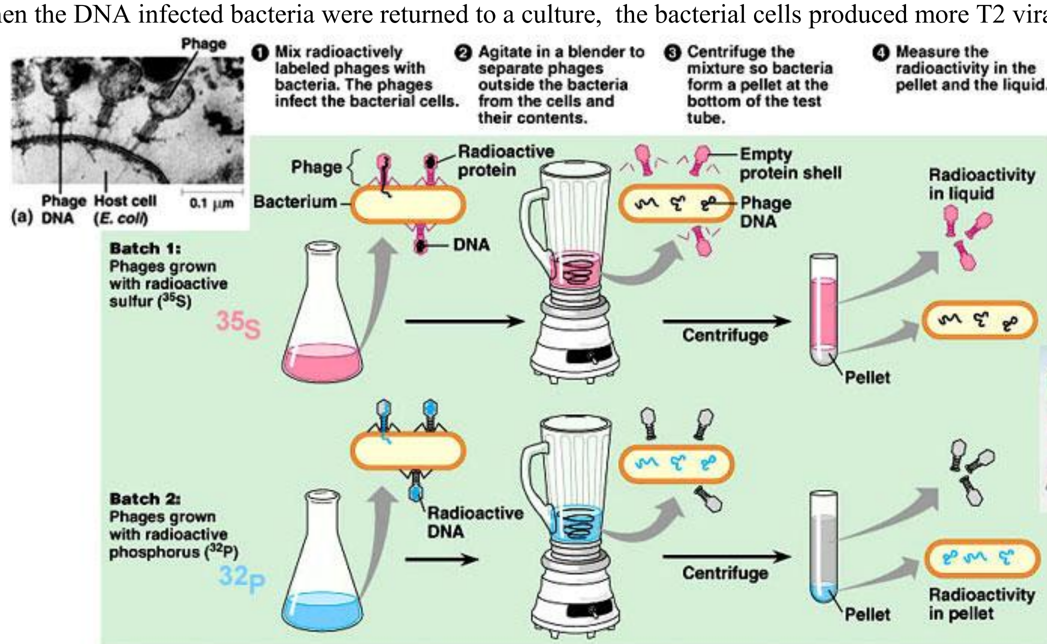
It was established by Griffith that inheritance has a biochemical basis, and that chemical is inherited.

The identity of this heritable agent was made by American bacteriologist ________________.

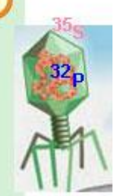
The "transforming agent" turned out to be __ __ __.



Hershey and Chase confirmed the identity of DNA as the transforming agent by exposing Bacteria (*E. coli*) to viral DNA and viral Proteins. The proteins aggregated on the outside of the exposed bacterial cells, but the DNA was found on the inside. Furthermore, when the DNA infected bacteria were returned to a culture, the bacterial cells produced more T2 viral cells.

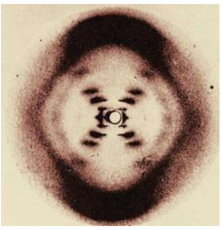


(b) The experiment showed that T2 proteins remain outside the host cell during infection, while T2 DNA enters the cell.



Erwin Chargaff determined that the amount of adenine in a cell always equals the amount of ___________, and the amount of cytosine always equals the amount of _______________.
Chargaff's Rule: ___ = T and ___ = G.

