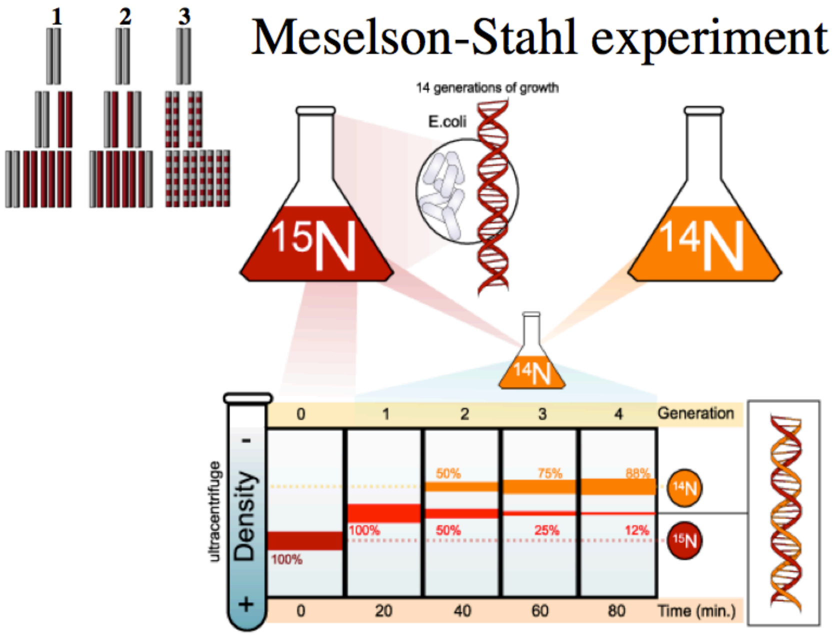
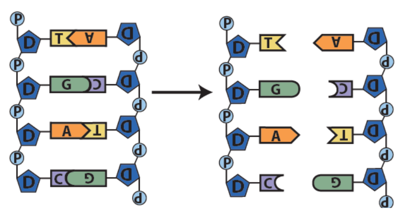
Name: ________________________ Period: _____ Date: ___________________

DNA Replication



Step 1

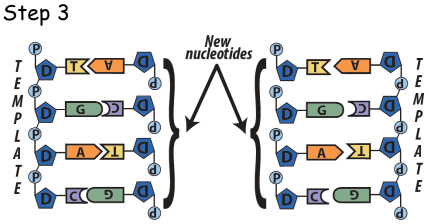


- The strands __________

Step 2

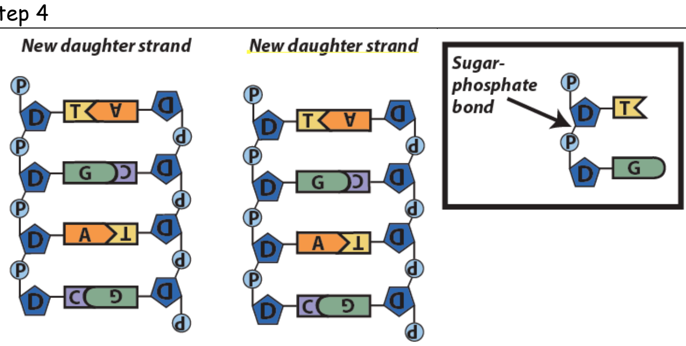
- Each single strand now serves as a _______________ for synthesis of a new strand.

