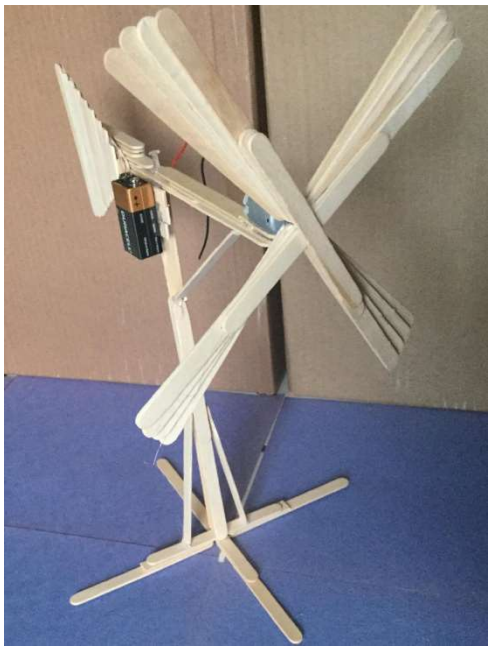
# Popsicle Windmill

**Grades (6-8)**



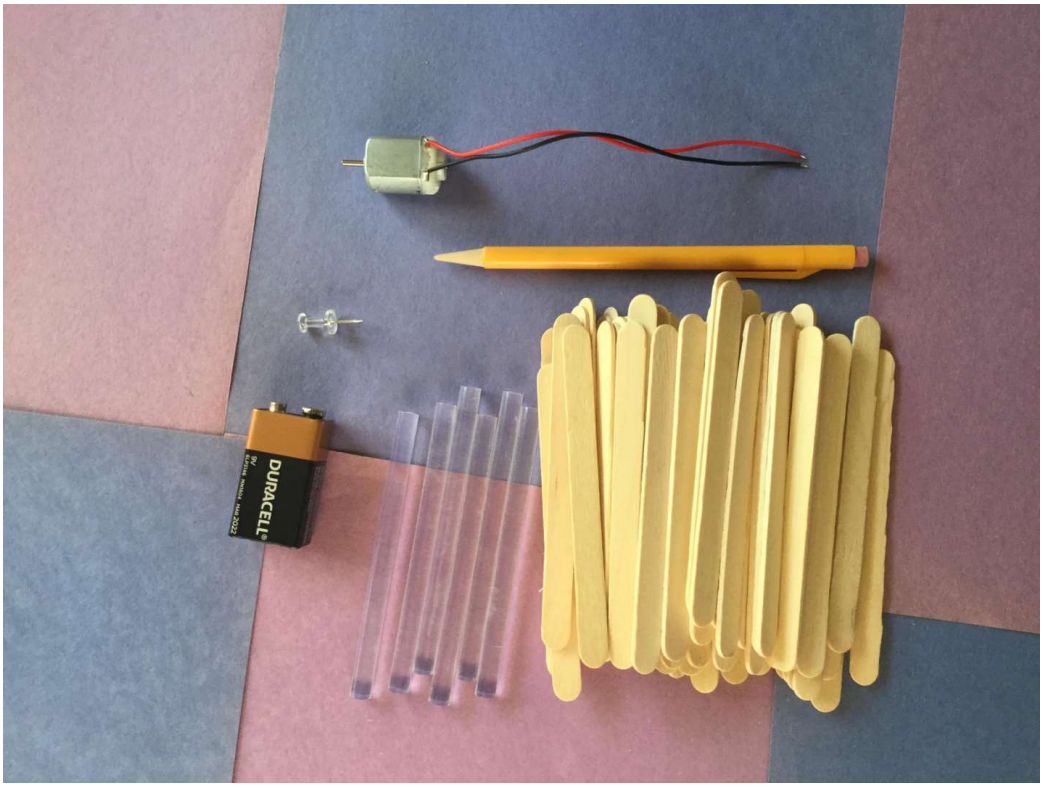
As a team, you will use your knowledge and understanding on energy and learn how to apply it in order to calculate the energy into the system and the power output. You will learn about the importance of efficiency.

Follow the steps and think about the questions below, they are meant to guide you through the process. Remember to get creative and have fun! ☺

## Final Product

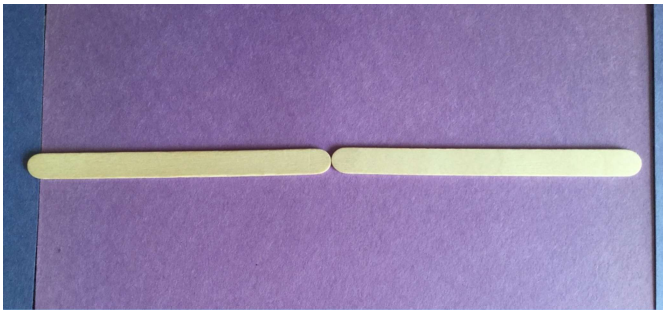
**Materials:**

| Quantity | Item | Item Label | Included Yes/No |
|---|---|---|---|
| 70 | Popsicle Sticks | A | Yes |
| 1 | Pin | B | Yes |
| 1 | DC Motor | C | Yes |
| 1 | Battery | D | Yes |
| 1 | Hot Glue Gun | E | Yes |
| 6 | Glue Sticks | F | Yes |
| 1 | Pencil | G | Yes |

