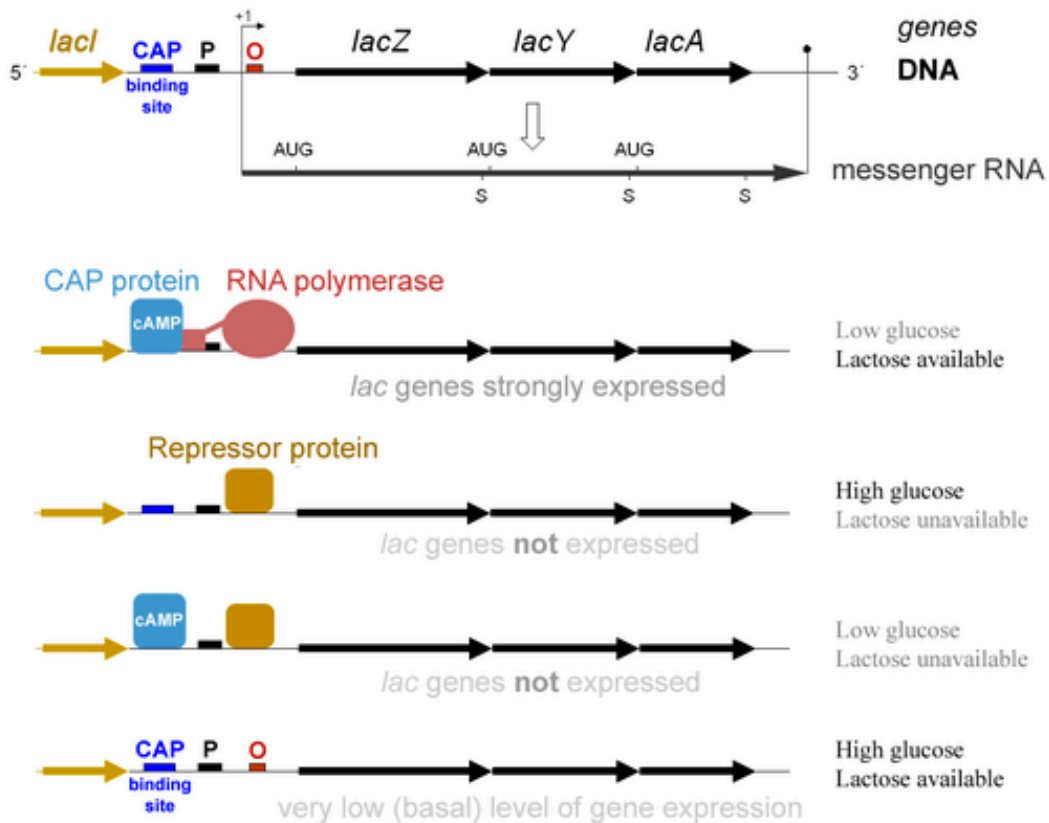# LAC Operon Model

Materials Needed:
- Coloured Popsicle sticks
- Hot Glue Gun and Glue
- Wooden craft Dowels (3/16")
- Screws (that makes holes about the same size as the dowels)
- 15-21 Small Styrofoam balls
- 2 Medium-large Styrofoam balls
- Scissors (or tools for cutting the popsicle sticks)
- A utility knife

Instructions:
1. Plug in the hot glue gun.
2. Start by preparing the small Styrofoam balls. Use the screw to put a hole through the middle of each ball.
3. Once the small Styrofoam balls are prepared, cut the popsicle sticks according to the list below:
    - Blue – Cut in half (two pieces)
    - Red – Cut into thirds (three pieces)
    - Yellow – Cut in half (two pieces)

- Purple – Cut in thirds (three pieces)

The popsicle sticks represent the bases: Blue – Adenine, Red – Thymine, Yellow – Guanine, Purple – Cytosine. With this in mind, students will have to arrange the popsicle sticks on the dowel in a matter that demonstrates codons and the idea of the operon.

4. Carefully using the utility knife, cut a ¼ inch slice into each of the Styrofoam balls. The slice needs to run perpendicular to the hole that goes through the ball (that was made by the screw). Below is a diagram of what it should look like. The blue are where the hole and slit should be.
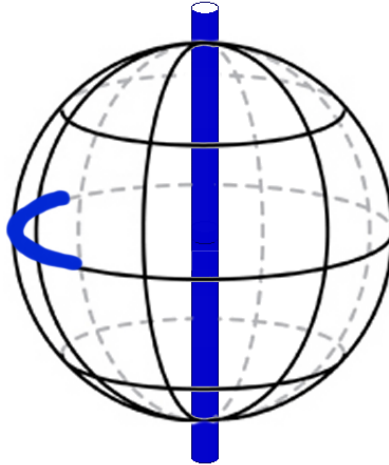
5. Carefully, use the glue gun and put some glue in the slit that you've just made. Some of the Styrofoam will melt, but that's okay.
6. While the glue is still hot and wet, place one of the Popsicle sticks in the slit, circle end in the slit. Hold it there until the glue is dry.
7. Do steps 4-6 for each Styrofoam ball – there should be 16 balls with different coloured Popsicle sticks in them.
8. Put the Styrofoam balls onto the dowel, through the hole that was created with the screw. Order the balls based on the codons that need to be present. Carefully using the hot glue gun, glue the Styrofoam balls together once they are on the dowel.
9. Take the medium sized Styrofoam balls and carefully glue them together.
10. Put slits into the balls so that they fit onto OPERATOR gene.

Follow Up Questions:

1. Why does the order of the Popsicle sticks matter?

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2. How many genes are coded on this model?

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3. What is the sequence of base pairs that you have created to code for the operator? The Lac Z, Lac Y, Lac A genes?

/4

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4. Would you consider this model an Iconic Model, Idealized Model, Analogical Model or Mathematical Model? Why?

/3

5. Fill in the following table:

Model Component	Real DNA component of DNA (that model component represents)	Importance of Real World Component of DNA
Small Styrofoam Balls		
Popsicle Sticks		
Wooden Dowel		
Medium Styrofoam Balls (glued together)		

/8