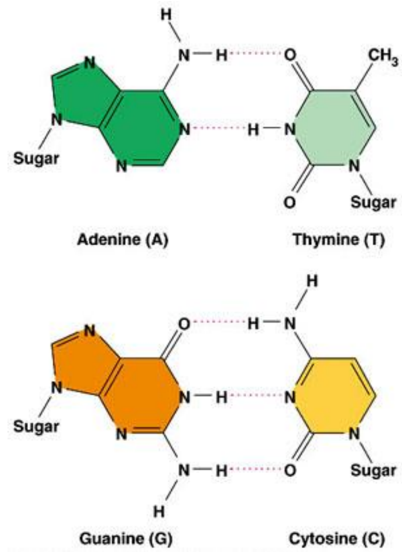
The Discovery Of The Shape Of DNA



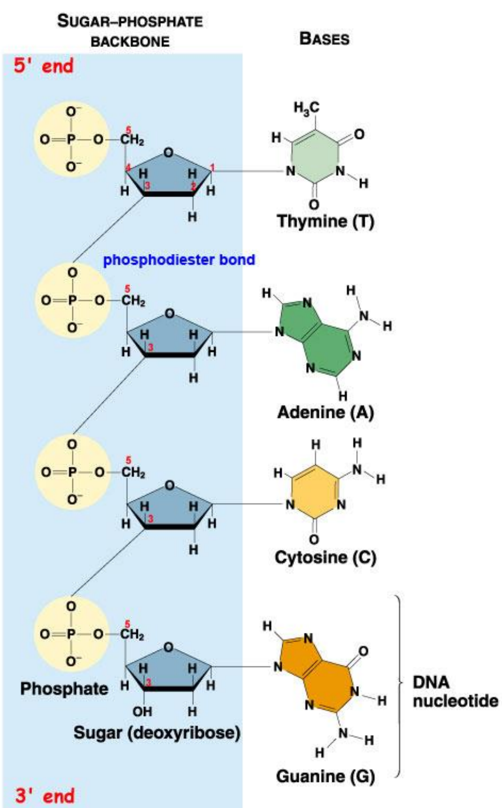
X-Ray diffraction experiments were being performed in the laboratory of _________________ by his lovely colleague, _____________.

She passed X-rays through crystallized DNA to create the image on the left. Watson was familiar enough with the process and result to recognize that the shape of the DNA molecule must be a ___________ containing _____ (#) strands. From these two pieces of information, we now called the shape of DNA a __________ _______.

Are phosphates *hydrophilic* or *hydrophobic*? _____________
Are neutral nitrogenous bases *hydrophilic* or *hydrophobic*? _________________
Watson placed the phosphates on the (inside / outside) of the model and the nitrogenous bases on the (inside / outside).
Their model agreed with Chargaff's rule by pairing A with ___ and C with ___.
A and G are called ____________ because they contain two rings.
C and T are called ________________ because they contain a single ring.
In DNA, a purine always pairs with a ________________.
A forms _____ (#) hydrogen bonds with T and C forms _____ (#) hydrogen bonds with G.
The true beauty of the model, however, was that it suggested a basicmechanism for the DNA molecule to ______________ itself.



Draw a circle around the purines in the graphic to the right.
Draw a square around the pyrimidines in the graphic to the right.
Draw a oval around each hydrogen bond.



To the left, you are viewing the Sugar-Phosphate backbone of DNA.
Draw a Phosphate in the square below:

Draw a Sugar in the square below:

Is every phosphate the same? ________ (*Yes* / *No*)
Is every sugar the same? ________ (*Yes* / *No*)
The "top" of the backbone is called the _____' end.
The "bottom" of the molecule is called the _____' end.
How many different DNA nucleotides are there? _____

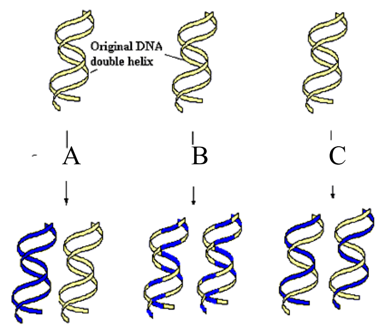
Did Watson and Crick *explain* a mechanism for replication in their first paper or simply *suggest* that DNA's structure hinted at a copying mechanism? ____________________

If two DNA strands have "opposite" arrangements of nucleotides, they are said to be c_________________.

Are nucleotides added (during replication) *one at a time* or *several at a time*? ______________________

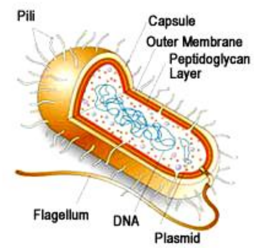
DNA Replication Model Matching

A. Dispersive Replication Model
B. Conservative Replication Model
C. Semiconservative Replication Model



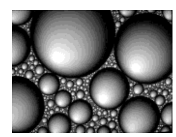
The Meselson-Stahl Experiment tested the three hypotheses and supported the ______________ model.