Step 3



- New ____________ nucleotides bind with the parent strands

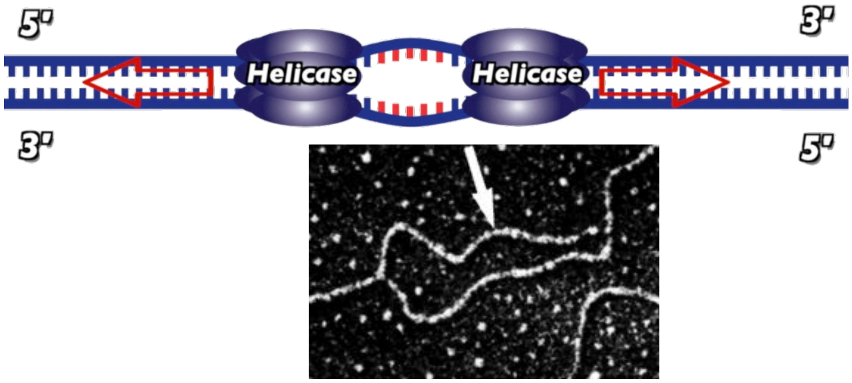
Step 4



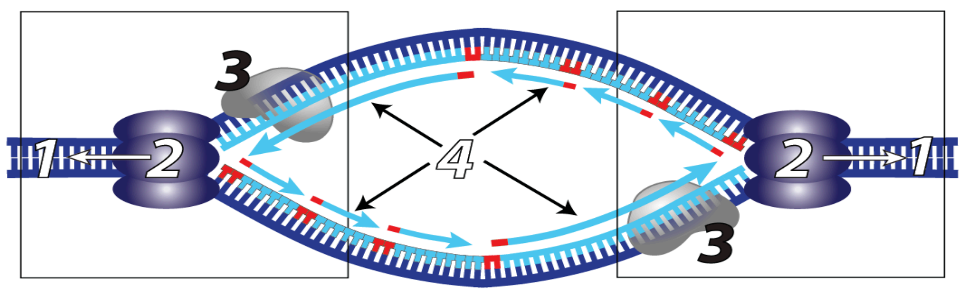
- _________ seal ______________ bonds between the sugars and the ______________ of adjacent nucleotides.

DNA REPLICATION: THE DETAILS

Origin of replication

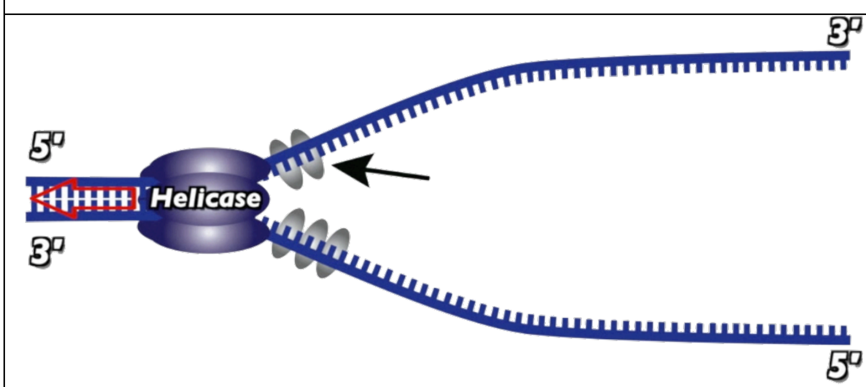


Replication begins as DNA ________________ finds an ___________, and creates a ______________ *bubble*



