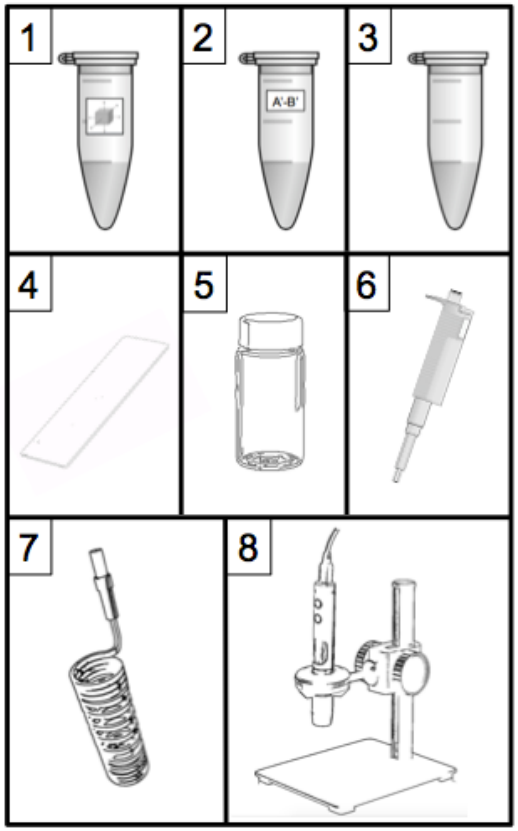
PARTS

The 8-Bit NanoKit contains the following:

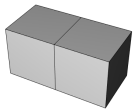
1. 4 nanocube vials
2. 28 linker vials
3. 25 Eppendorf tubes
4. 50 glass slides
5. 100 mL of buffer solution
6. 1 micropipette + 100 tips
7. 1 resistive heating coil
8. 1000x Zoom USB Microscope



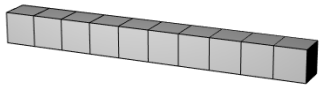
SAMPLE ASSEMBLIES

Try these sample assemblies:

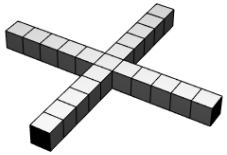
Dimers:
[1] + A′—A′



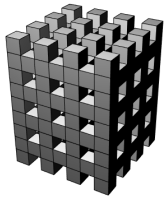
Wires:
[1] + B′—C′



Crosses:
[2] + [3] + C′—D′ + B′—C′



Porous Solid:
[2] + [4] + B′—G′ + C′—G′



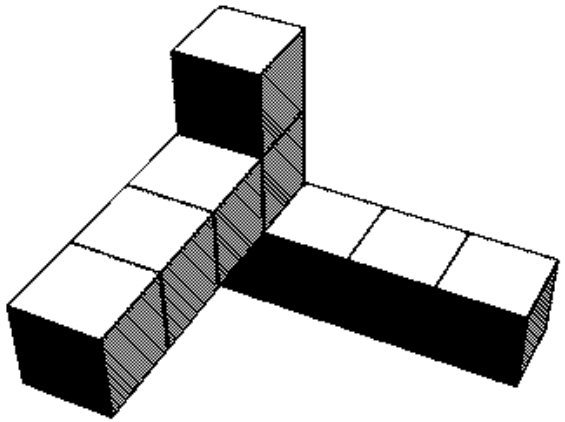
SOCIAL MEDIA

Make something cool? Share it with us on social media for a chance to have your structure featured on dnp123nano.com.

To enter, like us on Facebook or follow us on Twitter and Instagram:

facebook.com/XXXXXXX
twitter.com/ XXXXXXX
instagram.com/ XXXXXXX

8-BIT NANOKIT



THE FUTURE IS IN YOU HANDS

WHAT WILL YOU BUILD?

WHAT IS NANOTECHNOLOGY?

Nanotechnology is the manipulation of matter on a tiny scale. How tiny? Imagine you shrink yourself 1000 times smaller. Now you're the size of a small ant, but you're still way too big. You shrink yourself 1000 times smaller again. Now you're about the size of a bacteria or a human cell, but you're still too big. You shrink yourself down 1000 times smaller once more. You're the size of a single molecule. Now you're at nanoscale!

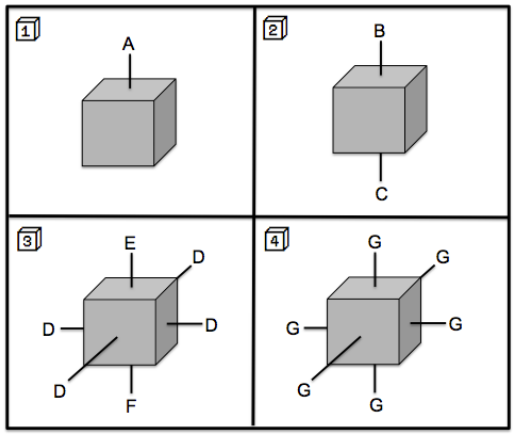
WHAT IS DNA?

Most people know DNA as the "code of life". Structurally, DNA is a double stranded helix. Each strand of the helix is a long molecule that contains a sequence of chemical bases (adenine, thymine, guanine, and cytosine) with specific binding rules. When forming a double helix, adenine only binds to thymine, and guanine only bonds the cytosine. Two single strands of DNA will only bond to each other if they are complementary. Each sequence has one and only one complementary sequence. It's the sequence of bases that codes all our genes.

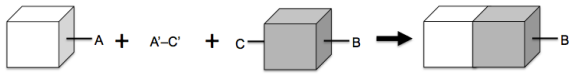
In addition to coding every gene in our bodies, DNA also makes a very useful nanotech building material. This is because DNA's lock-and-key binding rules allow us to program exactly which strands will bind together. Using DNA "origami", people have stitched DNA into all sorts of patterns including smiley faces and a map of the world. What's better, these patterns *self*-assemble. This means no one has to stitch them together by hand. The random motion of molecules is all they need to find their complements and form complex patterns.

ABOUT THIS KIT

This kit includes four vials containing nanocube building blocks. Nanocube faces have been patched with a unique sequence of single stranded DNA. There are seven different sequences labeled A through G:



Cubes can be glued together by combining them in solution with linker DNA. Linker DNA contains two "sticky ends" that are complementary to other sequences. For example, a linker containing sequence A' will stick to cube face A. To glue face A to face C, we would add linker A'–C' to a solution containing cubes patched with sequence A and cubes patched with sequence C:



By gluing many blocks together in this way, we can assemble almost any shape.

INSTRUCTIONS

1. First, design your target structure. Think about what blocks need to be connected in order for the device to assemble properly.

PROTIP: Remember that while the cubes bind fact-to-face, they will not necessarily orient themselves the way you intended. Shoot for structures where the orientation does not matter.

2. Once you've designed your target structure, select the vials containing the components you'll need. Combine 1 microliter of each component and 1 microliter of buffer solution into an unused Eppendorf tube. **IMPORTANT: Be sure to use a clean pipette tip each time so you do not contaminate your samples.** Make sure you add the right ratio of cubes. For example, if your target structure has two cube 1s for every cube 2, add 2 microliters of cube 1 for every cube 2. Place in the heating coil and heat for 5 minutes.

CAUTION!!! The heating element will be hot. DO NOT TOUCH!

3. Pipette the solution onto a microscope slide and let cool. Place under a microscope and observe as the nanocubes assemble into your target structures. If you have an extended structure, you should just be able to see it under the microscope at full zoom.