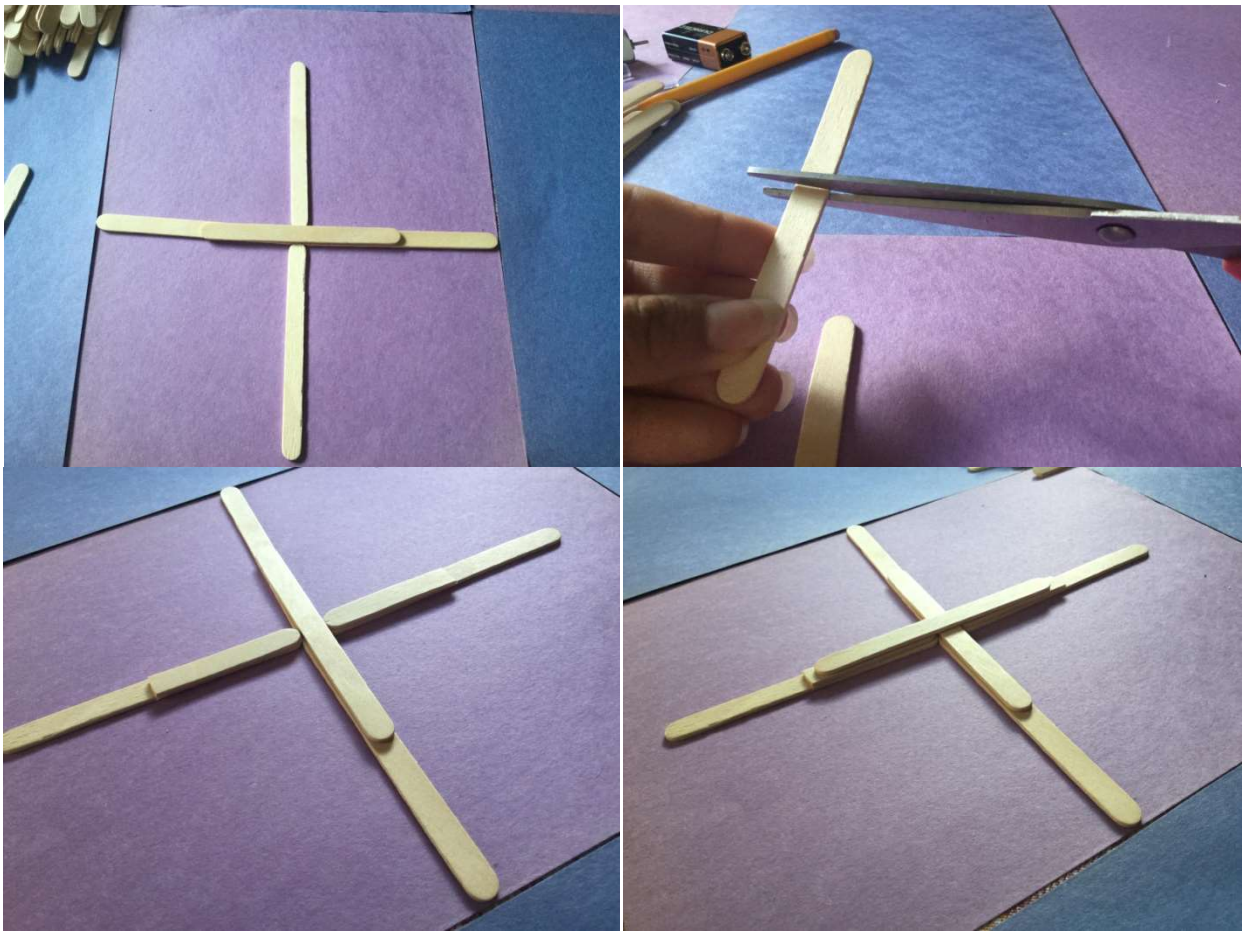



## Materials Needed

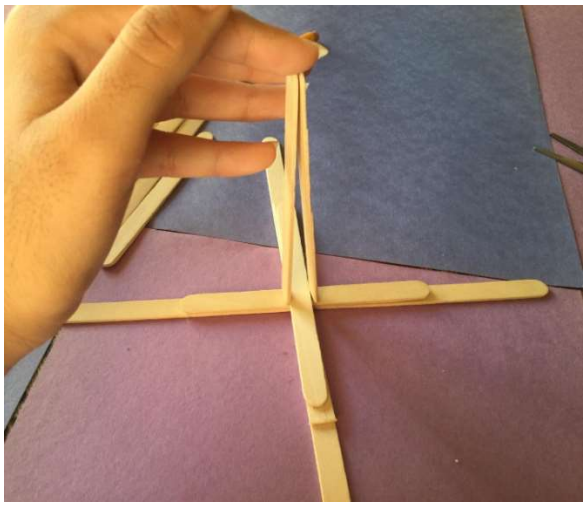
1. Place two popsicle sticks horizontally next to each other and place a third stick on top of both sticks at the center of the length of the two popsicle sticks.



2. Grab two more sticks and place them vertically, thus creating a cross. Grab another popsicle stick and cut it in half. Glue each cut piece on top of the two sticks that were previously placed. Place another stick on top of these cut pieces. This will be the base of your stand.

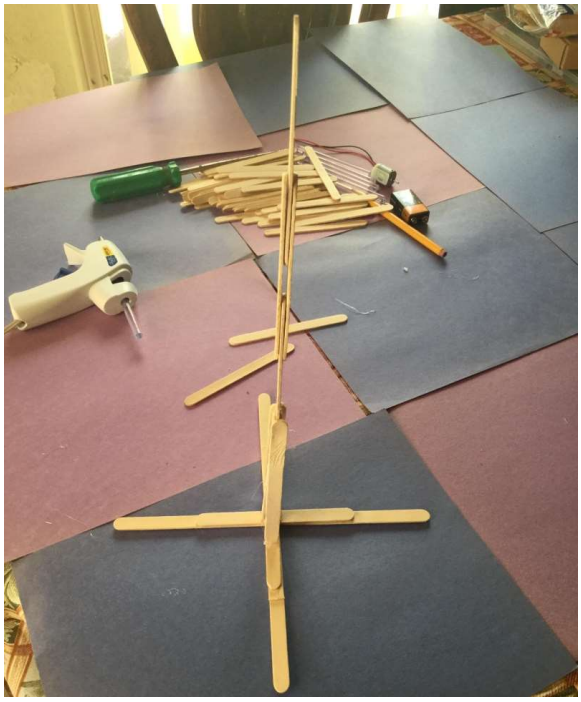


3. Glue two sticks perpendicular to the base you just made, like shown in the figure. Place a third stick in between the two sticks you just glued. Glue it into place.



