



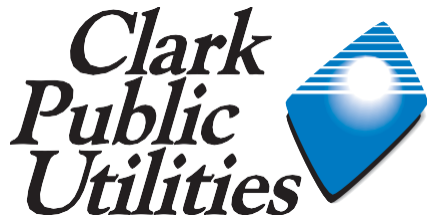
Solar Car Challenge 2020

Informational Night for New Coaches

Monday, December 9, 2019
Tuesday, December 10, 2019
presented by
Clark Public Utilities

in partnership with CE - Clean Energy. Bright Futures.

Renewable Energy Education Team



Clark Public Utilities

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CE Program

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Agenda

4:30 PM – Introductions

4:45 PM – Challenge Overview

5:00 PM – Activity Guide

5:15 PM – Build a Demo Vehicle!

6:15 PM – Logistics, Team Registration, Q&A

6:30 PM – Closing

Let's Hear From You!

- Name, grade level
- Why are engineering challenges valuable for your students?



Clark Public Utilities Solar Car Challenge



Saturday, March 14 (Pi Day!) 2020
Hudson's Bay High School

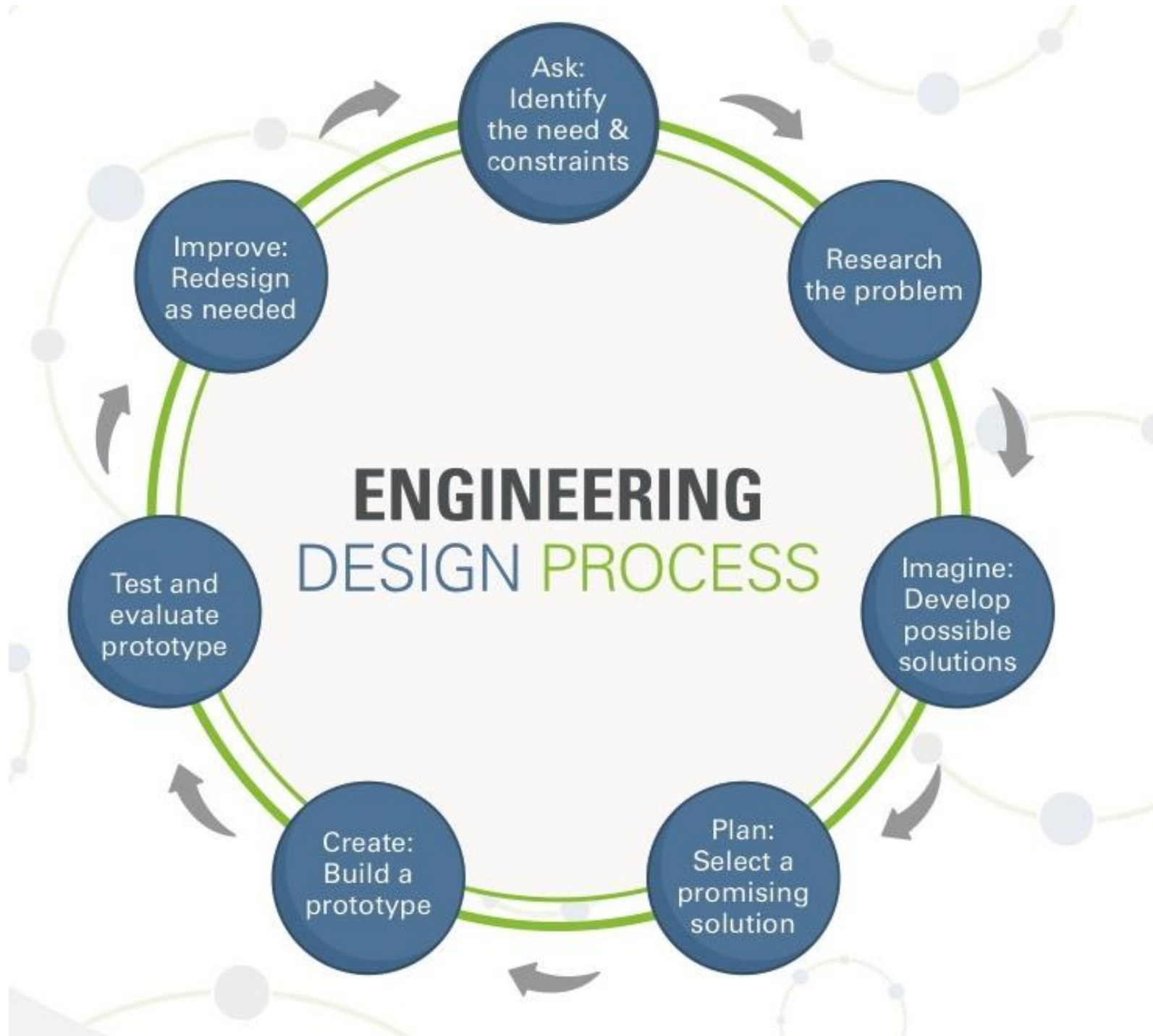


clarkpublicutilities.com/solarcarchallenge

Solar Car Challenge 2019 Recap



Engineering Design Process



Eligibility for Participation

- K-12th grade students in Clark County
- Adult coach to register team(s), mentor, and supervise
- Limited to 10 teams per school
- Team must be registered by Friday, December 6, 2019 to participate
