DIY Air Force Activities:

DIY DNA: Codon Code

Materials:

- gummy bears
- toothpicks
- pull-and-peel licorice
- pencil/pen and paper

Our DNA holds the key to all that makes us unique. It is made of two chains, or backbones, that coil around one another in a double helix. Each strand of DNA contains a genetic code that gives instructions on how to arrange the building blocks for our bodies. This results in our fundamental traits, like hair and eye color!

The core of this code uses just 4 letters (G, C, A, T), each representing something called a nucleotide base. These bases work in pairs to connect the two halves of the double helix, G with C, and A with T. Each can only be paired with their specific partner! A set of three of these letters is called a codon. The codon is a code that tells our body to build a specific molecule, called an amino acid. These then link together in the order the DNA dictates to build long chains called proteins. Our bodies are made up of proteins, like our muscle, skin, and even saliva! Think of it as instructions (codon) to form a link (amino acid) that can be used to create a chain (protein)!

Just like a computer code, an amazing amount of diverse results can stem from this simple 4 letter code! There are also codes for the start and stop of each chain. Following the instructions below you will build and decipher a delicious DNA model! Use the key on the back to read and write your code!

Directions:

1. Separate your gummy bears by color and assign one to each nucleotide base (a color for: C, T, A, and G).
2. Using a piece of paper, lay out the DNA code you want to build! Start on the left side, using the decoder the on the back of this sheet (or create one and decode it later). Now fill in the left side. Remember, G always goes with C and A always goes with T.
3. Spear each pair of bears with a toothpick. It works best if the bears are head-to-head. Leave a space between them for the hydrogen bond that links each side (see our Marble Print DIY for more on hydrogen bonds)!
4. Start at the top, and use your first tooth pick to connect the two pieces of licorice.
5. Place the next toothpick in the left piece of licorice slightly down and to the left. Cross the right piece of licorice over slightly and connect them with the toothpick. This will add the double helix twist!
6. Repeat steps 4 and 5 to build your DNA ladder. If you are struggling to get the twist at first that is ok!

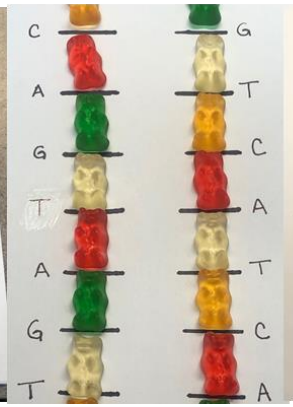
Have fun making multiple strands! Work with a friend and decode each other's creations!

Air Force Associations:

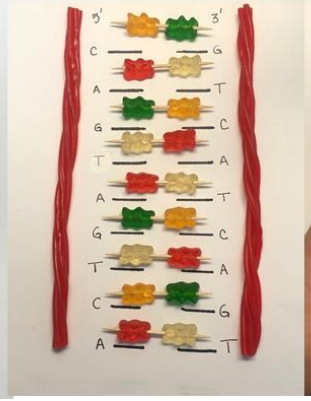
Being able to read this genetic code can be extremely useful in developing tests to identify and detect disease causing pathogens. Public health researchers at the 711th Human Performance Wing at Wright Patterson Air Force Base in Dayton, Ohio work diligently to sequence these codes. Knowing the code also allows them to track any changes or mutations that could affect the pathogens behavior and treatment. https://www.afrl.af.mil/711HPW/

Step 1:

Step 2:



Step 3:

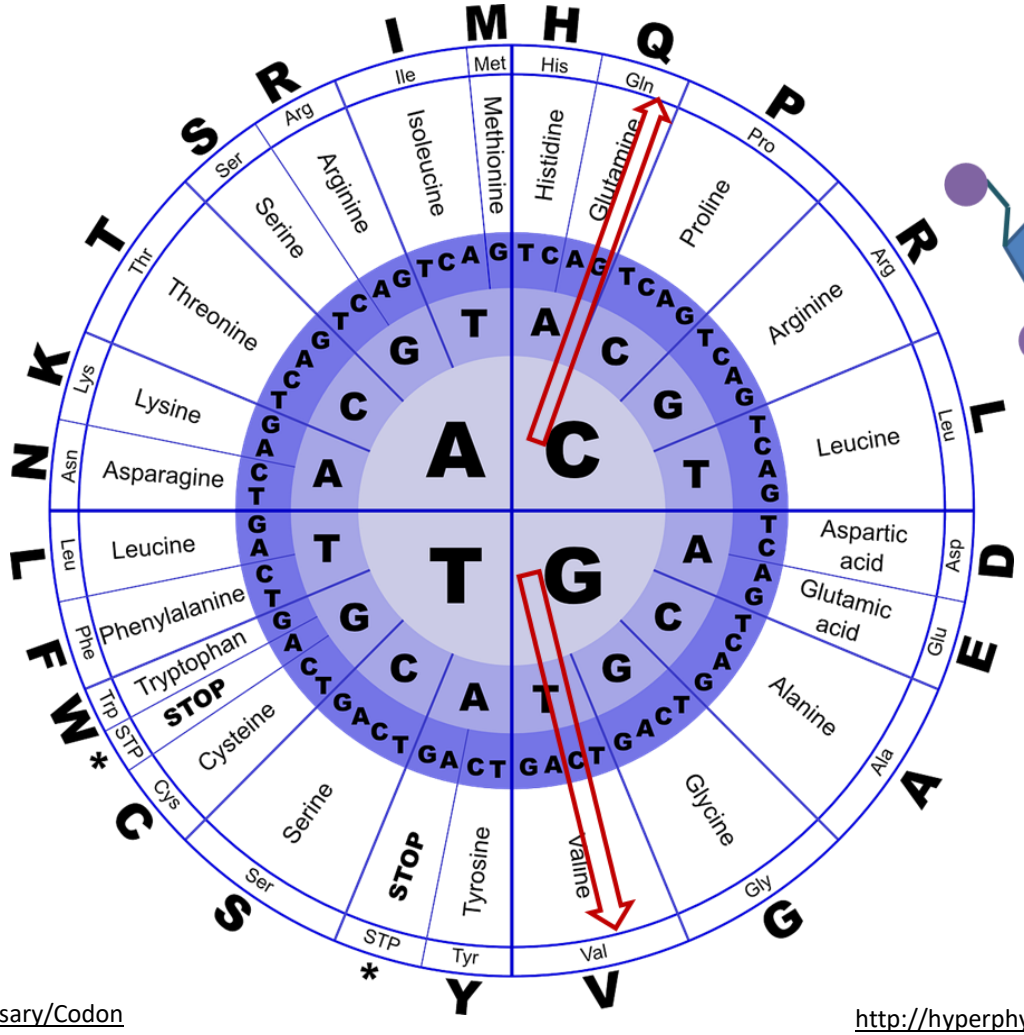


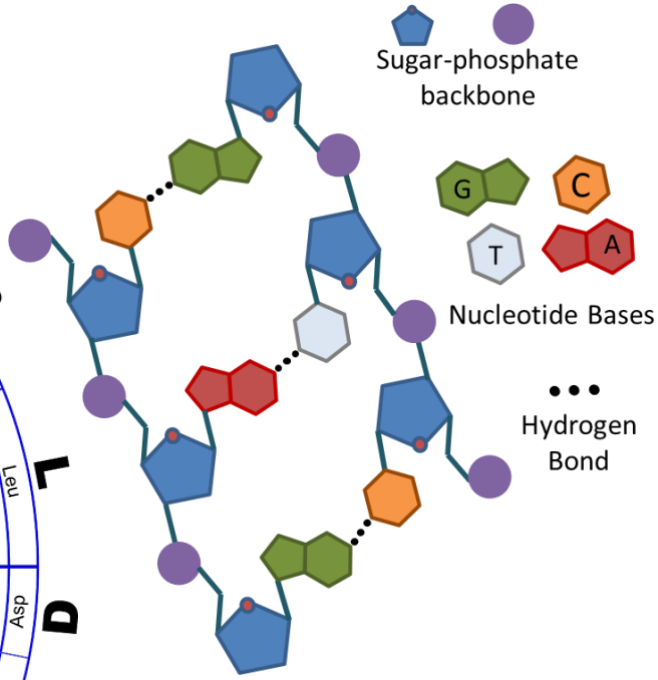
Step 4:

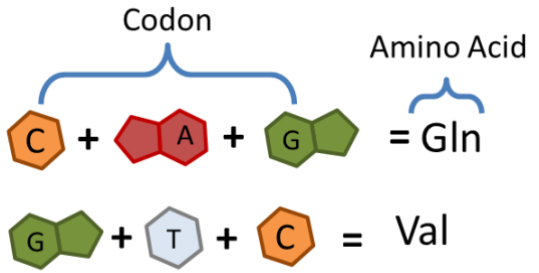
Step 5:

Step 6:

You can use this decoder to create and read your DNA strand! Start in the center, and radiate out to select 3 nucleotide bases. This is a codon! Our body reads each codon as a recipe for an amino acid. At the edge of the ring you will find the amino acid the code has told the body to make. Think of these as building blocks or links for a chain. These amino acid links are used to build the protein chains our body needs! There are 61 possible combinations for the links and 3 for stops or breaks in the code that end the chain.







https://www.genome.gov/genetics-glossary/Codon

http://hyperphysics.phy-astr.gsu.edu/hbase/Organic/gencode.html