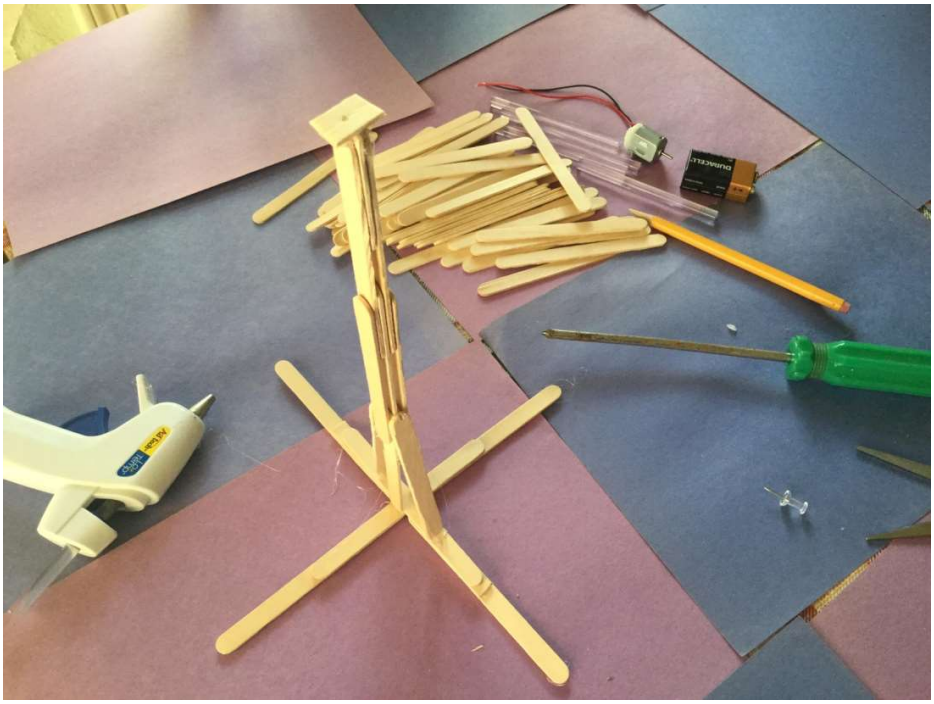

4. Now, vertically glue two sticks at opposite sides to support the stand you just made. Add a drop of glue at the bottom of each stick's edge of the base so that everything can be held into place.

5. Glue two more sticks on either side of the stand. You are making this tall now. Place a third stick in between the two sticks you just glued. Glue the third stick into place.

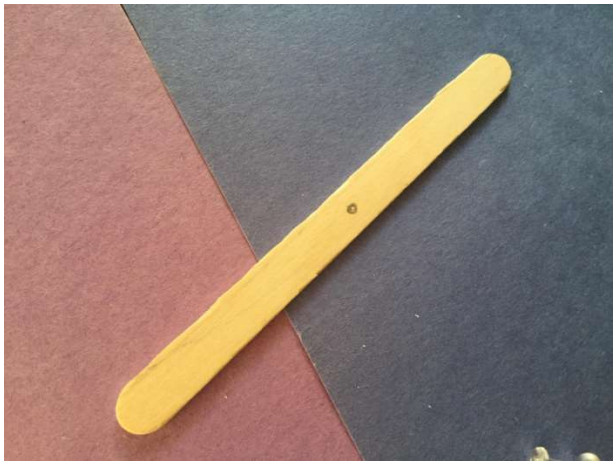


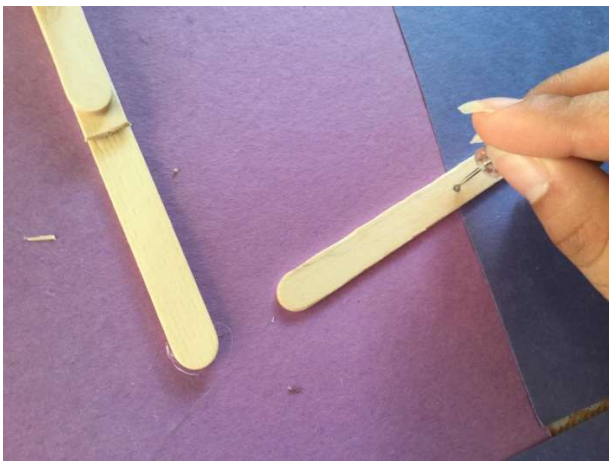
6. Reinforce the stand by gluing two sticks to each sides of the stand.

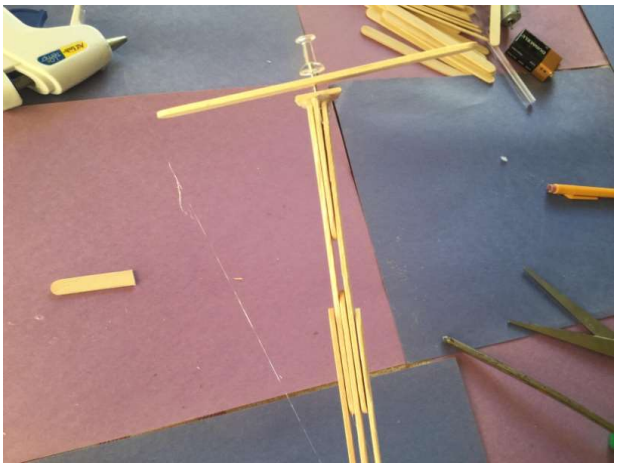
7. Cut the stick at the top of the stand so that it is aligned with the sticks next to it. Cut a small piece of a popsicle stick and horizontally place it on top of the sticks you just cut. Make a hole with the pin. The pieces should be centered.

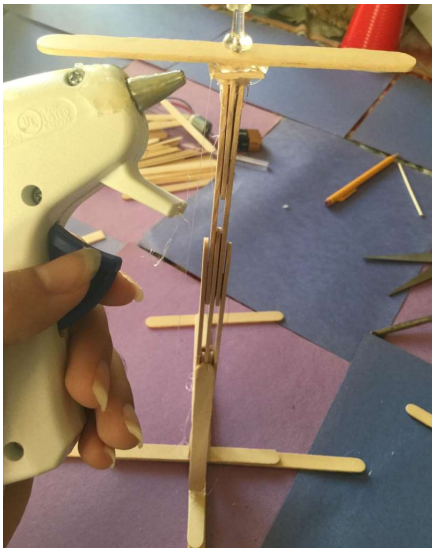


8. Get another stick and mark a dot at the center of the new stick. Push the pin through the stick and horizontally insert the stick on top of the stand. Hot glue gun the pin at the top of the stand to secure it into place.

