

## **Solar Car building guide: keep this guide in your box for reference. (2016)**

### **Getting ready to build: Days 1-3 (5/9-5/11)**

1. Draw rough draft of car design to make the fastest car you can. You must use the solar panel and motor provided. You want to make your car light, strong and reduce friction wherever you can. (You want to choose gears that will speed your car up fast but not top out at too low of a speed) Complete Gear Ratio worksheet as a group.
2. Work with group to choose design or mix designs: (Things to consider include, shape and size of chassis, type of bushings, distance between axels, placement of motor, gear ratio, battery placement, solar panel mounts and angel of solar panel)
3. Each person will draw one labeled actual size drawing of the top view, side view or bottom view of the car on graph paper.
4. Use an overhead projector to trace the outline of your chassis including cut outs and **axel lines**
5. Cut out outline with scissors
6. Get a piece of balsa wood and trace the piece of paper that you just cut out. Be sure to draw parallel lines using the triangle, T-square or L-square before cutting out your chassis
7. Cut out your chassis and sand it

### **Getting your car ready for the Roll Down test: Day 4, 5, 6 (5/12-5/16)**

9. Fill out your materials sheet and present it to your teacher. Then receive the bushings (brass or plastic) axels, wheels (large or small) and gears that you have indicated (the bushings hold your axels on the car and allow them to spin)
10. Place the axel through the bushings and line it up on one of the axel lines you drew on your chassis.
11. Very carefully attach the bushings using hot glue (not too much and not too little, see teacher demonstration). Wait for glue to dry before testing
12. Use tube o lube to reduce friction in your bushings and add axels wheels and gears so that you have a rolling car
13. **COMPLETE** one pink Roll Down worksheet for your group using the ramp in the hall as demonstrated by your teacher. (A score above 20 earns you and A)
14. Make any adjustments to your car to improve roll down test score and turn in the paper with all of your team's names on it

### **Getting ready for a speed test: Day 7, 8, 9 (5/17-5/19)**

- 15: Get a motor and a pinion gear (12 tooth), wires, alligator clips and a motor stand (if it is in your plans). Some of the motors are prewired with alligator clips.
16. Mount your motor to the chassis so that your drive gear (on the motor) matches up with your follower gear (on your axel) without too much friction, but close enough to transfer the force of the motor to your axel and wheels. You may need to make a balsa wood platform for it depending on which gears you are using.

17. Connect wires and make sure everything is running the way you want it. You may want to do some soldering of your wires or simply twist and use shrink tubing to make connections. (your teacher will demonstrate all of these methods)
18. Add any bumpers that are in your plans so that your car does not get caught up on the PVC pipes that line the track. (some materials that are often used are plastic zip ties, balsa wood, aluminum pieces from bent axels.
19. Do a speed test with 2 AAA batteries without the solar panel either in the back of the room (9 meter track) or in the hallway (20 meter track): Do three trials and calculate the speed ( $\text{distance}/\text{time} = \text{m/s}$ ). Complete first part of the green speed worksheet for your team.

**Adding the Solar Panel: Day 10, 11, 12 (5/26- 5/31)**

20. Get some balsa wood scraps for mounting your solar panel. Use cardboard cut outs the same size as the solar panel or a broken solar panel as your guide
21. Cut and glue your solar panel mounts to the chassis
22. DO NOT hot glue the solar panel. Use Velcro to attach the solar panel to your mounts
23. Test the car with batteries first inside and then on the final days try your car outside on the track in the driveway.
24. Complete the speed worksheet with the solar panel (with batteries if no sun is available)

**Refining and choosing car to go on race Day 13, 14 6/1, 6/2 we'll be choosing the cars for the race.**