DNA Replication video assignment

You will make a 2 min long video with your team demonstrating the process of DNA replication. All members of your team should have on-camera speaking roles (e.g. we need to see their face and they should introduce themselves during their part of the video).

Materials:

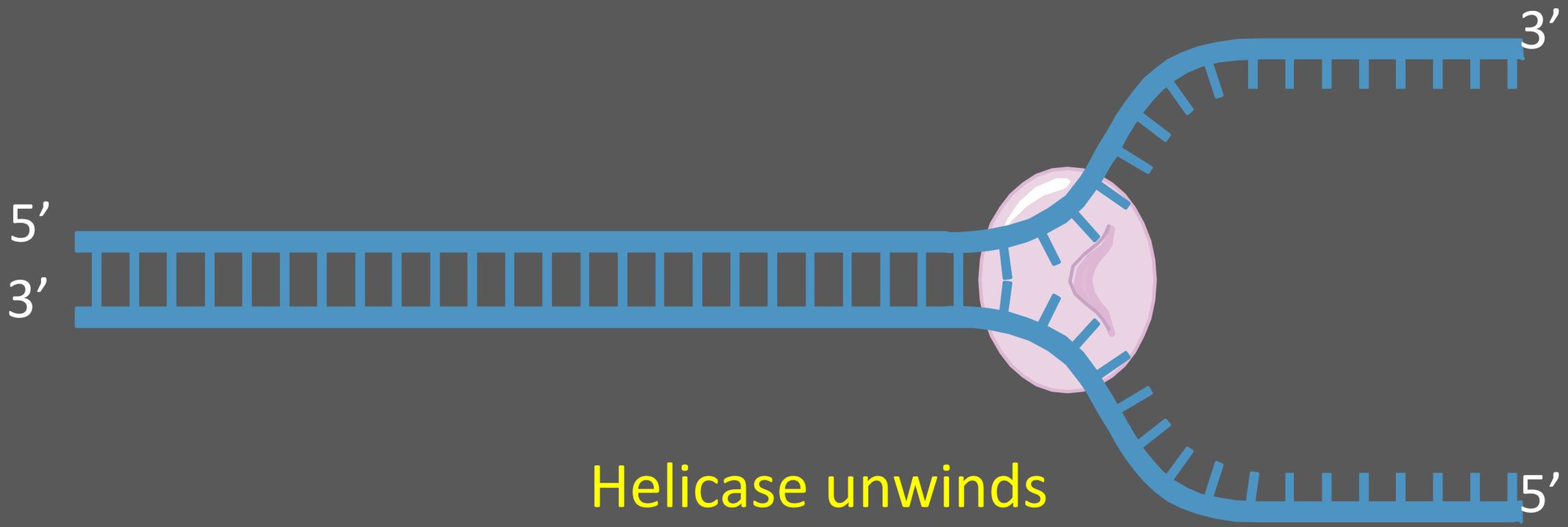
- 64 total PlusPlus pieces - these are your nucelotides.
- 4 additional PlusPlus pieces in white to be RNA Primer.
- 2 blue DNA Polymerase – one for leading, one for lagging strand
- 1 brown DNA helicase - use the wedge to pry the “DNA” strand apart
- 1 black ligase - slide the slot over the new DNA strands to squeeze the pieces together.

Your video should achieve the following:

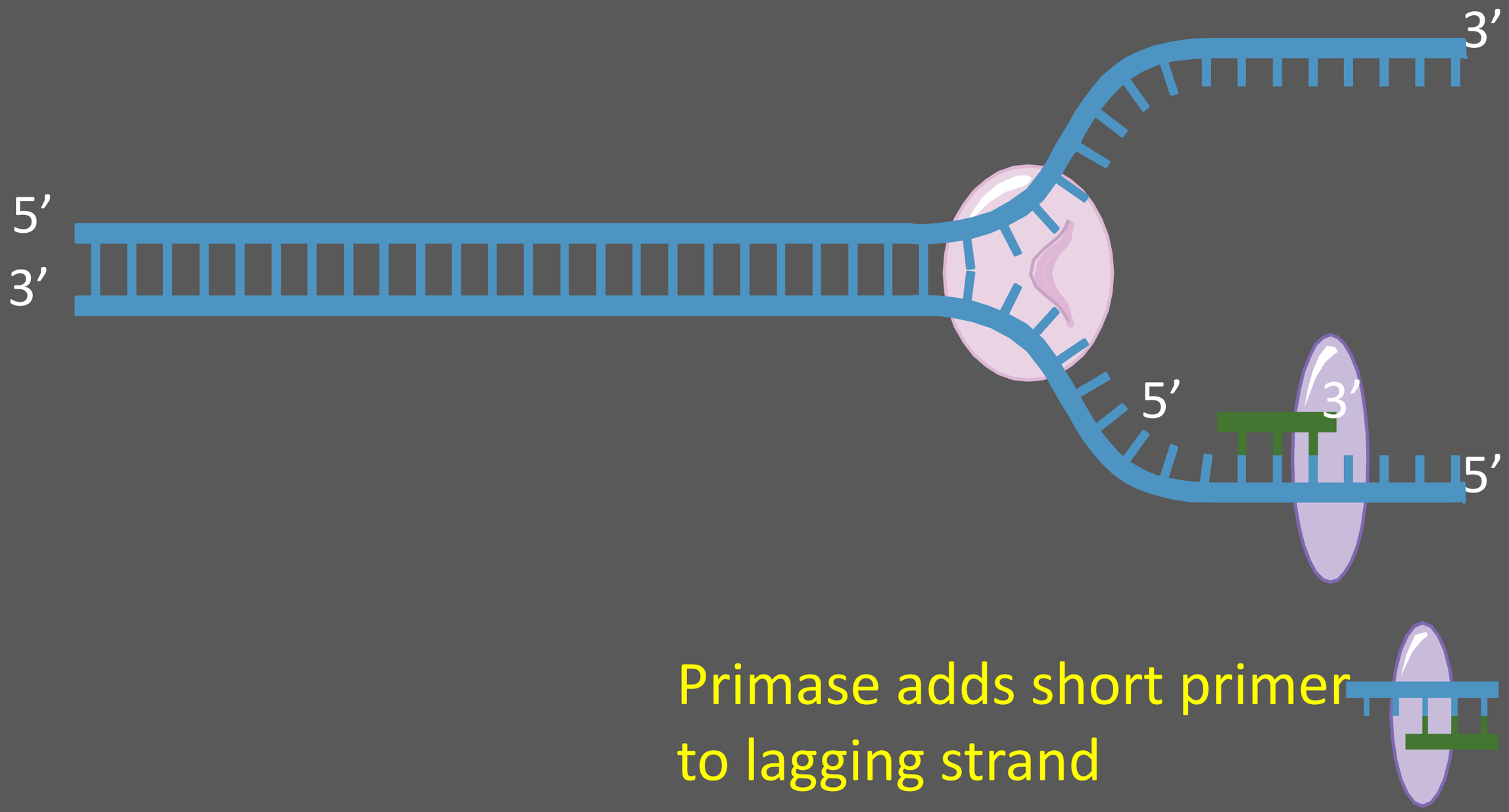
1. Identify the colors that you will use to represent A, T, G, and C, and RNA primer.
2. Make one double stranded DNA molecule that is **16 base pairs (bp)** long.
3. Demonstrate "unwinding" - Use Helicase to unzip to 1st replication fork (about 8-10 bp in)
4. Demonstrate replication of Leading strand 3' (add RNA primer and DNA Polymerase enzyme to build daughter strand).
5. Demonstrate replication of Lagging strand 5' (add RNA primer and DNA Polymerase enzyme to build daughter strand).
6. Use Helicase to unzip rest of DNA molecule
7. Continue replication of Leading strand 3' (use DNA Polymerase enzyme to build daughter strand).
8. Continue replication of Lagging strand 5' (add additional RNA primers and DNA Polymerase enzyme to build daughter strand).
9. Conclude replication
10. Remove RNA primers, fill in gaps with correct PlusPlus pieces, and use ligase to "bind" the nucleotides together.
11. Each group member should introduce themselves and appear on camera doing some of these steps.

