* DNA
  + Genetic material used indirectly to make proteins using RNA and ribosomes
  + All organisms (except some Viruses)
* Replication
  + 3 types of proteins
    - Helicase (unravels DNA strands [brakes the Hydrogen bonds that are between the Nucleotides])
    - Binding proteins (forces the strands to stay separated)
    - Topoisomerase (relives strain on the DNA caused by the unwinding)
  + Points of origin (where the DNA starts to be unwrapped)
    - In Eukaryotic cells there are multiple point of origin as they have more DNA to use. They go in to different directions (forming a “bubble”) and the way this is done will be discussed latter
    - Prokaryotic cells have one point of origin as they DNA is in a circle
  + RNA primase
    - The point of this is to add a primer (RNA primer) so that the DNA polymerase can attach and add the new DNA nucleotides.
    - Attach at a 3’ end and works its way to the 5’ end
  + Forks
    - Because of bubbles that were mentioned before there are DNA “forks” where the DNA strands are being separated which allows for access to the 3’ end in the middle of the bubble but causes problems going the other way which is solved by the Okazaki fragments
  + Okazaki fragments
    - Because the primers are only able to attach to the 3’ end and part of the bubble opens in the 5’ – 3’ directions the RNA primase has to form short segments that move toward the 3’ and work their way back toward the 5’ end.
    - These segments are Called Okazaki fragments and were discovered by Reiji and Tsuneko Okazaki
    - The none fragmented section is called the leading strand and the Okazaki fragments are called the lagging strand
  + Remaining RNA
    - After all the segments are filled with either RNA or DNA (placed there by DNA polymerase III) the DNA polymerase III is detached and DNA polymerase I attaches and replaces the RNA nucleotides with the their DNA counterpart.
    - Ps the difference between the 2 types of the Nucleotides is that RNA has U while DNA has T and that RNA has an extra oxygen.
  + Telomeres
    - End of the DNA strands with extra DNA that is lost after each division
    - The DNA is lost because even if the RNA primase attaches to the very end of the DNA strand the DNA polymerase won’t be able to attach so part of the end will always be lost
    - Why does this matter? Because it limits the DNA to a certain amount of copies.
  + Cancer
    - Cancer is a cell that divides rapidly without control.
    - How does this happen? The Gene that controls Telomerase (enzyme that extends the Telomeres) is turned on and so the cell can continually divide without cutting into the needed DNA information

1. DNA polymerase III and DNA polymerase I have different purposes in the DNA replication process what is the difference
   1. There is no difference
   2. DNA p III replaces the RNA Nucleotides with their DNA counter parts while DNA p I attaches to the primer and adds the DNA nucleotides
   3. DNA p I replaces the RNA Nucleotides with their DNA counter parts while DNA p III attaches to the primer and adds the DNA nucleotides 🡸
   4. DNA p I adds binding proteins where DNA p III relieves Strain caused by unwinding
2. DNA can be compared to what?
   1. Blue prints
   2. Barcode 🡸
   3. Ladder
   4. None of the above
3. What are Okazami fragments
   1. The leading strand in DNA
   2. Separates the DNA strands from each other
   3. Strands of RNA caused by the 3’ – 5’ fork 🡸
   4. Excess DNA at the end of DNA that is removed after cell division
4. How are Cancer cells able to continually divide?
   1. Telomeres are elongated by increases amount of Telomerase 🡸
   2. Magic
   3. By cutting off the Telomeres
   4. All of the above
5. Which way do the proteins move along the DNA?
   1. 3’ 🡺 5’
   2. 3’ 🡸 5’
   3. 5’ 🡺 3’
   4. Both B and C

Essays:

1. Eukaryotes and Prokaryotes are both organisms that go through Replication, how is the process the same and how are they different between the two type of Organisms?

For starts looking at the structure of the DNA between the two different domains is that the prokaryotic cells have a lot less DNA in there structure and the DNA is in a Circle. This differs between the eukaryotes that have so much DNA that it is bunched up in chromosomes. Because of the large difference in amount of DNA there is another difference the amount of Points of origins. Because prokaryotic cells have circular DNA there is only one point of origin which is largely different then the eukaryotic cells that have millions of points of origins. Although there were some differences they are mostly the same in mechanic. The is a point of origin which RNA primase attaches to and adds a primer which is then attached to by the DNA polymerase III which files in the rest of the gapes and after that DNA polymerase I removes the RNA strands and adds the appropriate DNA nucleotide.

1. Why are Okazaki fragments necessary and how are they responsible for the deletion of the telomeres

Okazaki fragments are necessary because it is the only way that RNA primers are able to lay a track for the DNA Polymerase III to attach to while still going in the 5’ 🡺 3’ end which all the proteins aren’t able to do. This makes the fragments the only possible route to move in said direction. They are responsible for the deletion of the telomeres because the DNA polymerase needs a place to attach to which cant attach unless it has the primer. Even if the primer was to end right as the strand was to end the polymerase wouldn’t be able to attach and the left over DNA nucleotides were removed.