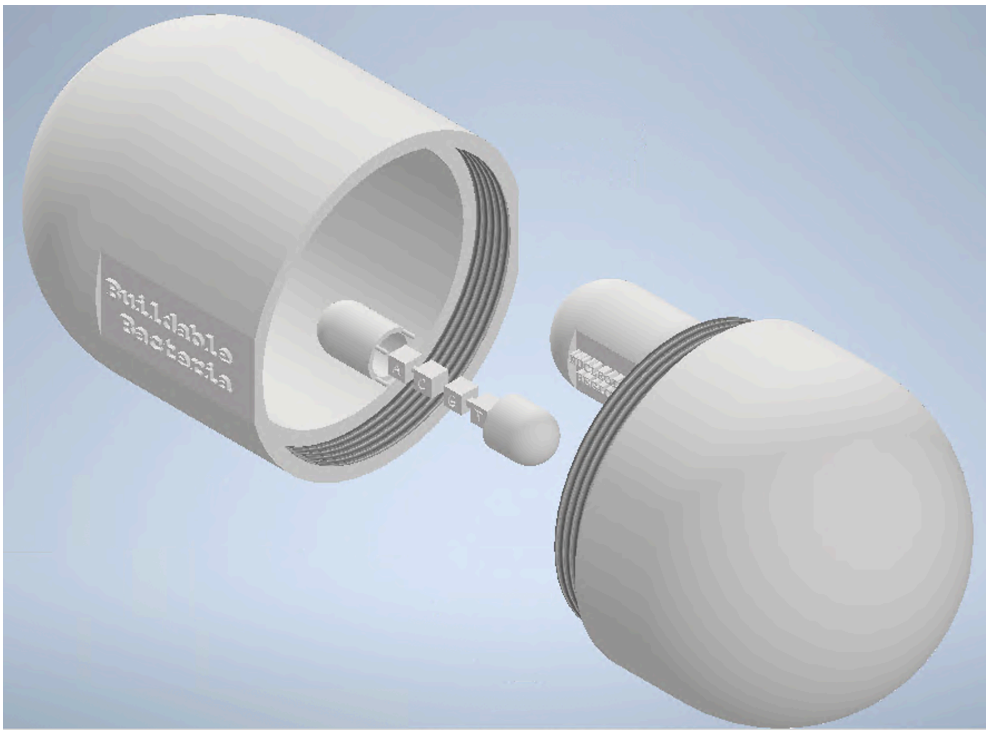
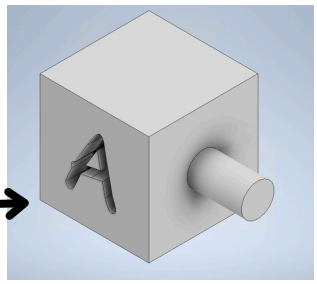
Buildable Bacteria Set Instructions



McMaster SynBio

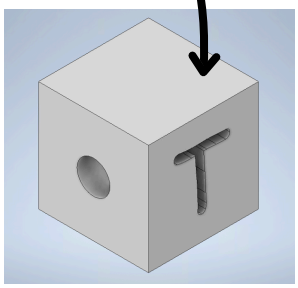
Piece List:

1. Adenine



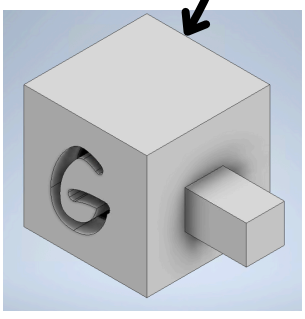
Make sure your set contains all of the pieces!