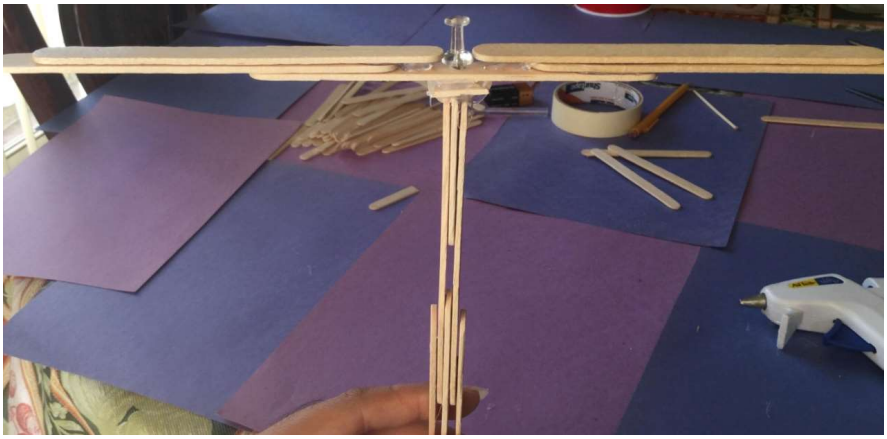




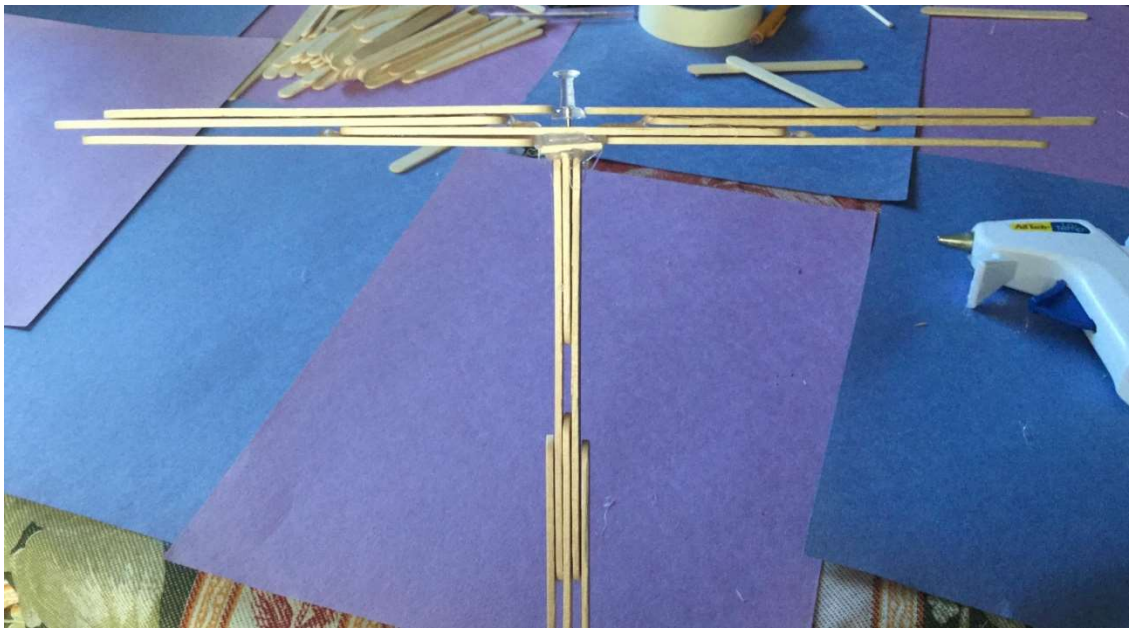




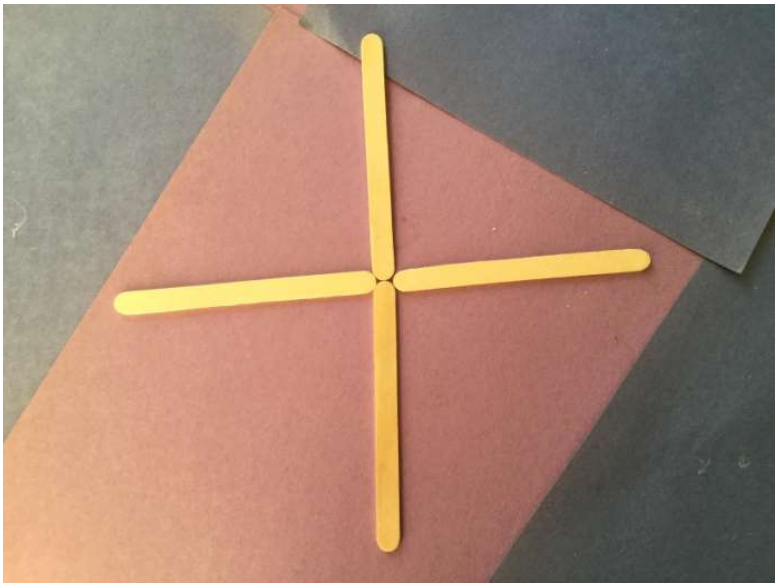
9. On the horizontal stick you just attached, glue two sticks on either side of it. Get two more sticks and glue them on top of these two sticks.

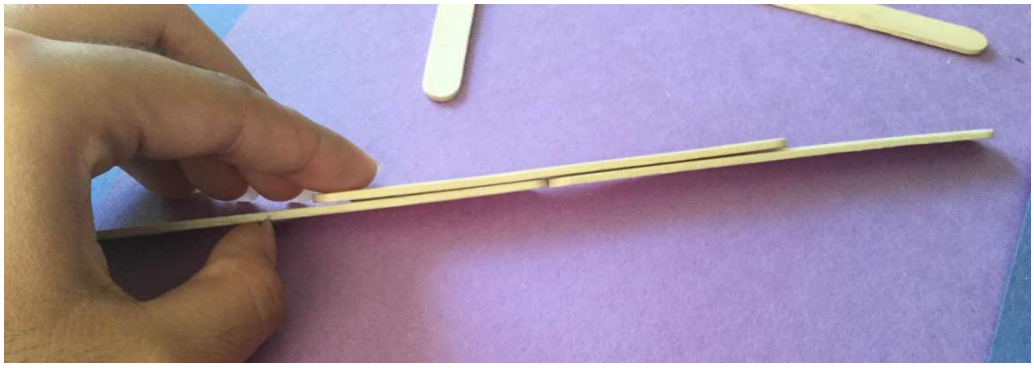


10. Get two more popsicle sticks and glue them at the bottom of the stick that has a pin inserted in it. Make sure the top “base” of the stand is well-balanced.