Work with your team to identify who will demonstrate each process above, what they will say, the best place to stand when filming, the best position for the demonstrator's hands so they do not cover up what they are doing, best way to edit video so its not too long or boring (should not be longer than 2 minutes and we don't need to see you add in *every* plus plus piece), etc. In other words, you want to practice this before you shoot video!

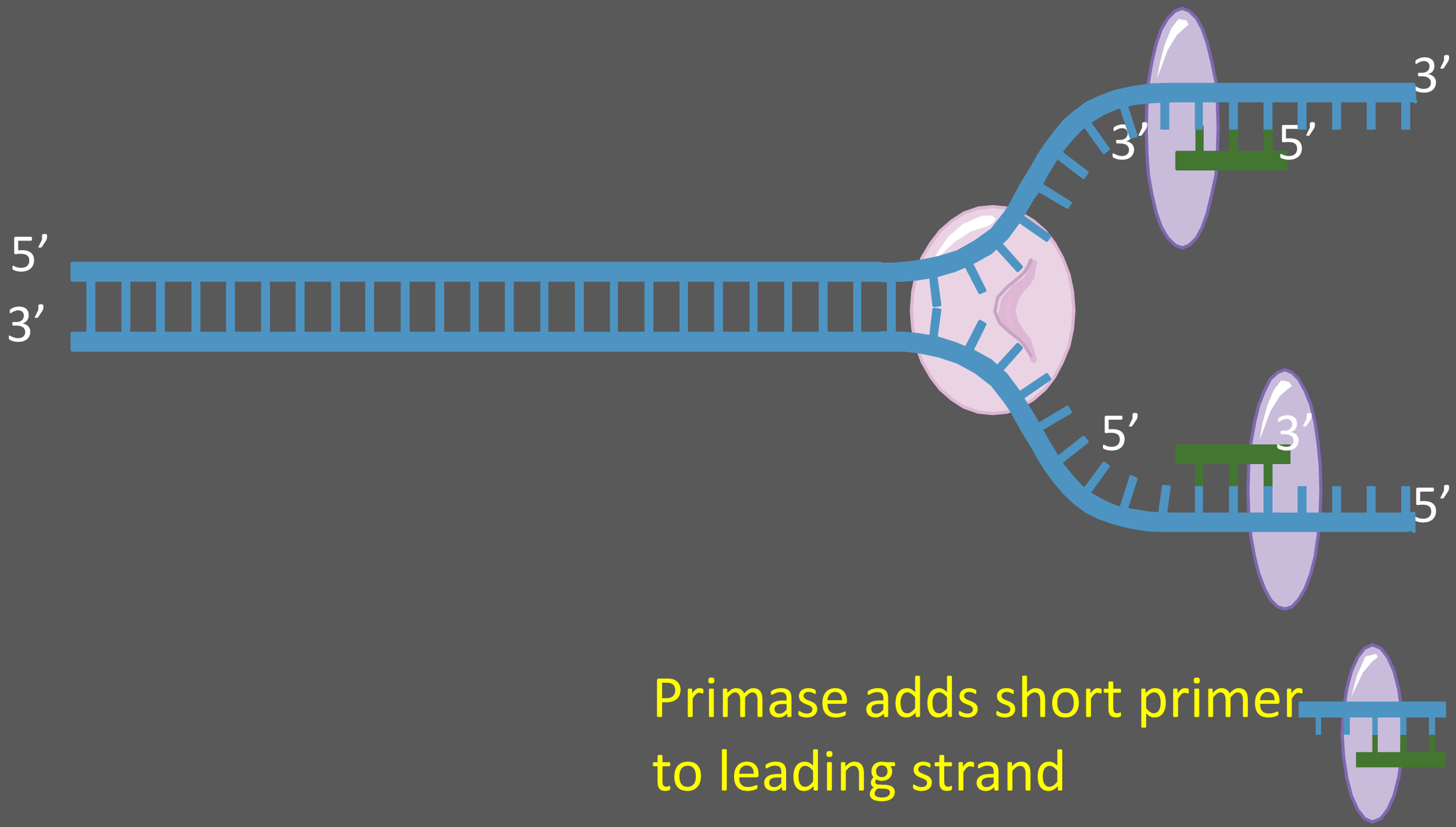
First, let’s review DNA replication



Stabilizing enzymes such as gyrase are not shown here.



Primase adds short primer to lagging strand



Primase adds short primer to leading strand

Overall direction of replication

5’

3’

3’

3’

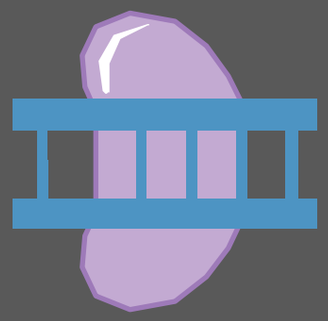
5’

5’

3’

5’

DNA polymerase binds nucleotides to form new strands



Overall direction of replication

5’

3’

3’

5’

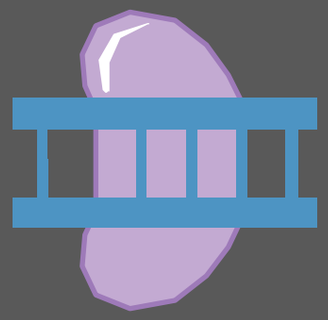
3’

5’

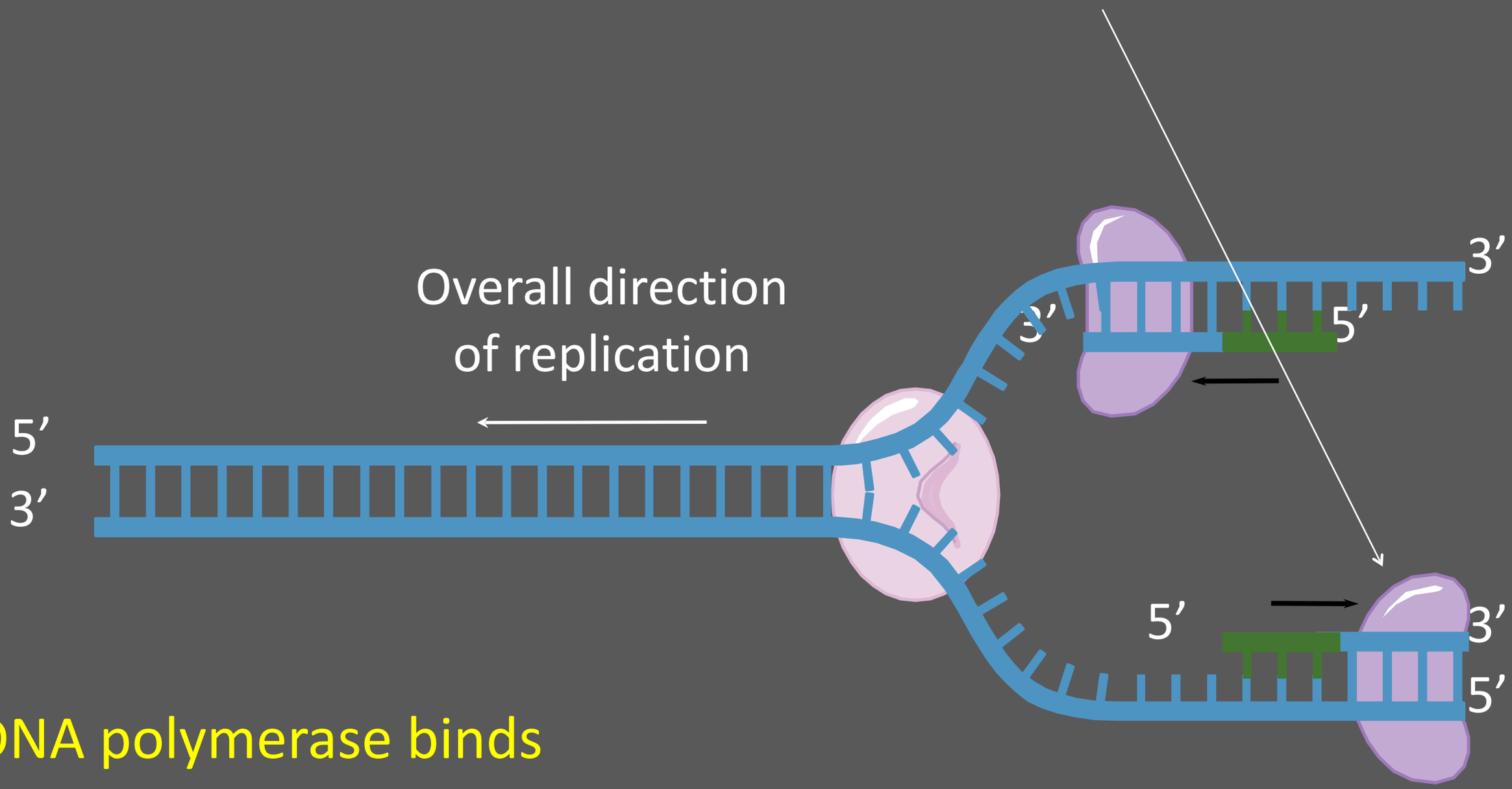
5’