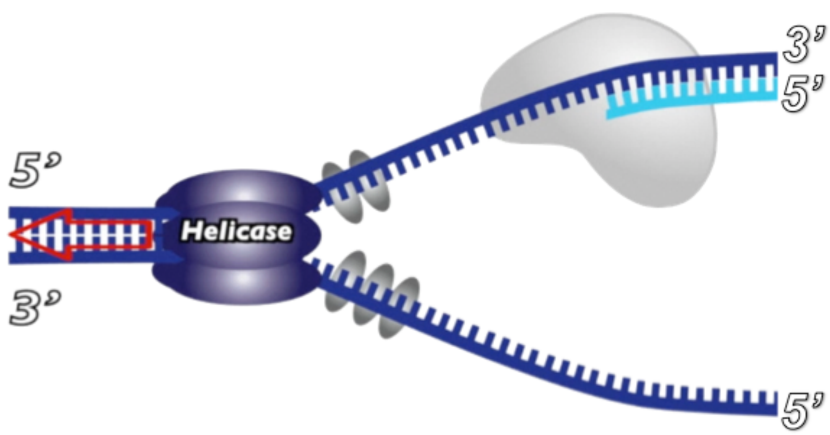
Replication Fork

1. ________ DNA
2. ____________
3. DNA polymerase
4. __________ DNA



Single Strand Binding Proteins

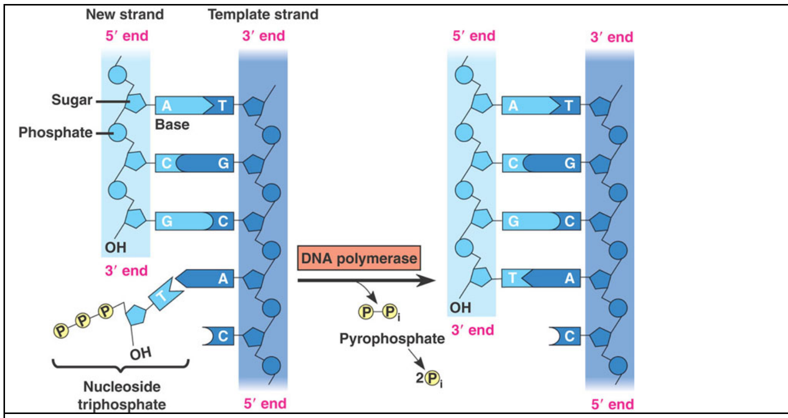
keep DNA from ______________

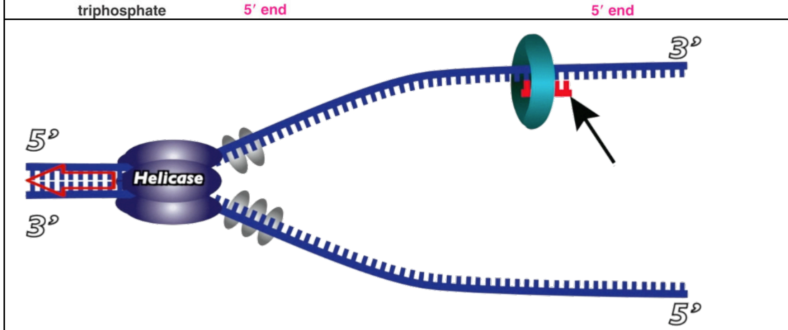


DNA Polymerase III (big picture)

uses the parent strand as a _________ and adds a new ___________ at the 3' end

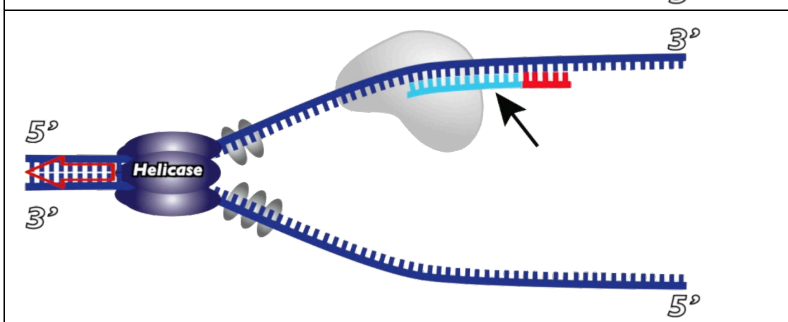
template: something that serves as a model for others to copy: *the plant was to serve as the template for change throughout the company.*