2. Thymine

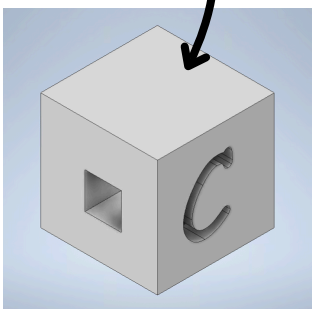


Throughout the instructions, the piece number will be written in brackets after the piece name, ex. Piece (#)

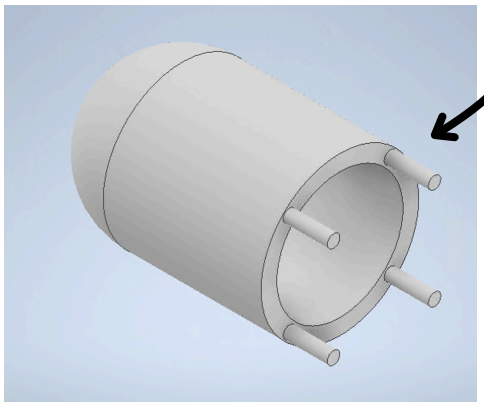
3. Guanine



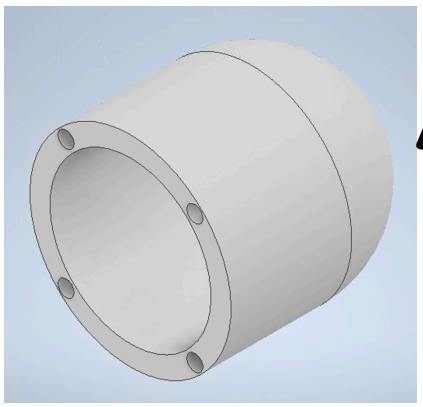
4. Cytosine



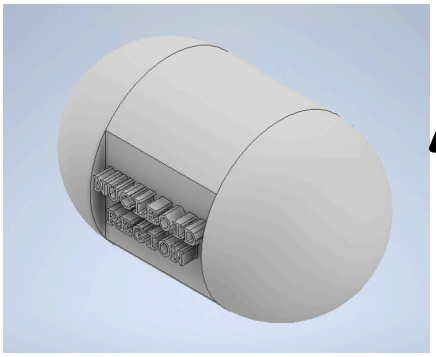
5. Plasmid Half 1



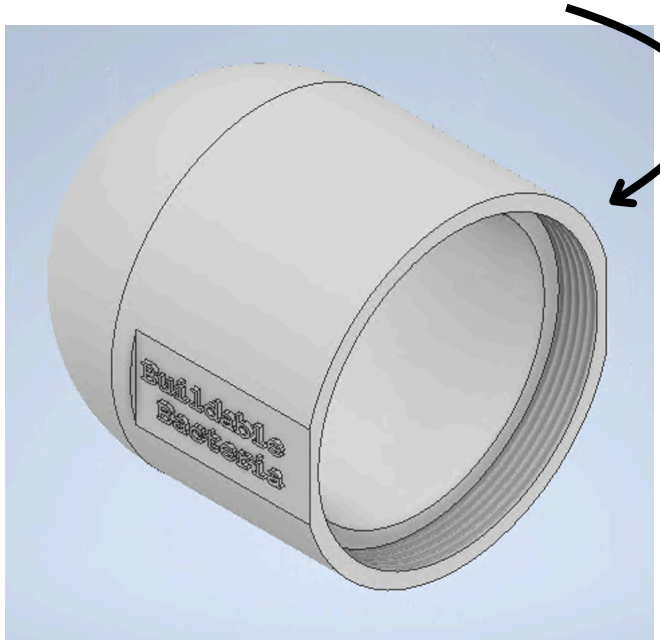
6. Plasmid Half 2

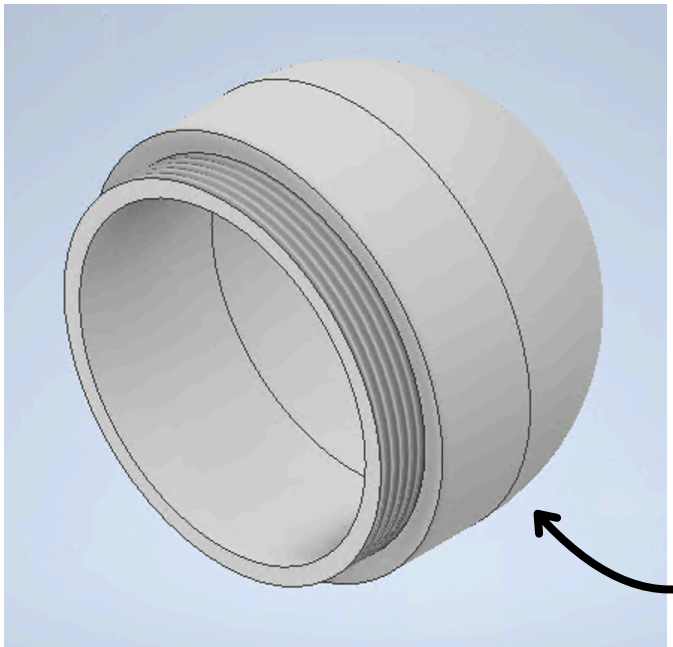


7. Nucleoid Region



8. Bacteria Half 1



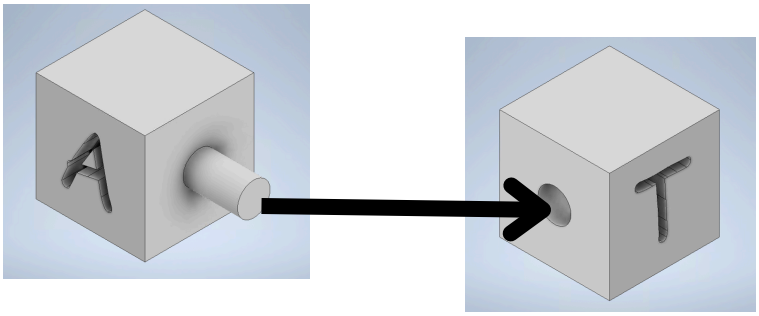


9. Bacteria Half 2

Instructions:

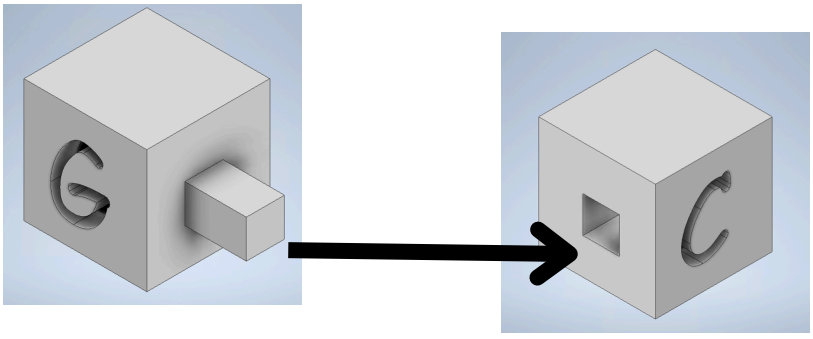
Step 1