3’

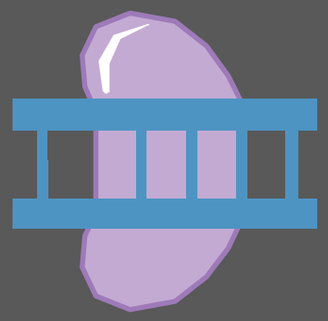
DNA polymerase binds nucleotides to form new strands



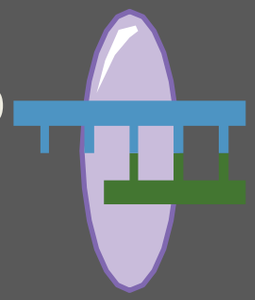
Why is this guy going the “wrong” direction?



DNA polymerase binds nucleotides to form new strands



Primase adds short primer to lagging strand



Overall direction of replication

5’

3’

3’

5’

3’

5’ 3’ 5’ 3’

5’

Overall direction of replication

5’

3’

3’

5’

3’

5’

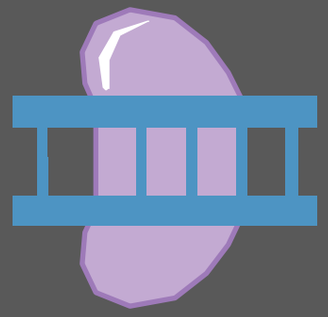
5’

3’

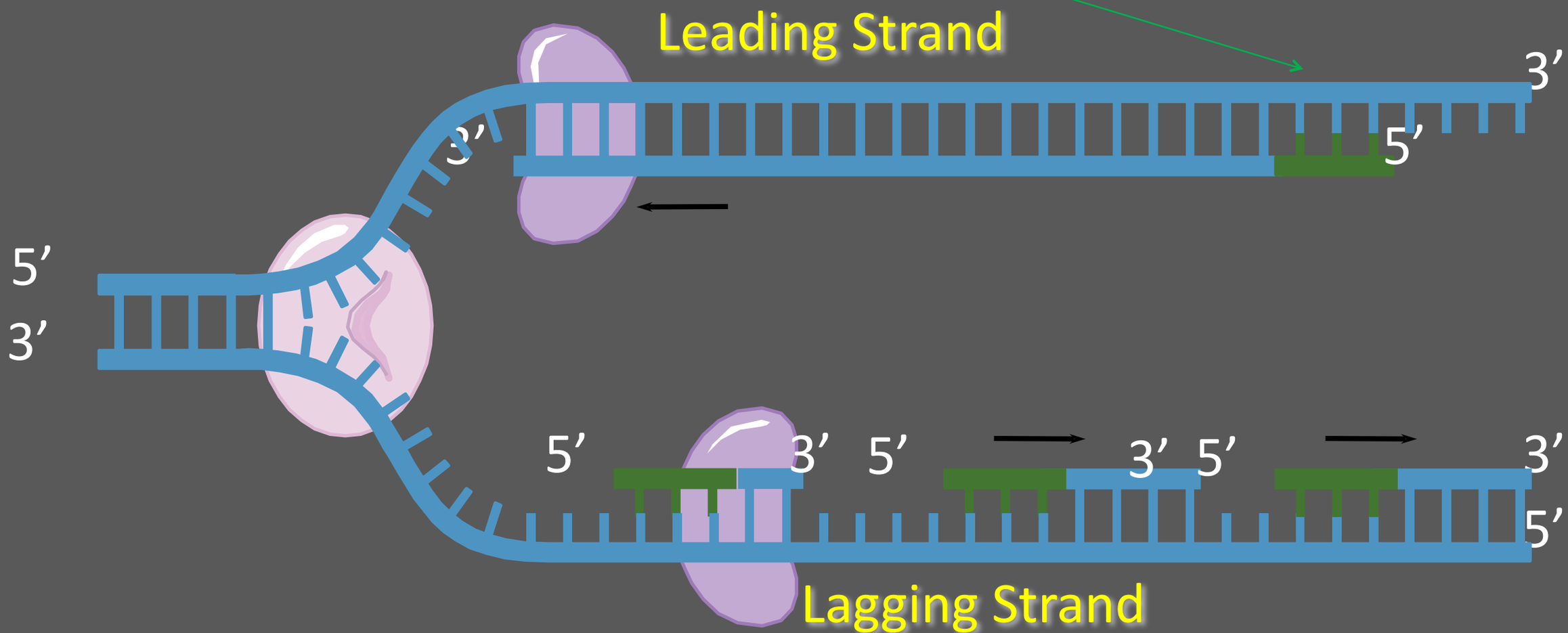
3’

5’

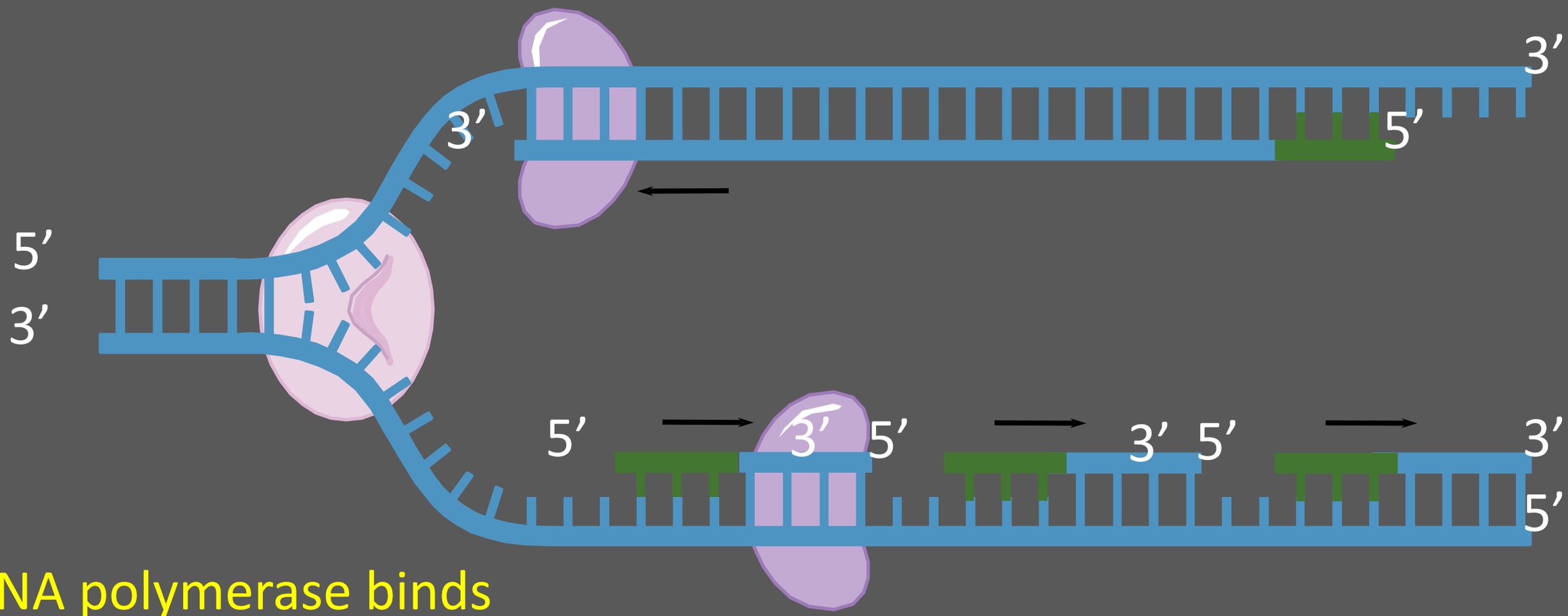
DNA polymerase binds nucleotides to form new strands