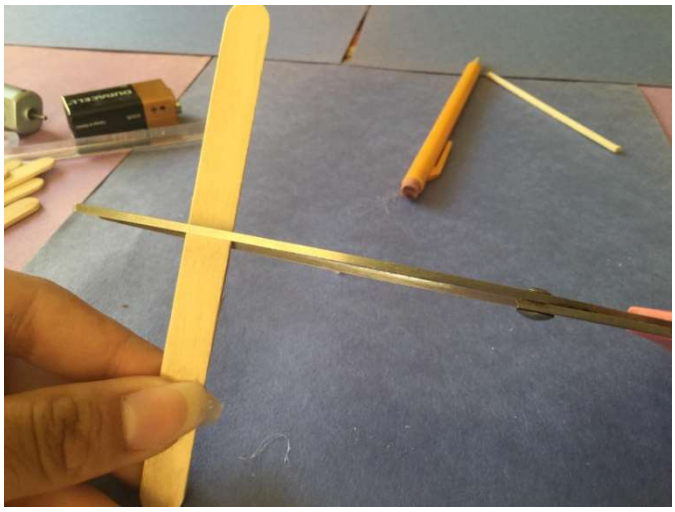


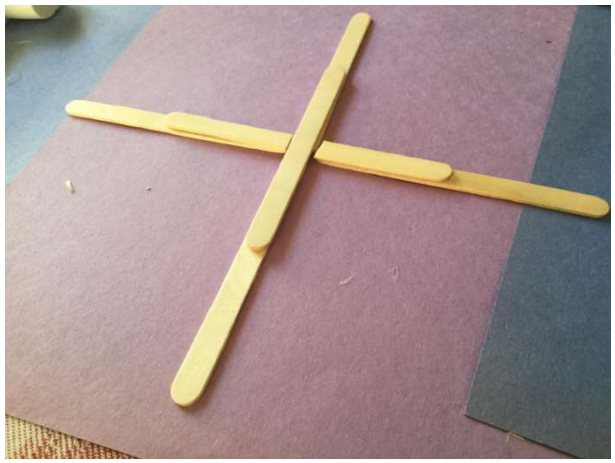
11. Now is time to work on the turbine. Place four sticks in the form of cross as shown below. Get another stick and glue it on top of two sticks and shown in the picture.



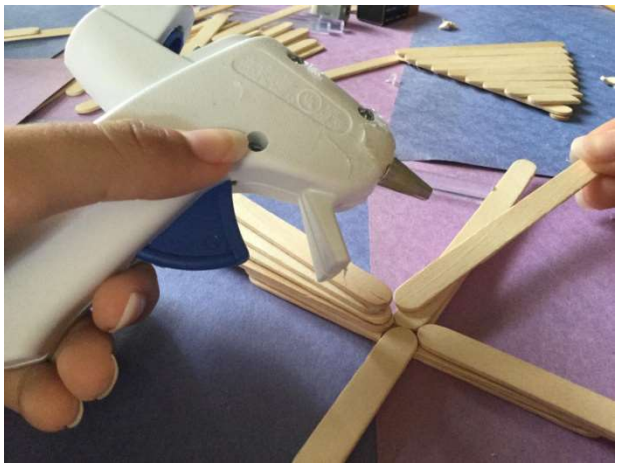
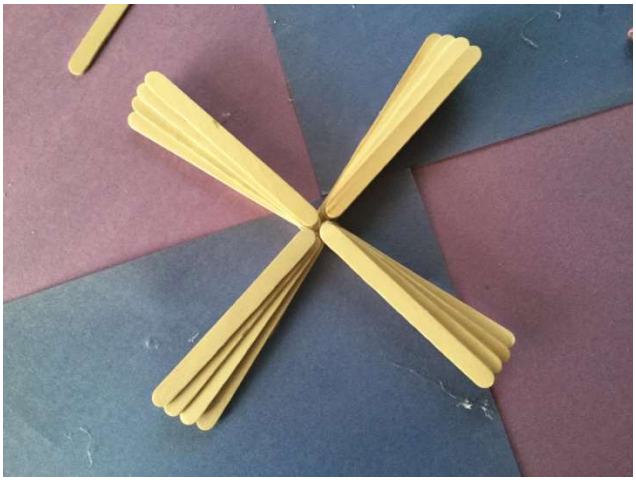
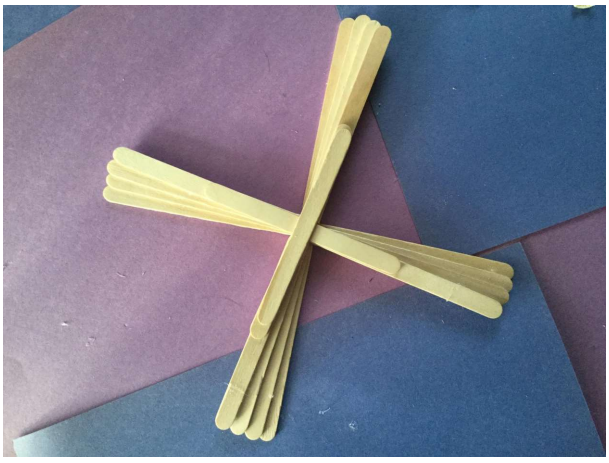


12. Grab another stick and cut it in half. Glue each cut piece on either side of the previously glued stick. Then, secure by adding and gluing another stick on top of both halves. Similar to the process that was made to do the base of the stand.