Combine the **adenine (1)** and **thymine (2)** pieces. Notice, only **adenine (1)** and **thymine (2)** can bind with each other. This is because in genetic sequences, **adenine (1)** and **thymine (2)** have special chemical make-ups that allow them to bond with each other, sort of like two best friends doing a secret handshake.



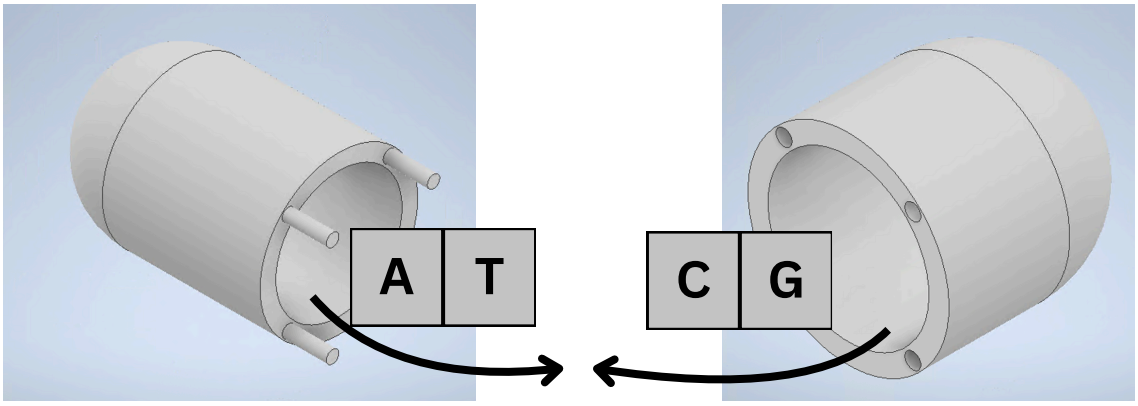
Step 2

Combine the **guanine (3)** and **cytosine (4)** pieces. Again, notice how these two pieces fit into each other perfectly. This is because in our genes, **guanine (3)** and **cytosine (4)** have perfect chemical structures that allow them to bond with each other.