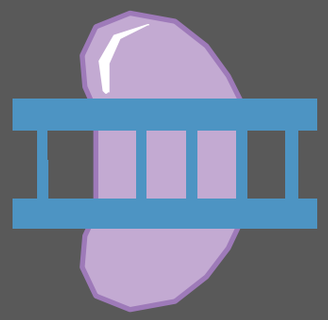
How many primers does the leading strand require?



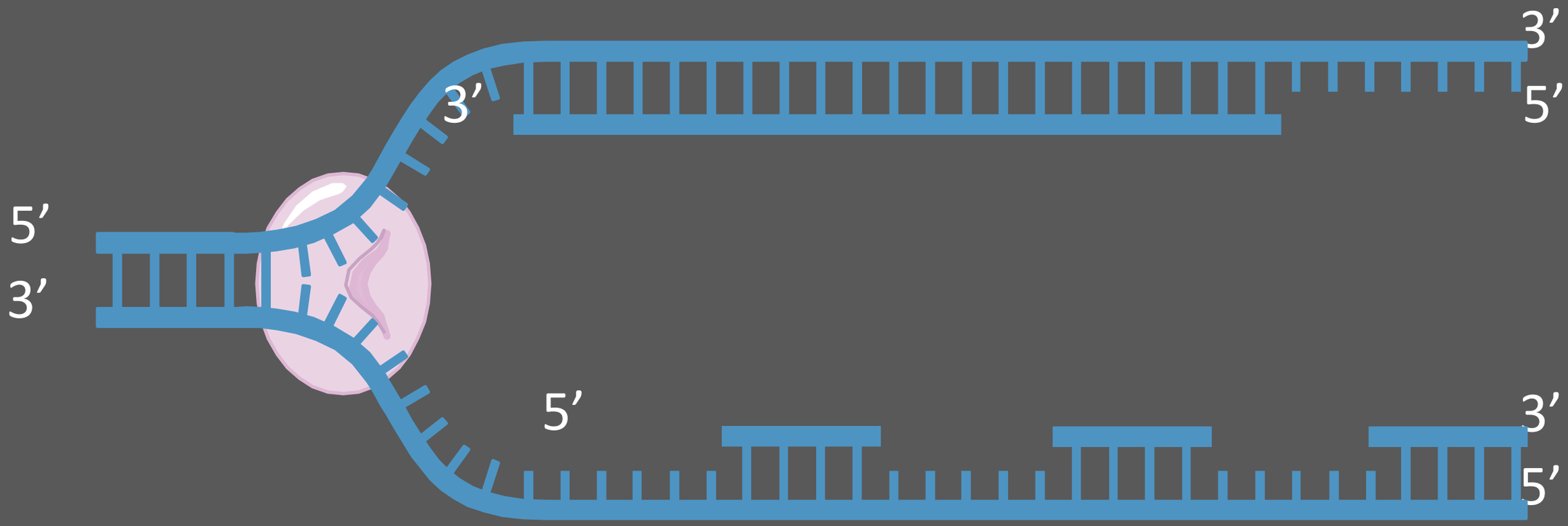
What happens to all the temporary RNA Primers?



DNA polymerase binds nucleotides to form new strands

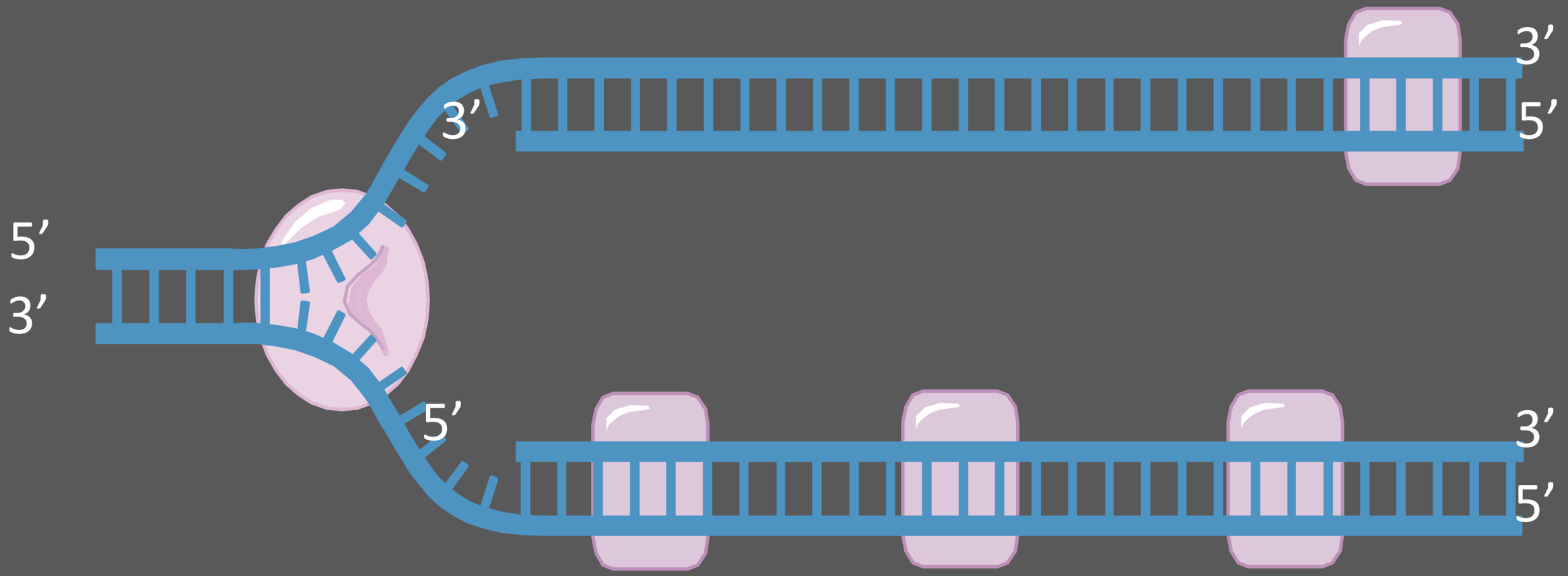


Enzymes (not shown) delete the temporary RNA primers.