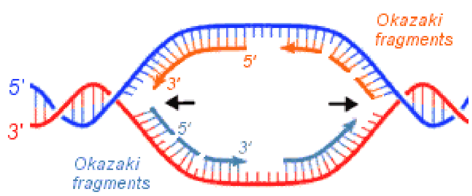
How many base pairs in bacterial DNA? About __________________!
A diploid human cell (somite) has how many strands of DNA in its nucleus? _________
How many base pairs in human DNA? About ___________________!
How long does human DNA replication take? ___________________
How often does an error occur? ____________________
How many enzymes participate in DNA replication? ________________



Getting Started: Origins of Replication

A bacterial cell has _____ (#) origin(s) of replication.
Is bacterial DNA *linear* or *circular*? ______________
Is human DNA *linear* or *circular*? _____________
A human cell has perhaps _______________(#) origins of replication.
The site where replication separates the two complimentary strands is called a replication b________________.
At the ends of the replication bubbles are the replication f___________.



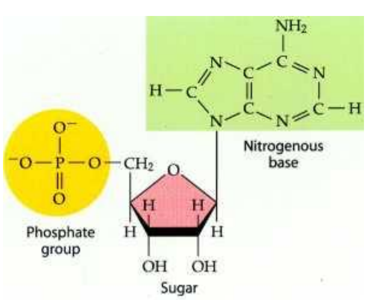


In the diagram to the left, **circle** the replication forks and **color** in the replication bubble.

Nucleotides are added to a newly-synthesized growing complimentary strand by an enzyme named ___________________.
This addition occurs at the rate of __________ nucleotides per ________ in humans.
The nucleotides are provided by n_________ t___________, of which there are four – one for each base! This exergonic reaction is driven by the separation of _____ (#) phosphate groups from the triphosphate.

The Antiparallel Arrangement Of The DNA Strands

Do the S-P backbones of DNA run in the *same* direction or in *opposite* directions? ______________