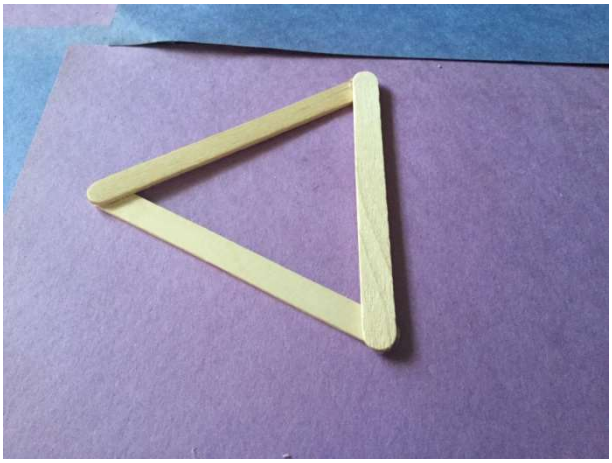


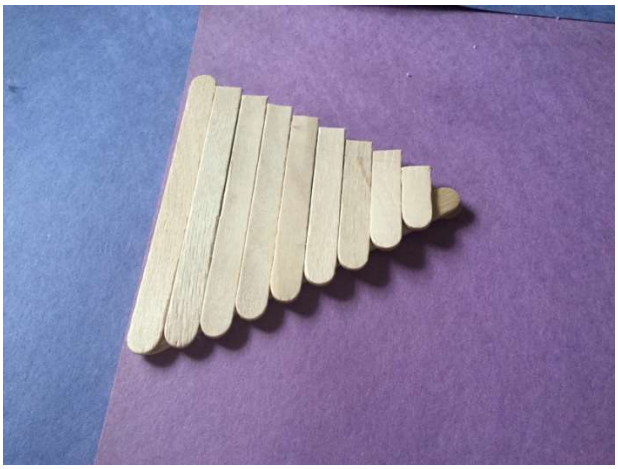


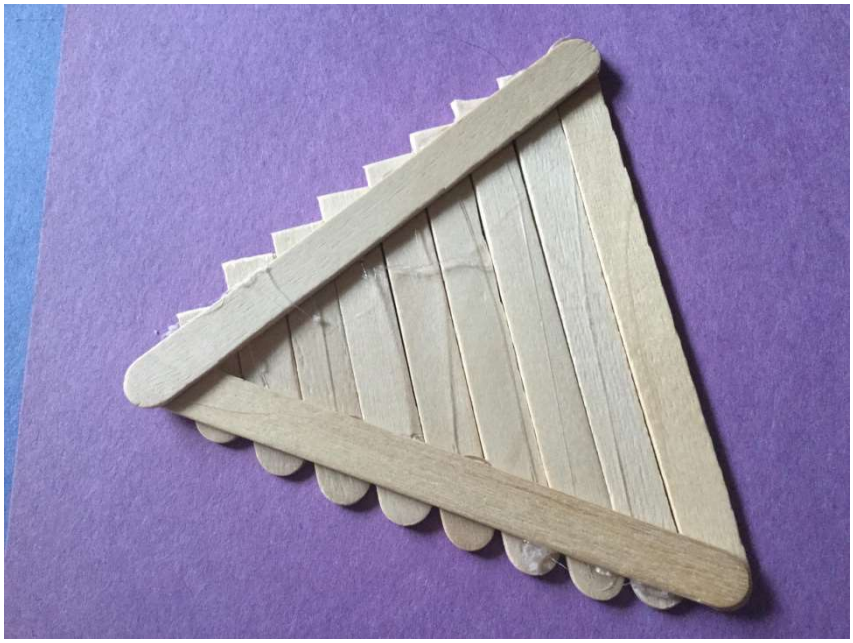
13. The side that has the sticks cut in half should be facing upside down. To make the blades, glue four sticks on each side of the cross-shaped blade at a slight angle. Fill in the center with glue and attach to the DC motor.

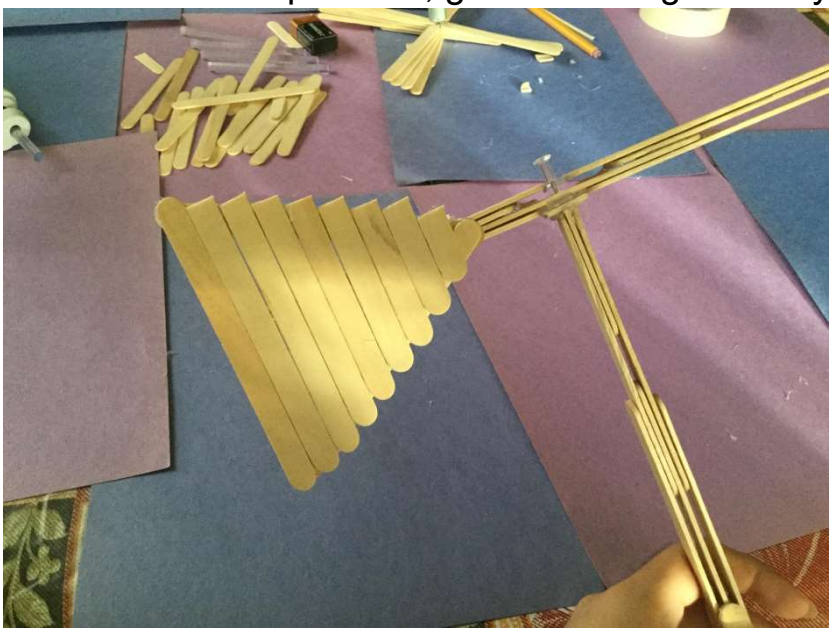

14. With three new sticks, you will create a triangle as shown in the picture below. Then fill the gaps by fitting and gluing more sticks to it.