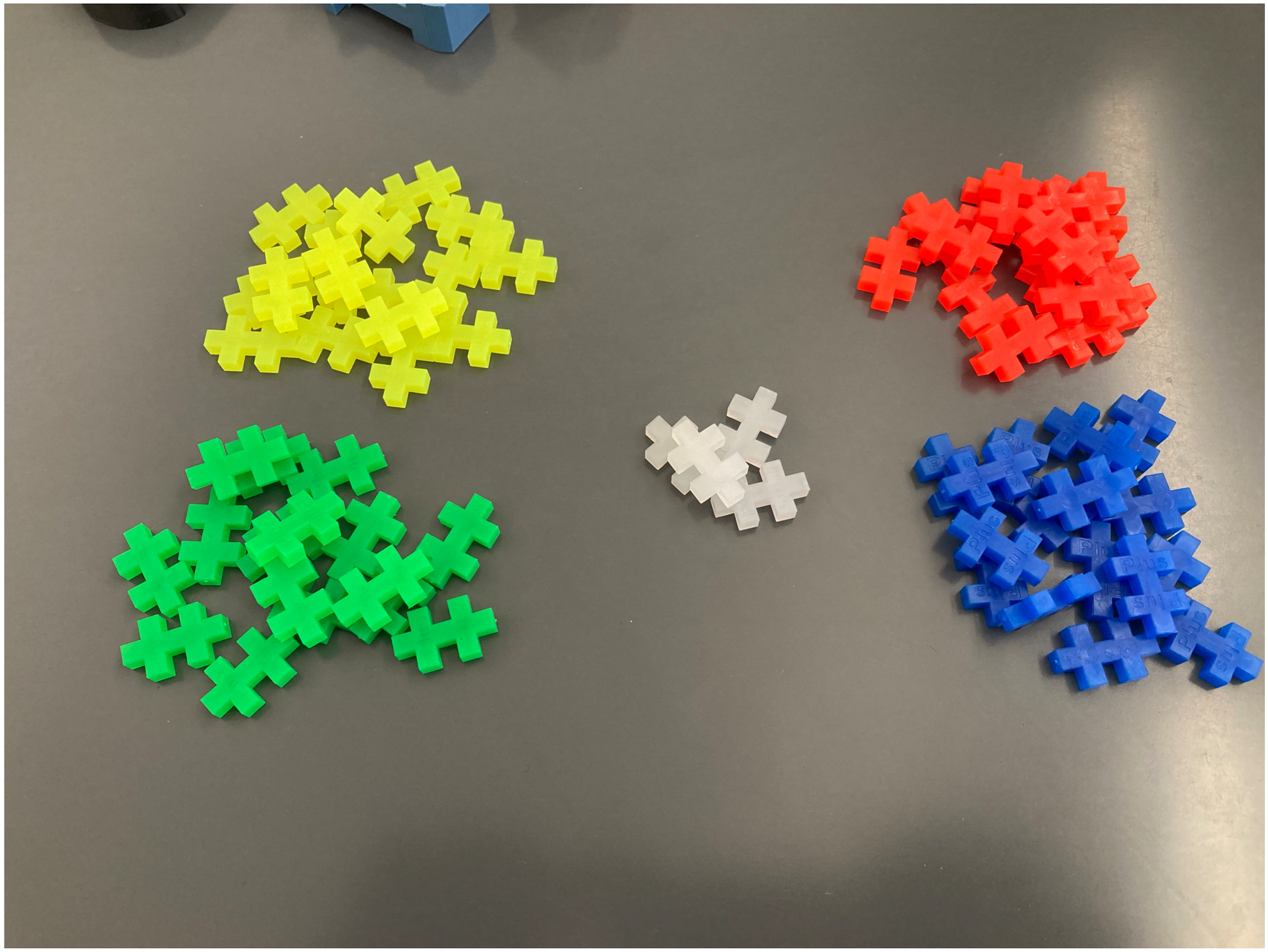


But what about the gaps???

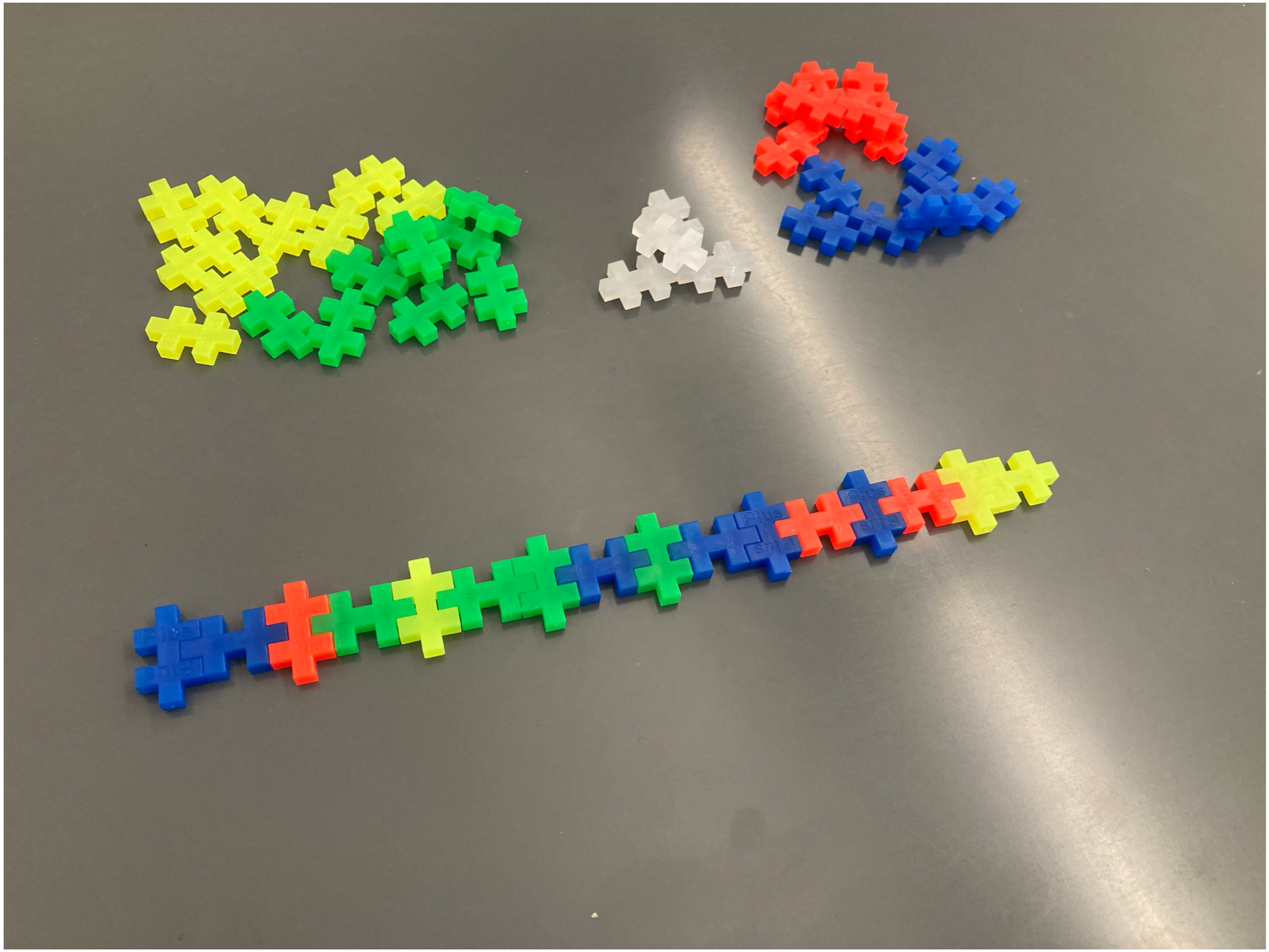
DNA polymerase fills in the gaps & ligase joins nicks (covalent bonds).



Sort out your PlusPlus pieces and determine which you will use as A, T, G, and C.