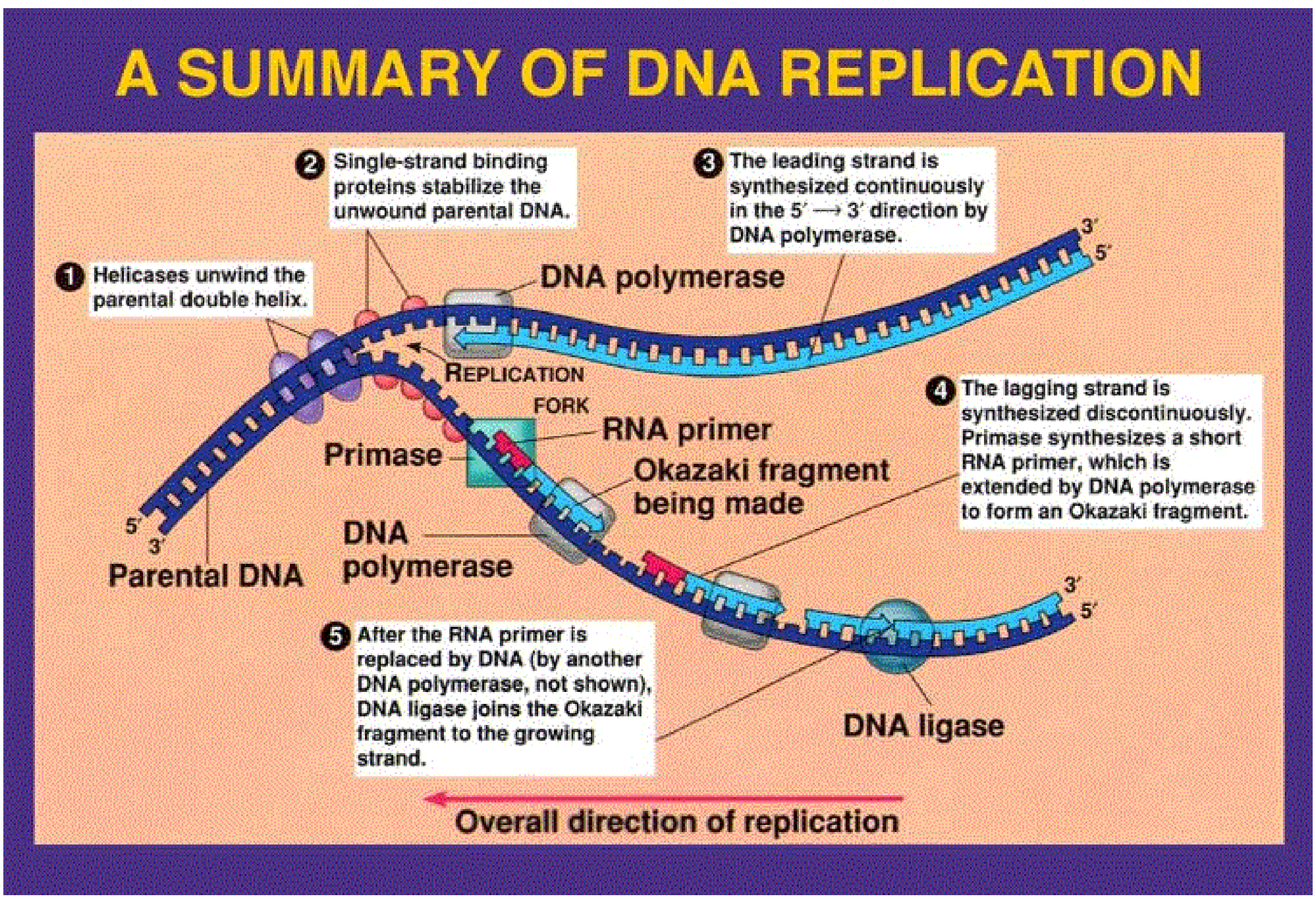


Number the five carbons (as 1, 2, 3, 4, and 5) in the nucleotide drawn to the left.

A nucleotide's phosphate is connected to the _____' carbon.
A nucleotide's base is connected to the _____' carbon.
At the terminal end of a side of DNA, the 3' carbon is attached to a ______________.
At the leading end of one side of DNA, the 5' carbon is attached to a ______________.
DNA can only elongate in the ___' → ___' direction.
When DNA replicates, one strand is called the _____________ strand and the other strand in the bubble is called the __________ strand.
In the leading strand, nucleotides are added _____ at a time.
In the lagging strand, nucleotides are added in DNA fragments called ____________ fragments.
How long are these fragments? ________________ nucleotides.
The enzyme _____________ is utilized to join together Okazaki fragments.
What serves as a primer to initiate separation of the sister strands? A length of __ __ __! The enzyme that joins the RNA to the "unzipped" DNA is named _______________. Is the RNA that is attached *permanent* or *temporary*? ____________
On the leading strand, _____ (#) primer(s) is (are) required.
On the lagging strand, there is one primer for every ___________ ____________.

Other Proteins Assisting In DNA Replication

The enzyme that "unzips" DNA at the replication forks is named ________________.
What is **single-strand binding protein** used for? ____.
Does our current, best information indicate that the *DNA strands move during replication* or that *the enzyme-complex moves along the length of DNA* (like a freight train)? ____



What happens to the length of a DNA molecule after repeated replications (preceding mitosis and meiosis)? They get ____________!

At the end of eukaryotic DNA there is a repetitive area of nucleotides called the _____________ that contains no g________________. These ends are eroded after many rounds of DNA replication, and they are not repaired.

This process could not occur endlessly because DNA damage would be passed on from generation to generation. Instead, an enzyme named ______________ re-lengthens the telomeres in germinal epithelium. In somatic cells, this repair does not occur and is thought to contribute to aging. Curiously, telomerase is also found in _____________ tissues.