Key Card for DNA Molecule #B107

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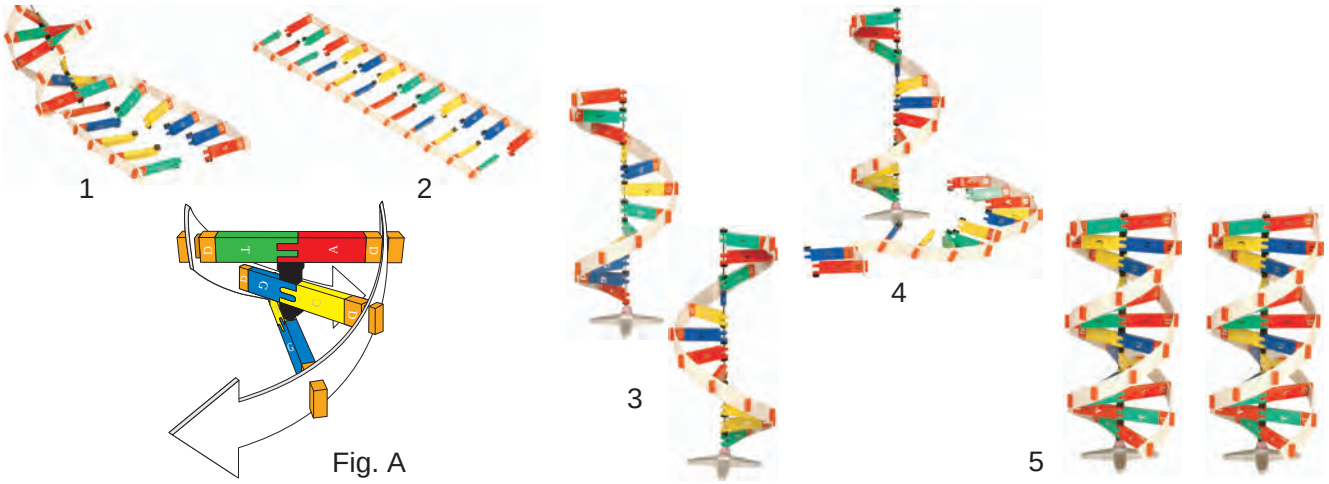

Fig. A

Nucleic acid bases symbols:

Purines: A- Adenine G- Guanine

Pyramidines: T- Thymine C- Cytosine

Deoxyribose - D P- Phosphate

Assembling the DNA Molecule. This model has the following parts:
48 bases, 12 of each A, G, T, C, color and shape-coded, 4 rubber strands representing phosphate of the phosphate back bone of the resultant DNA molecule, 2 supporting center rods and 2 pedestals.
Assemble as follows: 1. Screw the supporting rods into pedestals. For sturdier assembly, tighten the rods with pliers. 2. Take one rubber strand and hold it so the perforations slant up towards the right as shown above (Fig. A). This assures you that the helix is going to be right handed.
3. Holding the rubber strand as shown, insert the grooved sugar ends of the nucleic acid bases from below into the oval openings. This represents the formation of nucleotides: sugar-phosphate backbone and associated bases. CAUTION: Do not use more then six of one base on the phosphate strand. If you do, you will not be able to complete the second DNA molecule, properly. The bases can be in any desired sequence. The black spacers on the snap-lock end of the bases can be up or down. 4. After completion of one strand, put it on the supporting rod by pushing the snap-lock ends of the nucleotides onto the supporting rod. Here you discover that the helix is right handed, i.e., if you view the helix from the end and think if it as a screw, you could only insert the screw by turning it to the right. 5. Take the unused bases from the tray and engage them to the matching bases already assembled on the rod. Shape coding of the ends prevents you from making mistakes, so does the color-coding, blue fits yellow, red fits green. 6. Take the second rubber strand and place it onto the sugar ends of the bases (nucleosides). This completes the DNA molecule.

Splitting the DNA Molecule. 1. With one hand , lift the DNA model holding it by the pedestal.
2. Turn it upside down. 3. With the other hand , grasp and hold the pair of nucleotides closes to the metal pedestal. CAUTION: Remember the color of the bases you are holding in your hand because this is important to the next step. 4. Slowly pull back on the pedestal, thus pulling out the rod. (See picture No. 1.) The "hydrogen bonds" between the base pairs break and the molecule splits in two. (See picture No. 2.)

Replication of the DNA Molecule. Place each of the separated strands onto the two supporting rods. (See Fig. 3.) Start from the bottom of the rods with nucleotides you were holding in your hand when pulling the supporting rods (refer to par. 3. "Splitting the DNA molecule"). For example, if the lowest pair of bases before splitting was yellow and blue, then the yellow base should also be at the lowest level of one rod and the blue should be on the lowest level of the other rod. This assures you that the to new molecules you are assembling are not going to be upside down in relation to the replicating molecule. 2. Take the remaining bases and push them onto the supporting rods, thus engaging them with their counterparts. 3. Join the sugar ends of the bases with the phosphate represented by the perforated rubber strand. (See picture No. 4.) The result are two identical molecules (See Fig. 5).

Mutating the DNA Molecule. 1. Disengage one pair of bases from sugar-phosphate chain.
2. Turn them 180 degrees around their axis. 3. Insert the rotated base pair in the rubber strand. You may represent a second example of a mutation by disengaging two pairs of bases. Remove them completely from the rod and reverse their respective positions by putting the last-removed base pair on the rod first. Reconnect with phosphate chain. This is a good opportunity to discuss the genetic code with students.