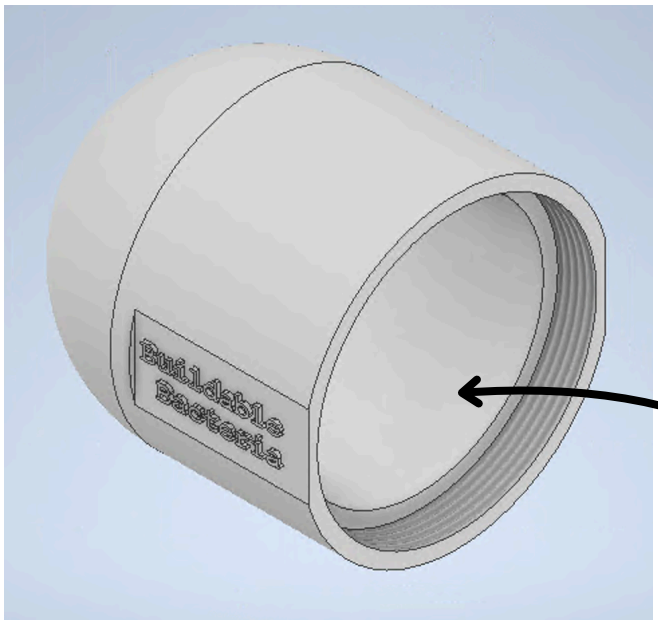
Step 3

Place the **AT** and **GC** combined pieces inside the **plasmid (5,6)**. Press the two halves of the **plasmid (5,6)** together so that they contain the genetic information.



Plasmids are small, circular DNA molecules separate from the bacterial chromosome that often carry non-essential but beneficial genes. In genetic engineering, specific gene sequences can be inserted into plasmids, allowing bacteria to express those genes and do certain functions. For example, we can encode traits like antibiotic resistance by inserting the appropriate genes into the plasmid, just like you did in this step!

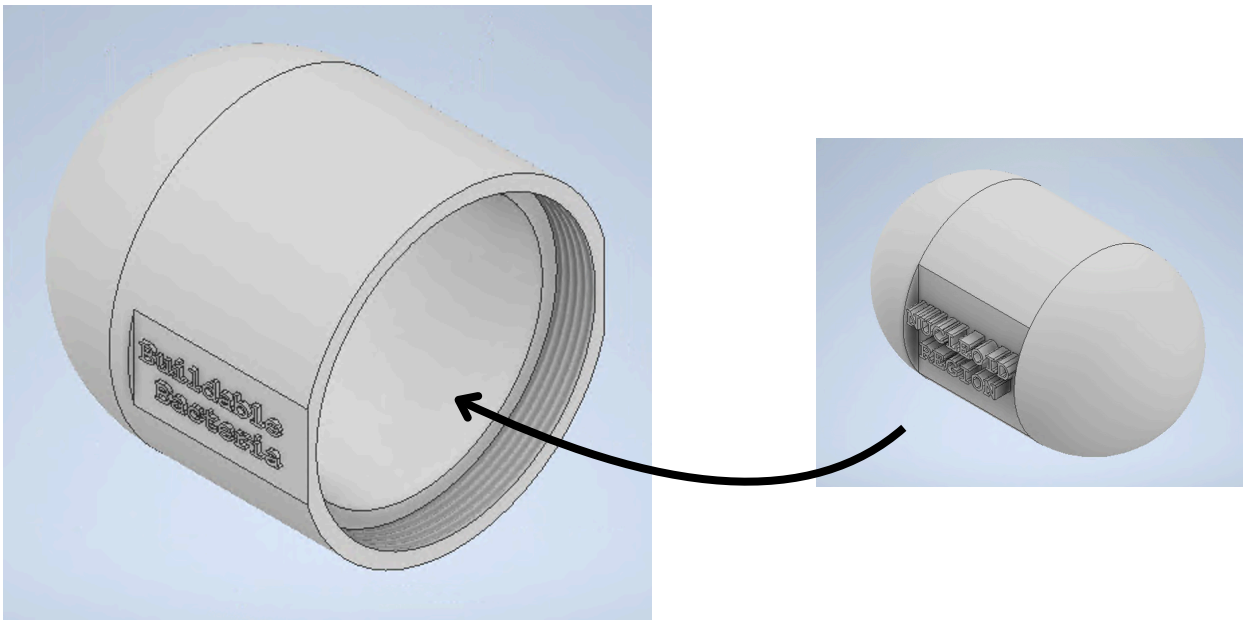
Step 4 Place the assembled **plasmid** inside the **bacteria half 1 (8)**.