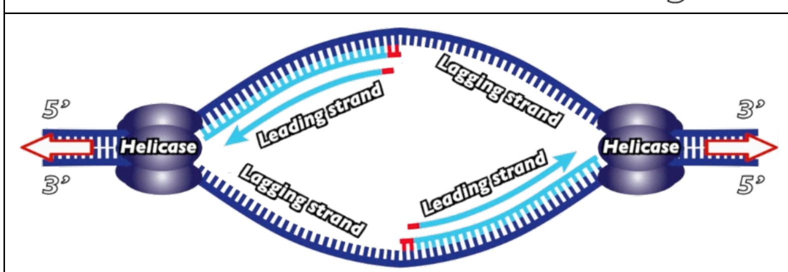
<table>
<tr>
<td>
</td>
<td>DNA Polymerase III

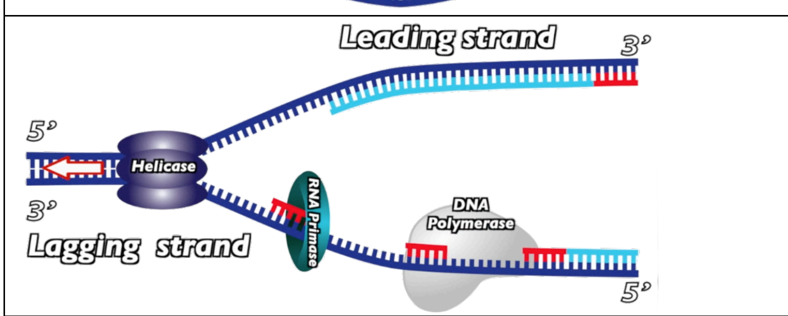
Waits for free ____________ to ____-bond with bases on the template strand.
Creates sugar-__________ bond between existing strand and new _____________ at the __________ end.
Energy comes from _____________ groups on nucleotides.
</td>
</tr>
<tr>
<td>
</td>
<td>Priming:

Why: Because DNA polymerase III can ____________________
Primase

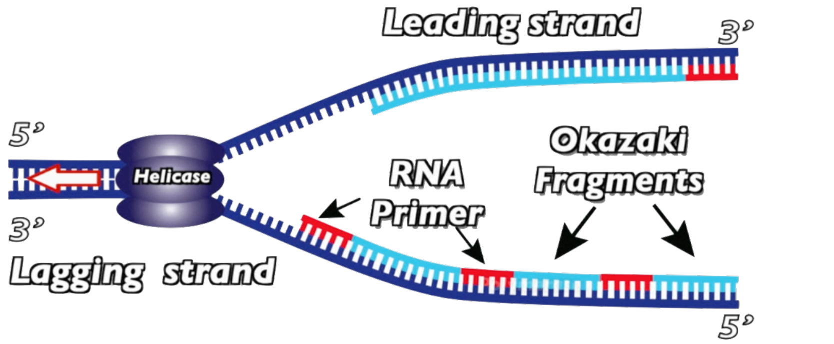
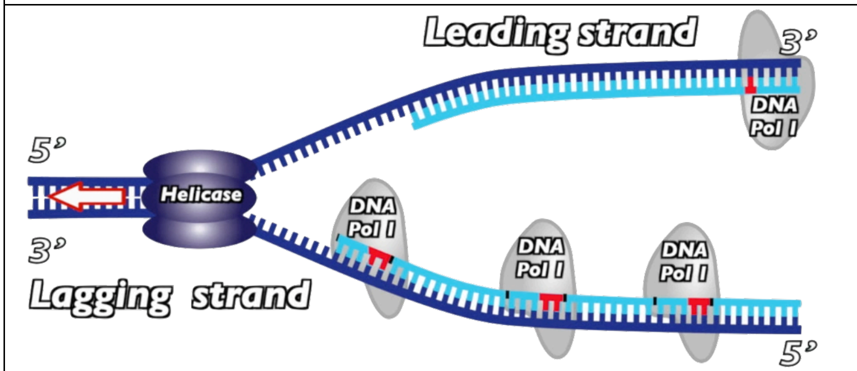
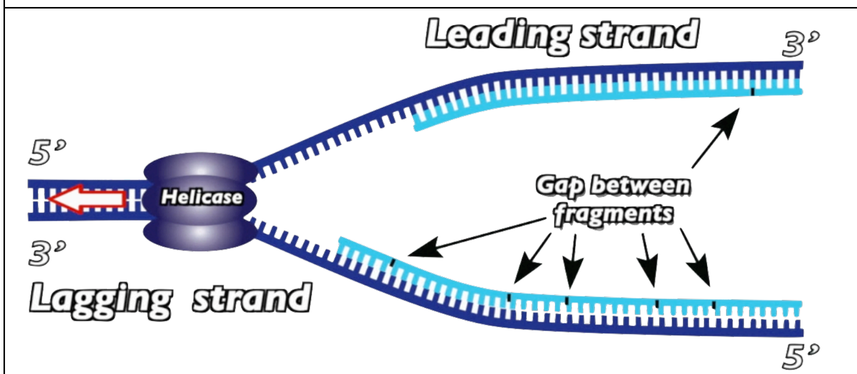
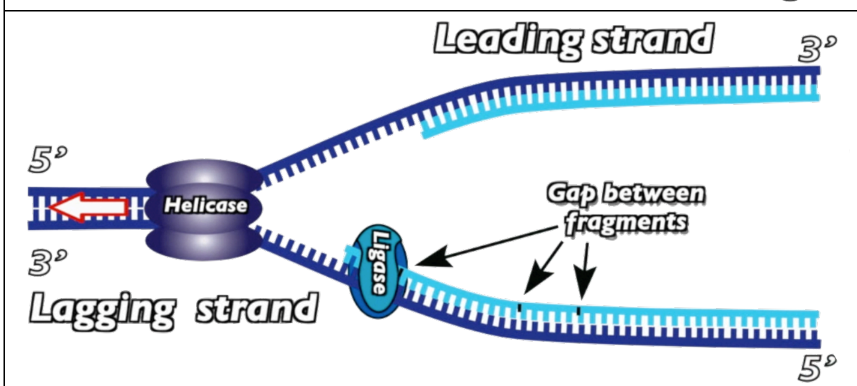
Starting from origin, lays down a short strand of complementary ___________
Works in ____′ to 3′ direction.

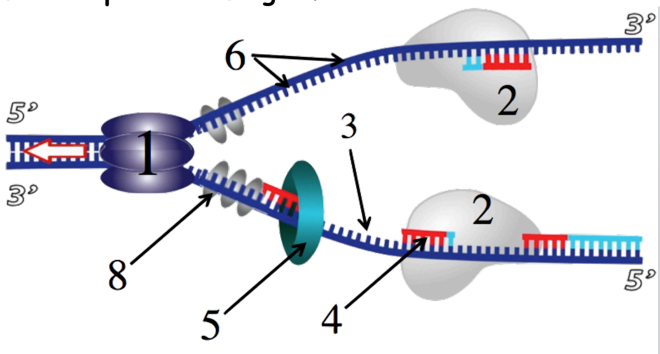
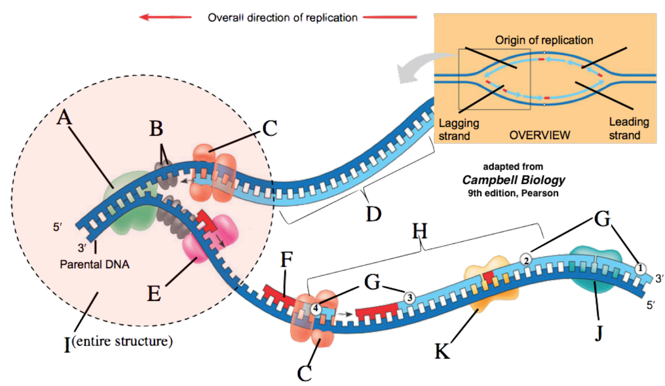
</td>
</tr>
<tr>
<td>
</td>
<td>After Priming…