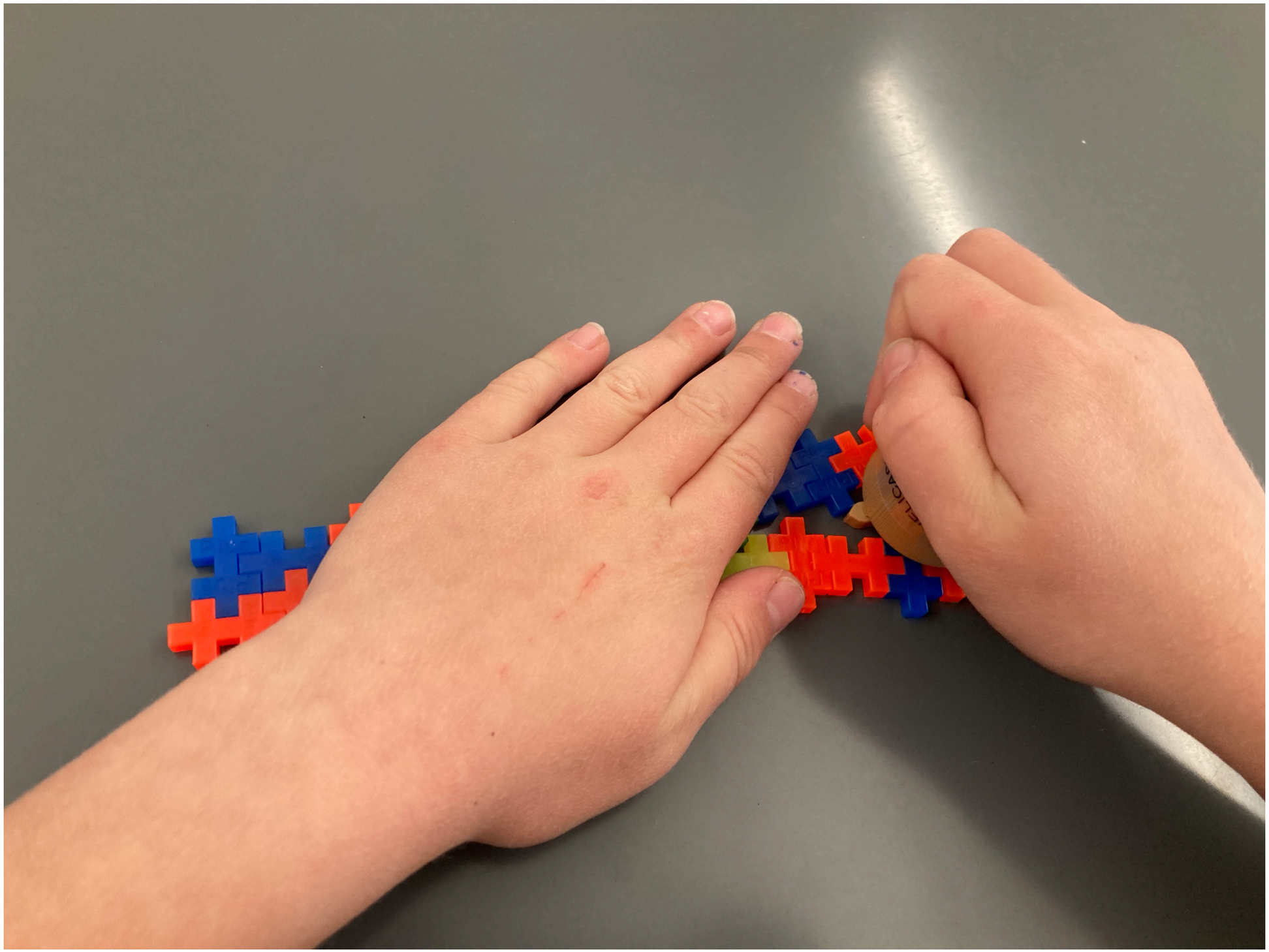


Use 16 pieces to make single DNA strand.

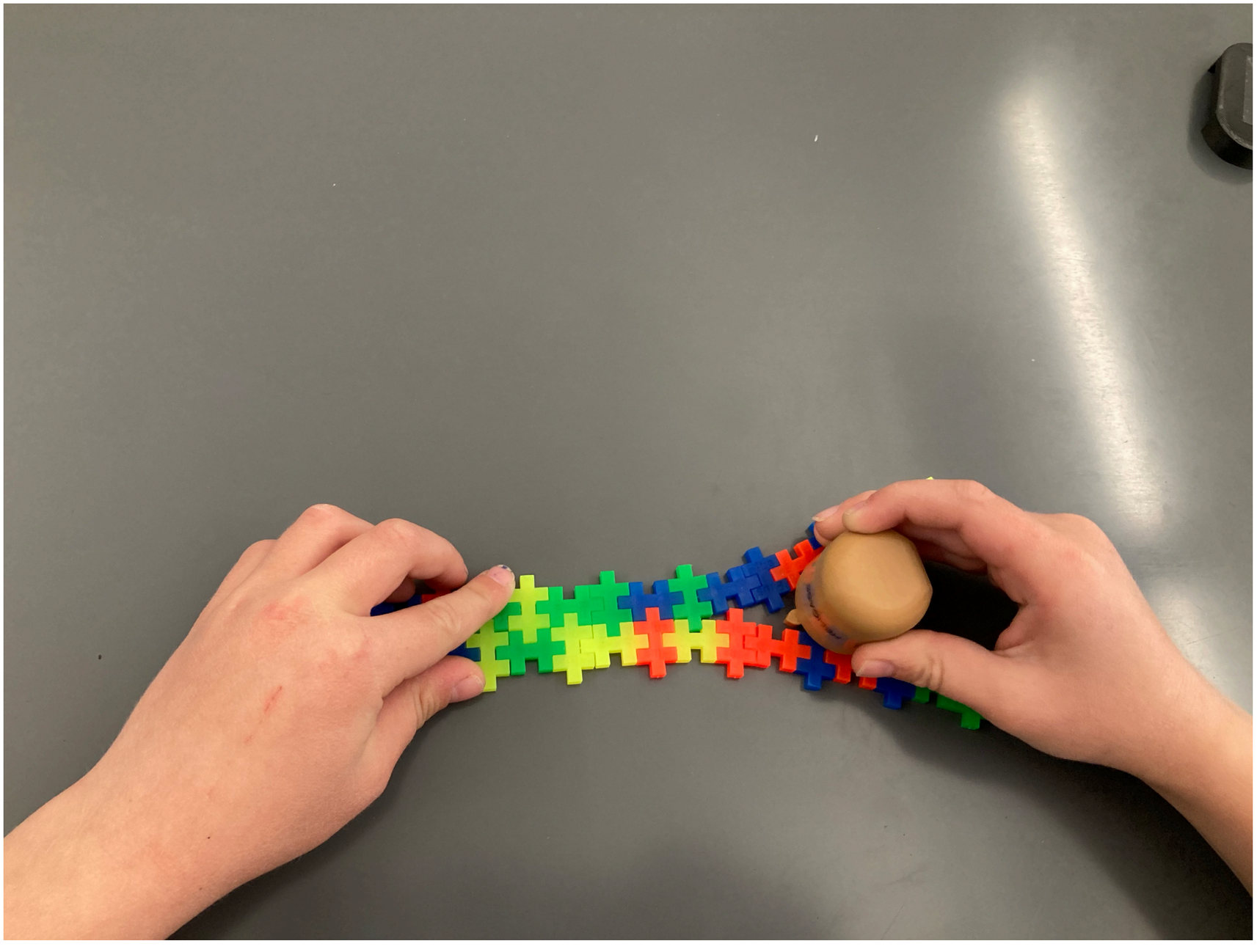


Make the complimentary DNA strand and fit them together.

Get your hands out of the way, we can’t see what you’re doing!