Plasmid

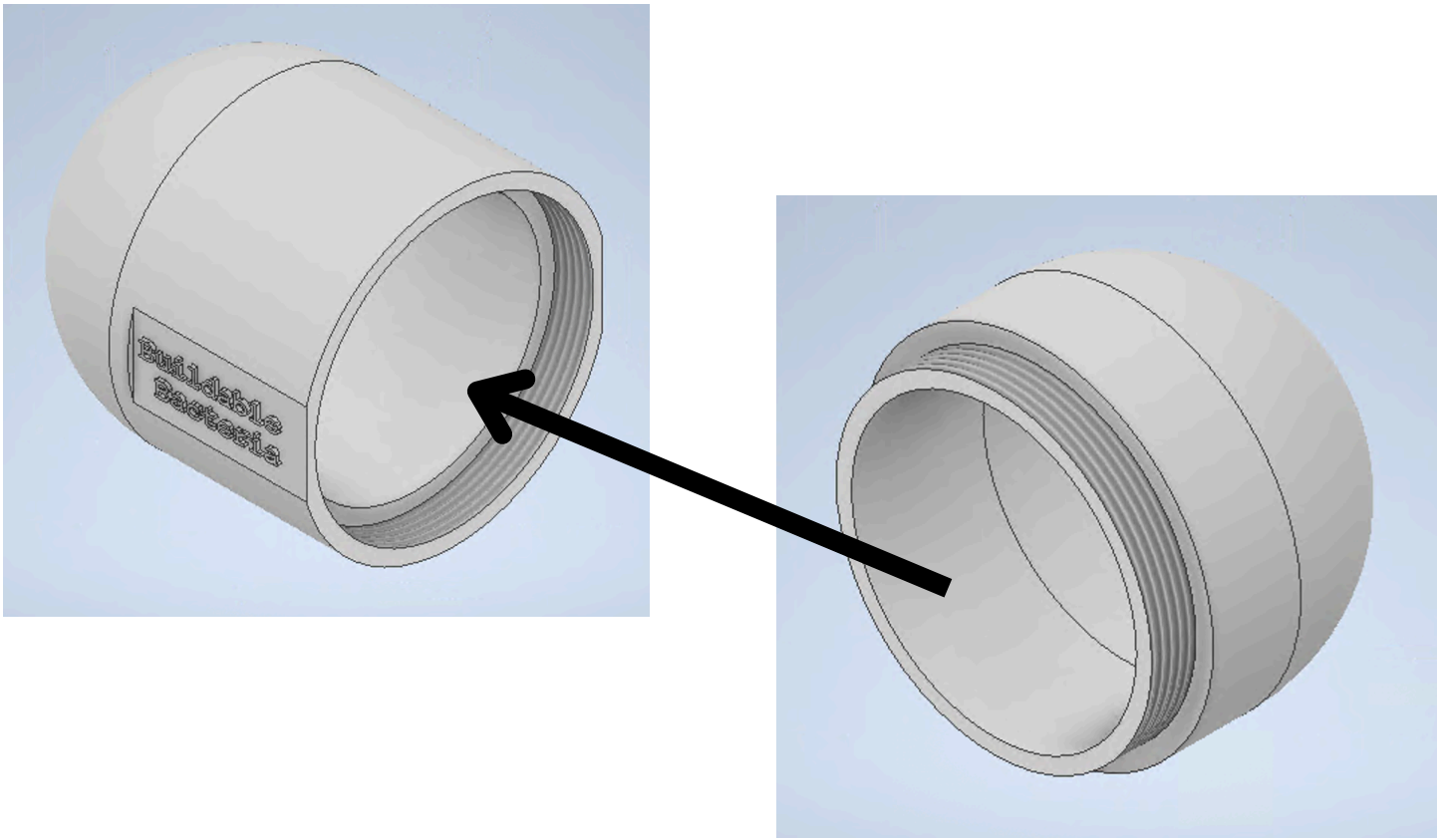
The plasmid floats around inside the membrane of the bacteria.