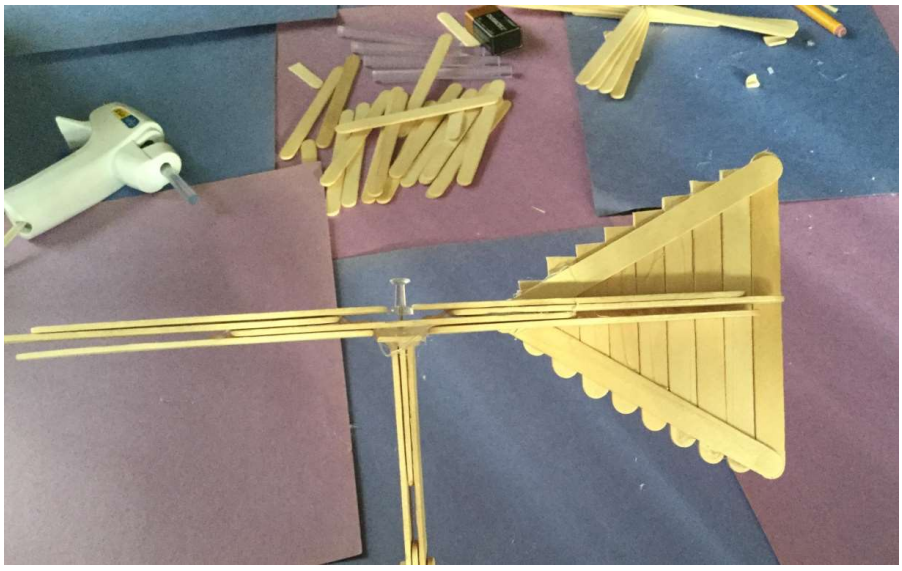




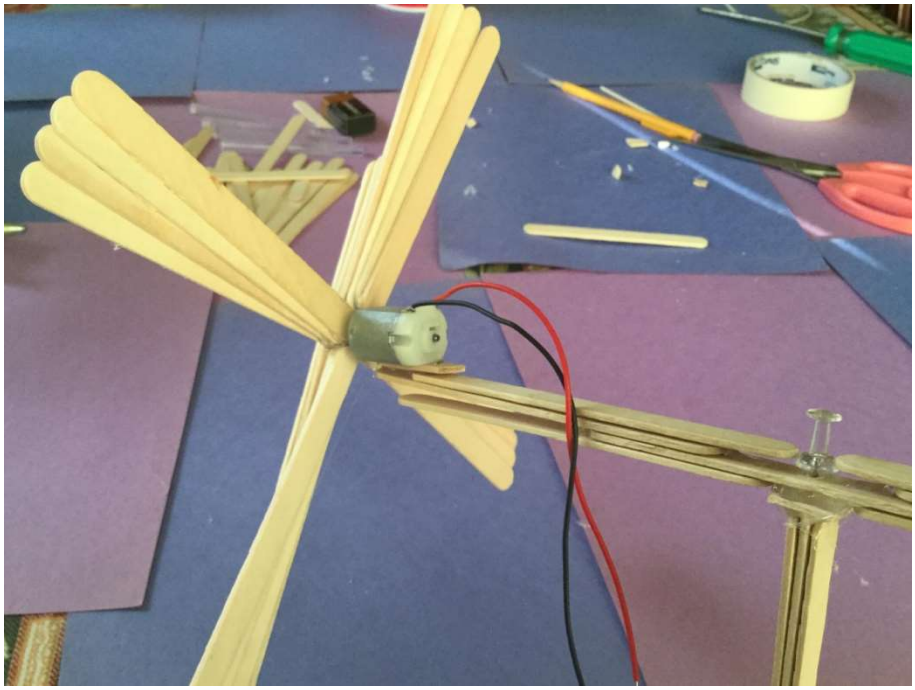


15. On one side of the top “base”, glue the triangular tail you made.

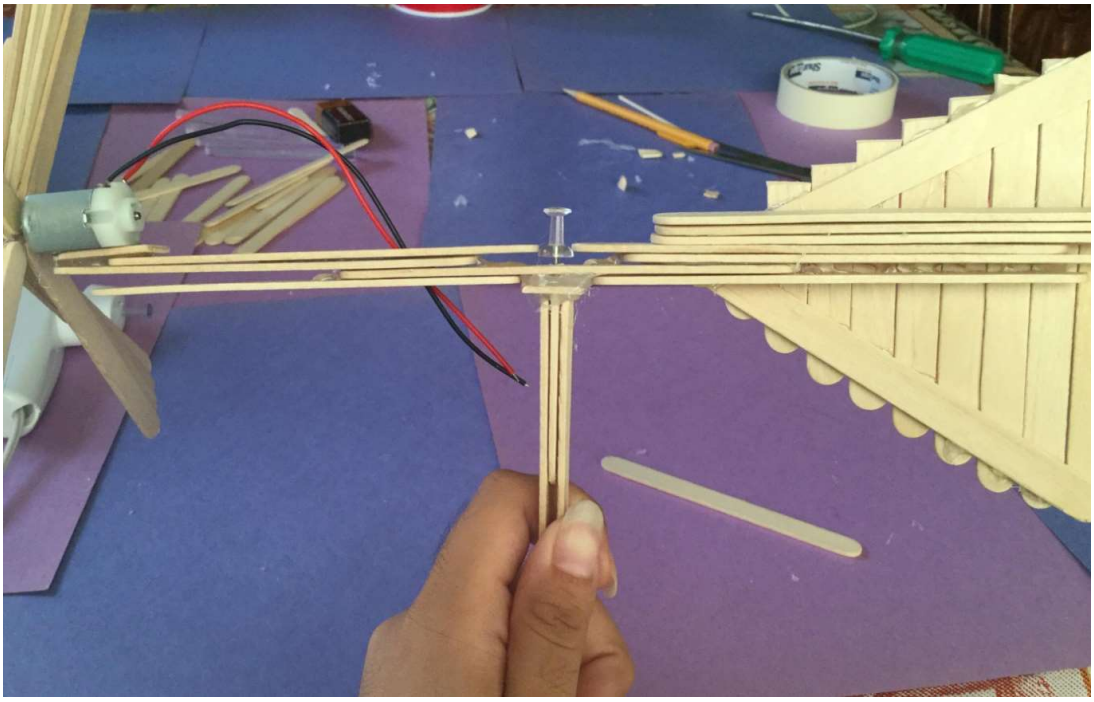


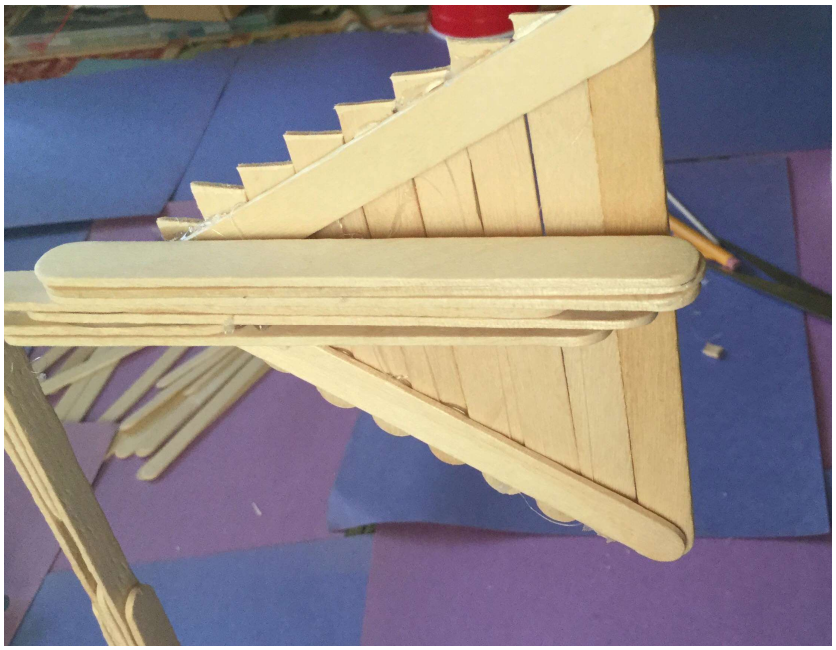


16. Cut a small piece of another stick to create a base for the motor. Glue the DC motor on this small base.

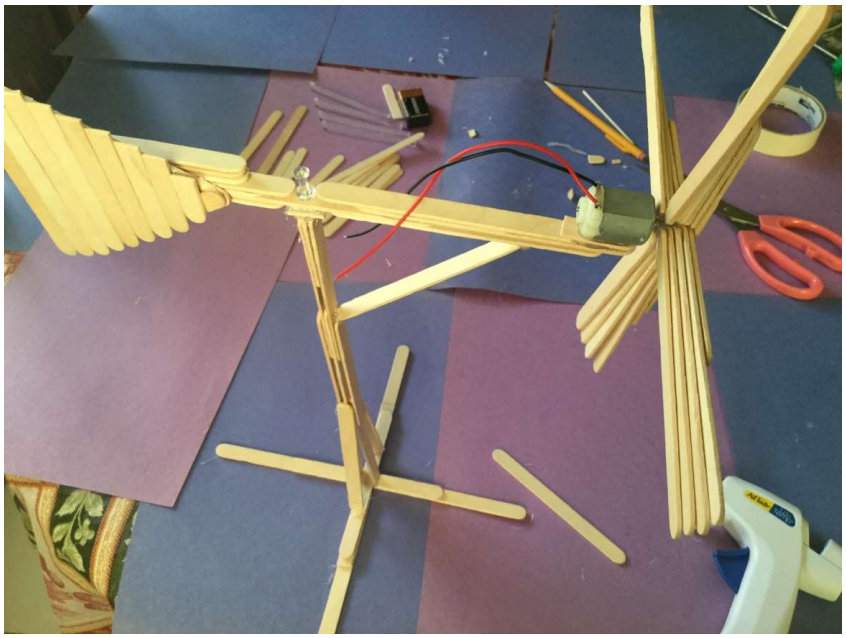


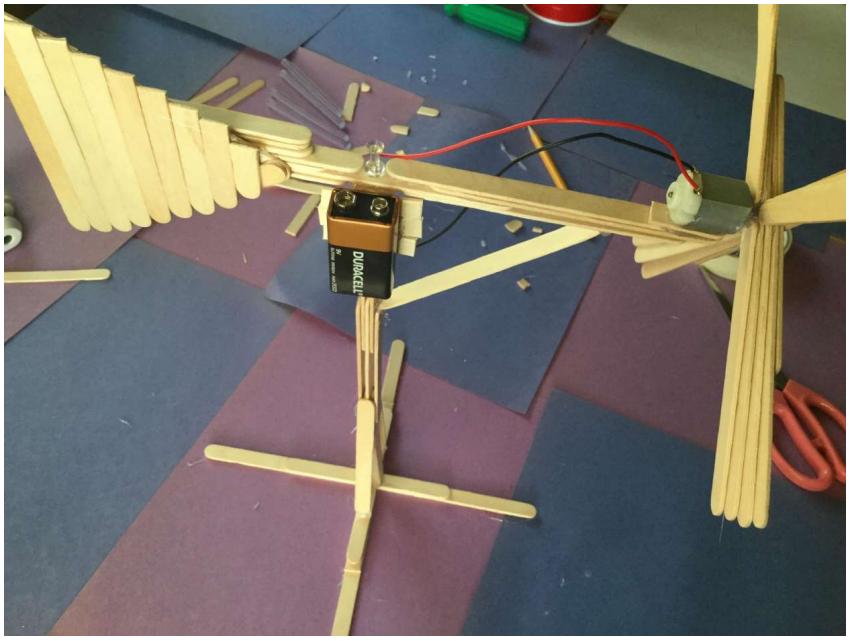
17. Get five sticks and glue them on top of one another as if placing them into a stack. Then