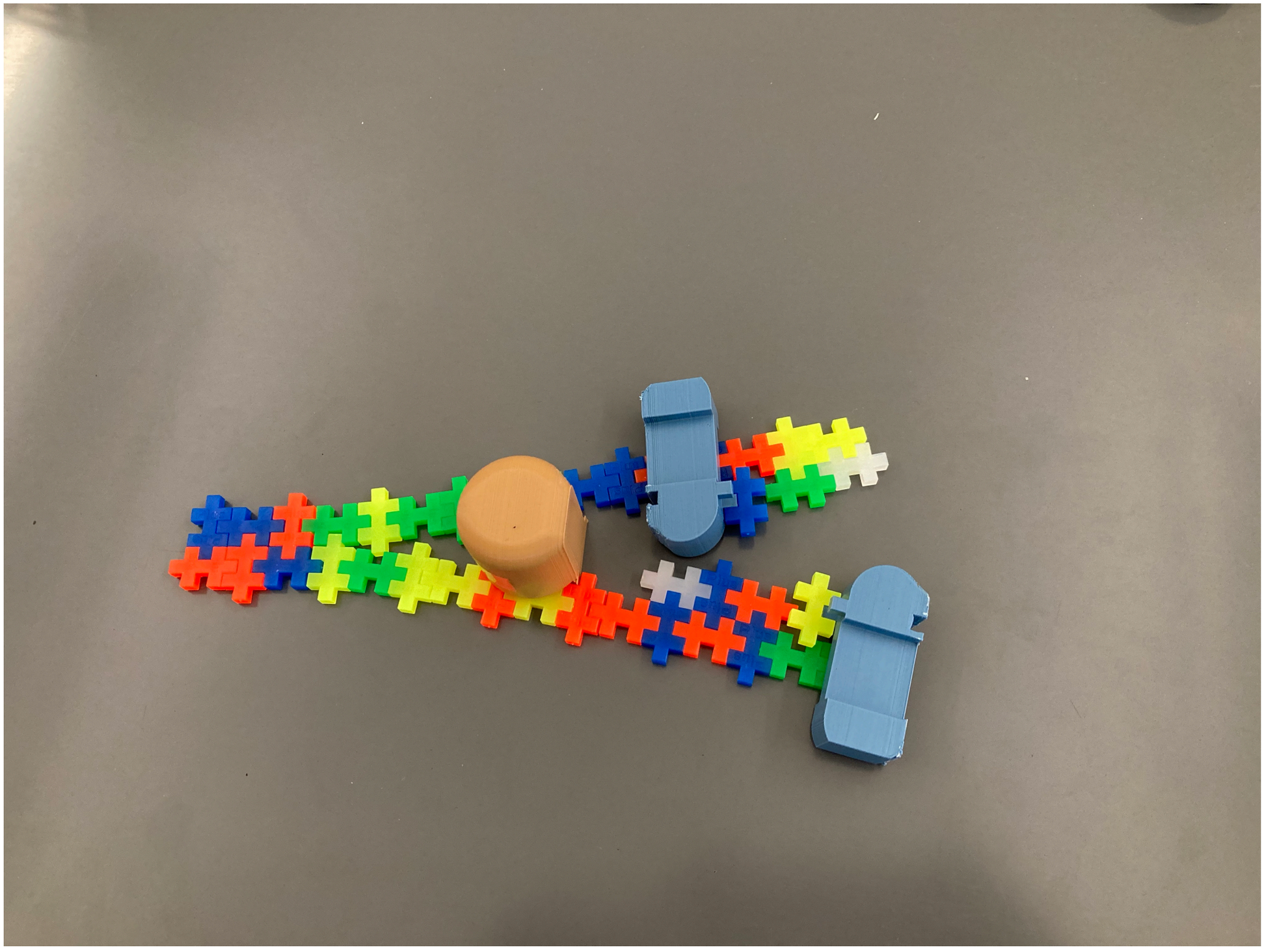


That’s much better! We can see DNA helicase doing its job. *TIP: Wiggle helicase model side to side and the wedge on the bottom with separate the two strands.*



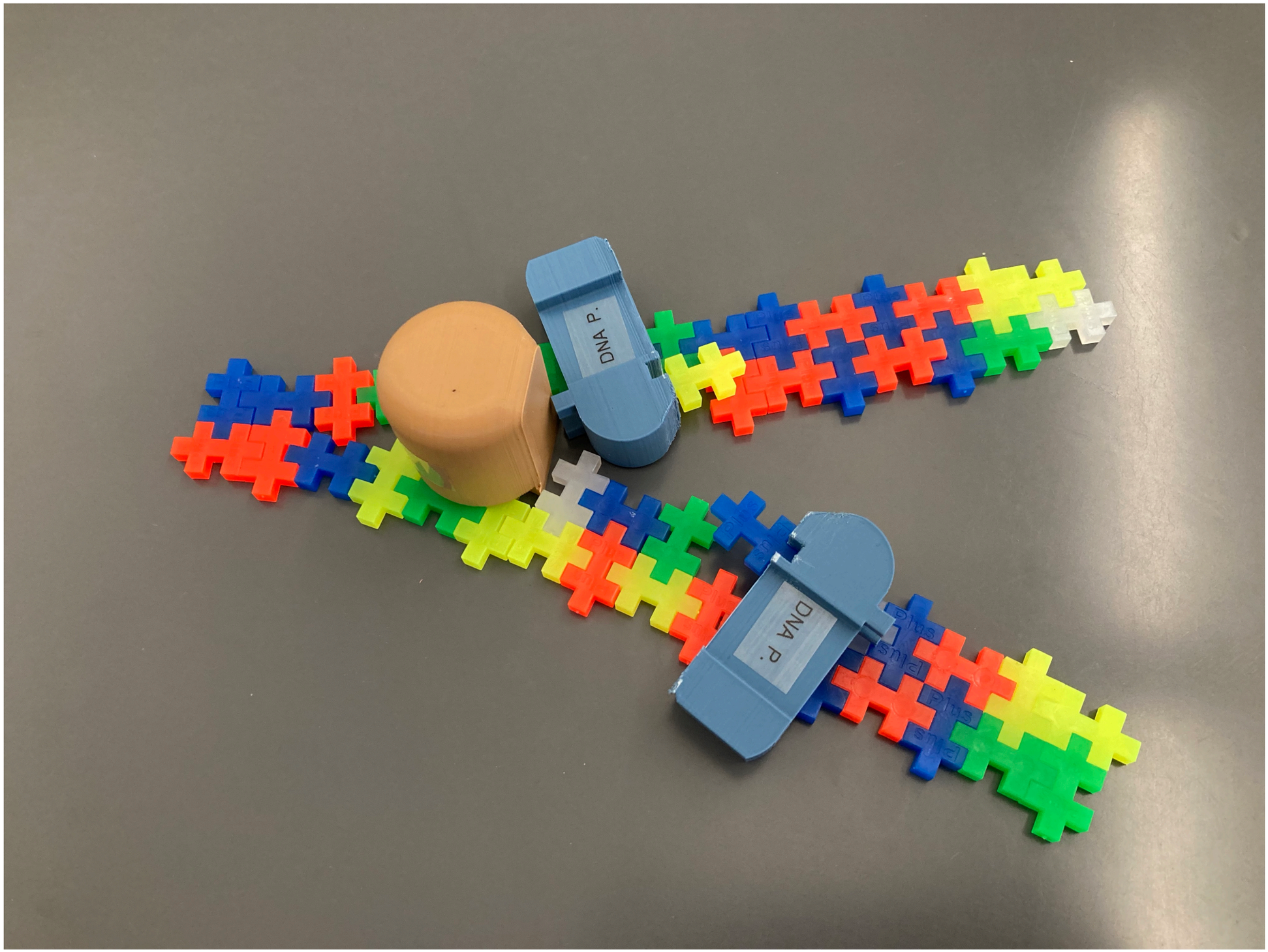
Demonstrate building the daughter strands.

Note white primers and polymerase model.