Step 5 Place the **nucleoid region (7)** inside the **bacteria half 1 (8)** piece as well.



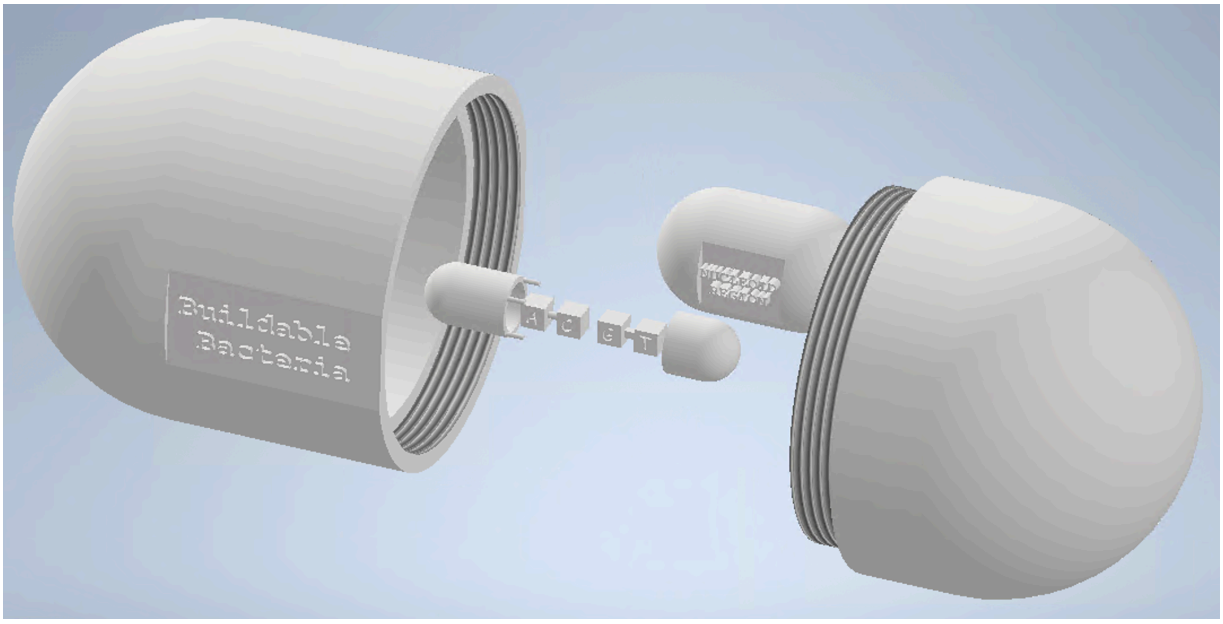
The nucleoid is the special area inside a bacterial cell where its main DNA is found. It's like the control center of the cell, where all the important instructions for how the bacteria grow and survive are stored. Unlike other cells, bacteria don't have a separate nucleus, so the nucleoid is where all the action happens!

Step 6 Screw the **bacteria half 2 (9)** piece into the **bacteria half 1 (8)** piece.



You have now finished assembling your own bacteria model. You have learned how bacteria organize their genetic information. You have also learned how we as genetic engineers can use this organization to make bacteria behave the way we want them to.

The following is a blown up version of what you have built showing all of the internal components:



Keep in mind that bacteria also have other very important structures such as ribosomes and pilli, but the purpose of this set is to develop an understanding of the organization of genes in a bacterium.

For more information about the **McMaster Synbio** team, and how we used genetic engineering principles in our project, please visit our wiki:

McMaster SynBio

These instructions were made with Canva