glue the stack on the side that has the triangular tail. This is done in order to balance the weight of the blades and tail.



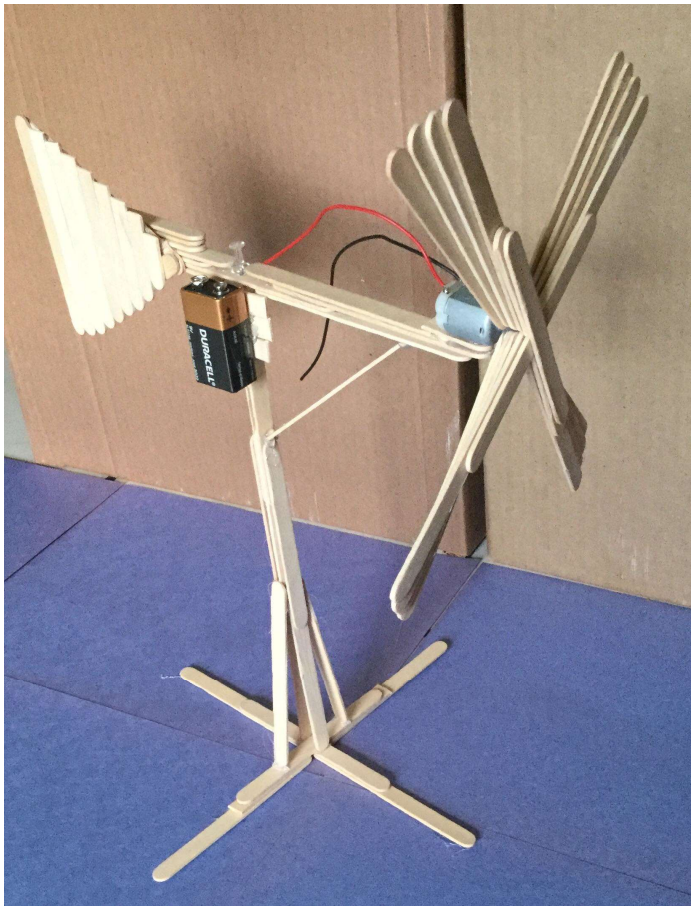


18. Make sure that your base is not tilting back and forth and that the weight is well-balanced. Finally, glue the 9V battery at any convenient space. The wires of the DC motor should be able to connect to the battery.






19. Connect the wires of the DC motor to the 9V battery and see how the windmill spins!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