DNA _______________ III takes over, adding new nucleotides at ___′ end</td>
</tr>
<tr>
<td>
</td>
<td>Leading v. Lagging strand

The strands where DNA polymerase III follows the opening ______________ fork is the leading strand
Replication moves _________________ in a 5′ to 3′ direction.
</td>
</tr>
<tr>
<td>
</td>
<td>What happens on the Lagging strand

In _____________ strand, DNA polymerase III moves _____________ from the opening replication fork.
Replication is in short pieces called _________________ fragments
</td>
</tr>
</table>

	**Lagging strand replication:** **Okazaki Fragments**
	DNA Polymerase 1 • Removes the _____________... • And replaces the _________ with DNA.
	After DNA Polymerase 1... • Fragmentary synthesis results in __________ in the sugar-phosphate backbone
	DNA ____________ • Creates a sugar-phosphate bond between one _____________ and the next.

DNA Replication Diagram 1	**DNA Replication Diagram 2**
 **key**	 **Key:**

Notes from the DNA Replication Animation at Wiley.com

DNA Replication Rap

DNA's structure, with its bases complementary ,
Makes replication easy, but not quite elementary
Since A only bonds with T and C with G,
The double helix seems to copy naturally,

or as Crick and Watson said: (PAUSE BEAT)

CHORUS
"It has not escaped our notice
that that the specific pairing
we have postulated
immediately suggests
A possible copying mechanism
for the genetic material."

You first unzip the DNA in one or more places,
Breaking hydrogen bonds to separate the bases.
Each resulting single strand serves as a template,
Allowing enzymes to replicate

New strands with complementary bases that match
And through hydrogen bonds these bases attach
Each nucleotide now bonds to the next
Through a sugar-phosphate bond they connect

Meselsohn and Stahl proved in '58
That this is how the double helix replicates
One strand new, the parent strand preserved,
In other words the whole thing is semi-conserved,

CHORUS
Now let's see how replication really goes,
With blind, mindless enzymes controlling the show.
Made more complex by something you can see
Each DNA strand has directionality

5 prime to 3 is how the enzymes go,
(Just refer to the carbons in deoxyribose)
So when a new strand is synthesized
Nucleotides get added on the 3 prime side

The process begins with helicase,
Which opens up the helix at a special place
Breaking hydrogen bonds at the **origin**,
A sequence telling helicase where to begin

A replication fork is now composed,
Where both parent strands have their bases exposed
And to keep the double helix from rewinding,
Single strand proteins come in and start binding.

Note two forks always form when DNA doubles,
The whole thing's called a replication bubble
Now it's primase's turn, the next enzyme
To come to the origin at this time

Primase lays down a primer of RNA,
Complementary to the template DNA.
Setting the stage for the star of our show
DNA polymerase, now set to go.

DNA polymerase's job is to add
Deoxyribonucleotides to a growing strand.
But polymerase needs a growing strand in place,
Which is why initiation is the job of primase.

What happens now is simple, it's a replication race,
As polymerase follows helicase,
As the fork opens up, replication proceeds,
With nucleotides added at incredible speed.

CHORUS
What we've said applies to the leading strand
Where replication's smooth, continuous and grand,
But on the second strand, fork opens 3 to 5:
a direction where polymerase can't polymerize

So instead of following helicase,
Polymerase moves *away* from the forking place
So replication's lagging, and fragmentary
As discovered in '66 by Okazaki

So the lagging DNA's filled with Okazaki fragments,
And RNA primers, and to clean up this mess,
Polymerase 1 removes the primer,
Puts deoxyribonucleotides in what could be finer?

And now the fragments need to be connected,
So the new DNA can be perfected,
Ligase carries out this function with pride,
Sealing sugar-phosphate bonds between nucleotides
CHORUS

DNA REPLICATION: THE WHOLE SHEBANG