Part A

What process happens in S phase?

DNA replication

What is the first thing that must happen to start this process?

* Topoisomerase unwinds DNA & we don't get into but some will know
→ Helicase separates the DNA

What components from your supplies are needed for this step?

Blue ziploc Zipper

Using your supplies create a representation of the first step in this process

What cellular components arrive to maintain what happened in step 1?

Binding Proteins

What supplies do you have that can represent these components?

Thumb tacks

Using the appropriate supplies ensure step 1 will be maintained for the duration of the process

What is the orientation of each strand of DNA?

They decide
5' → 3'
3' → 5'

What are the names of each strand? Why are they different?

Leading + Lagging

Leading strand is constructed as a single continuous strand b/c DNA pol can follow as helicase opens.

Lagging strand is constructed in short stretches called Okazaki fragments b/c DNA pol can only add to 3' end + 3' end of the growing strand faces away from the replication fork

Using paper and tape (so your cardboard will remain reusable) label the orientation and name of each strand

What cellular component arrives now?

RNA primase

What does this cellular component do?

creates an RNA primer

Using your supplies, represent this cellular component carrying out its action on both strands simultaneously(ish)

Now that these temporary sequences are in place what component arrives?

DNA polymerase

Where does this component start its action?

at the 3' ends of the RNA primer

What does this component create?

Daughter strand DNA / Complementary DNA

Using your supplies, represent this cellular component carrying out its action on both strands simultaneously(ish). *Note that this representation should look different than the previous.

Part B

Observe the strands you started with and those you've created

What is different between the strands?

One is continous + one is discontinuous

What is the same?

Presence of RNA primer + newly synthesized DNA

What does green represent in the strands of this exercise?

RNA primer

What does the cell do about this?

Degrades the RNA + replaces w/ DNA

What cellular component carries this process out?

in Prokaryotes: DNA Pol I (DNA pol I but they dont have to know the num)
in Eukaryotes (in case): RNAse H + FEN1

Using your supplies, represent the cell's solution to the presence of the green sequences

What is the last hurdle to the new strands being complete?

The pieces need to be 'glued' together: Ligase does this

Represent the cell completing the strands

This process is carried out on the entire length of the strands you started with

What is the end product?

2 identical DNA molecules

This end product consists of what types of strands?

Each molecule has 1 parent + 1 daughter strand

Flip the model you've created.

What does this change? What doesn't it change?

changes leading + lagging strands + orientation of replication fork

What are your key take-aways from this exercise?