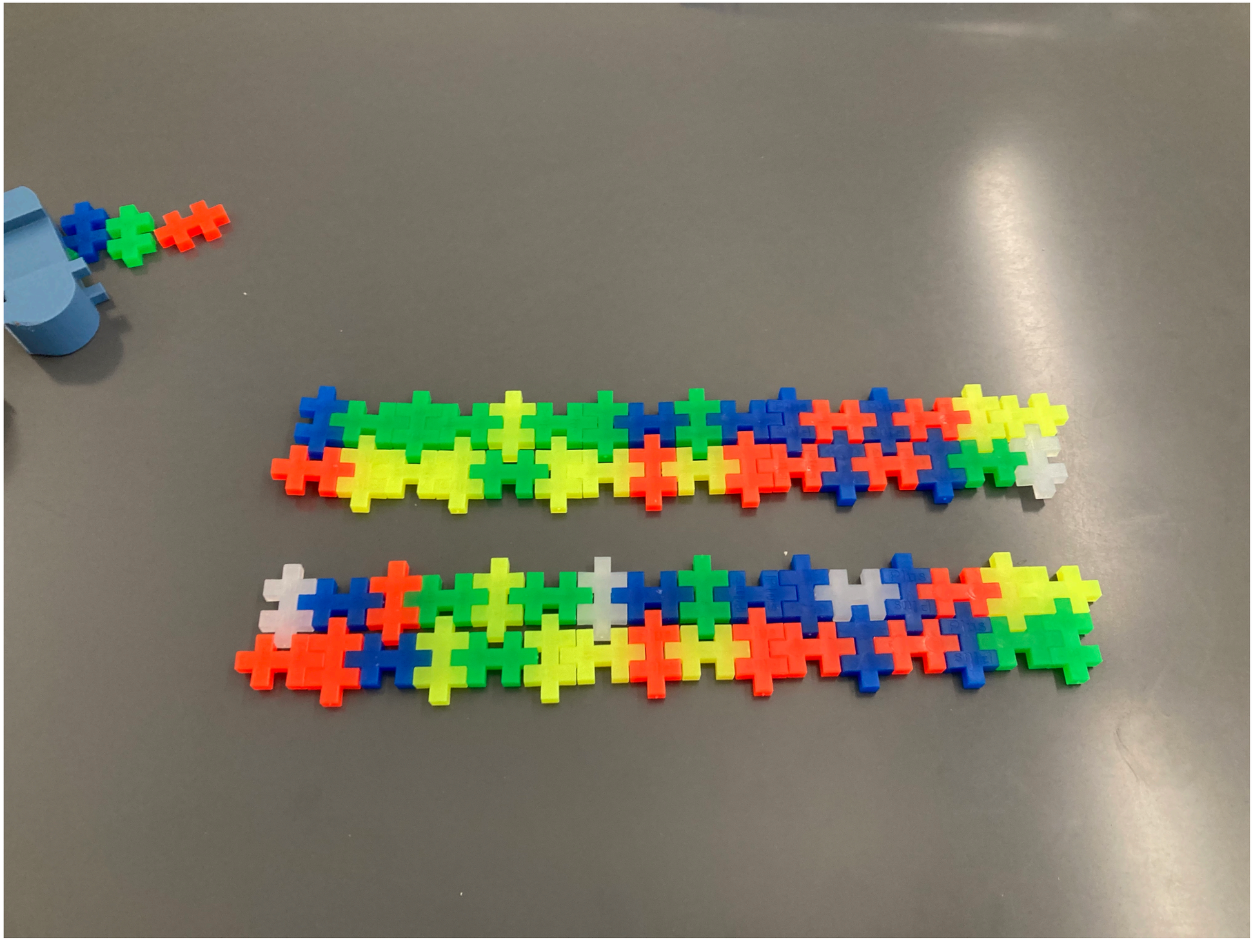


Continue building the daughter strands.

Note white primers and polymerase model.



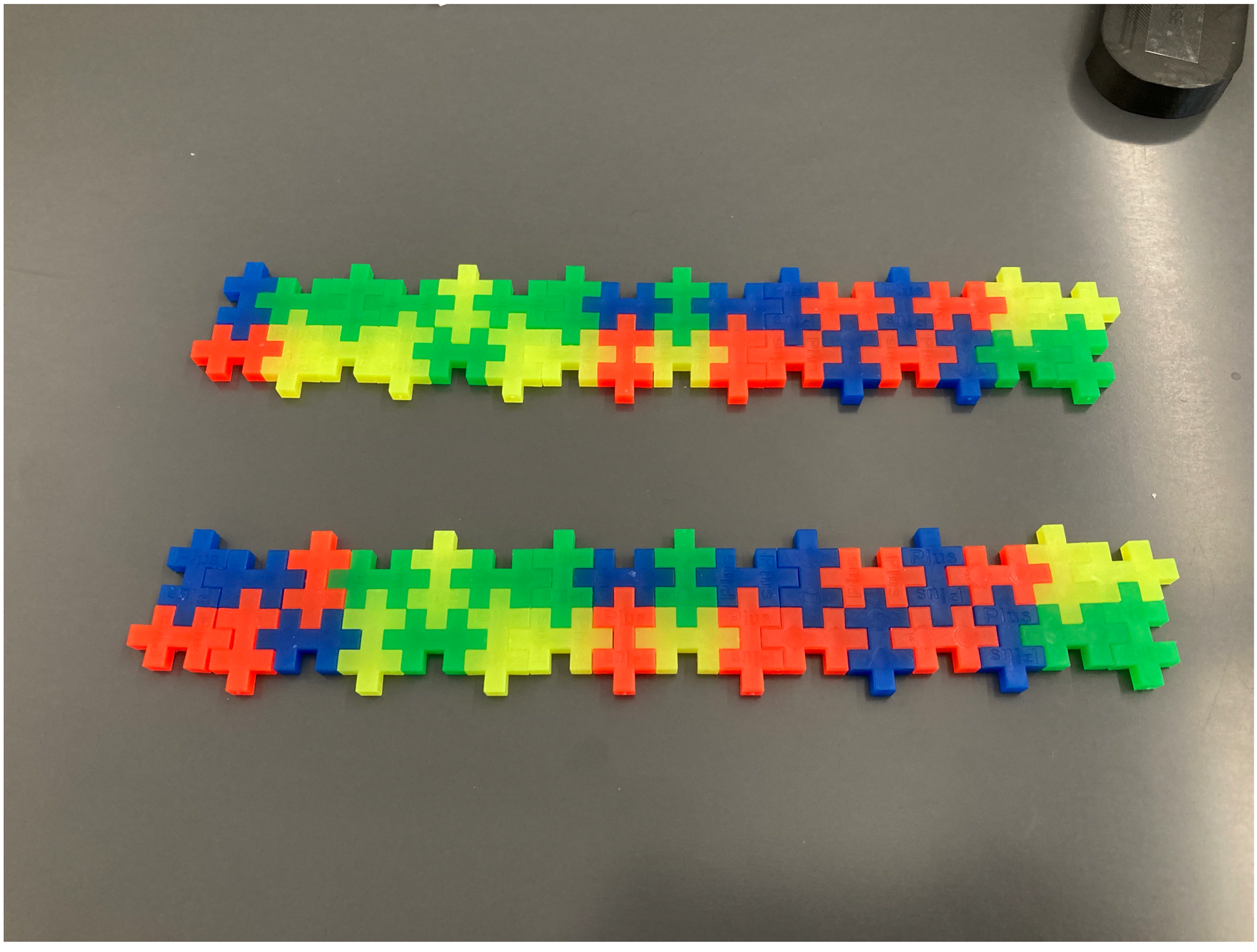
Continue with daughter strands…just need to remove white primers and fill in the gaps.



Ligase in action, bonding nucleotides.

Tip: wiggle it back and forth as you slide it over DNA and it will push pieces together.

2 copies of DNA!



Be sure to dismantle all pieces of DNA you made and put everything back in the baggie. Return it to TA.