- Registration opened Friday, November 15, 2019

Vehicle Requirements

- Must use the following provided materials:
 - 2-AA Batteries
 - DC Motor
 - Solar Panel
 - A switch that disconnects batteries from circuit
- Middle and High School Must additionally include:
 - one LED in circuit
- High School must include:
 - Resistor in series with battery



Disqualifying Actions

- Using solar panel as the body (chassis) of vehicle
- Modifying the solar panel in any way that makes it less or non reusable
- Using additional or changing existing motor in any way (aside from attaching it into circuit)
- Adding additional power sources
- Purchasing/using materials with a value greater than \$10

Scoring

TOTAL CHALLENGE POINTS	% Score	Point Structure
Race Trials (Team Heat Races, modified double elimination)	45%	400 maximum points Content, clarity, teamwork, preparedness, research, final product
Documentation of Engineering Design Process	30%	500 maximum points Poster and engineering notebook
Team Interview	25%	0 points 1 st place: 5 points 2 nd place: 3 points 3 rd place: 1 point DQ* or DNC**

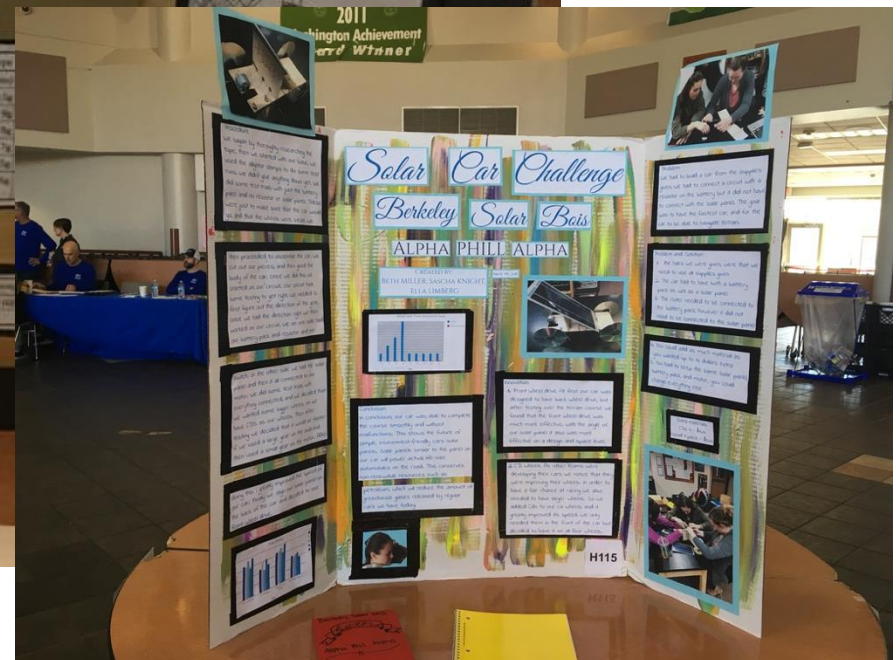
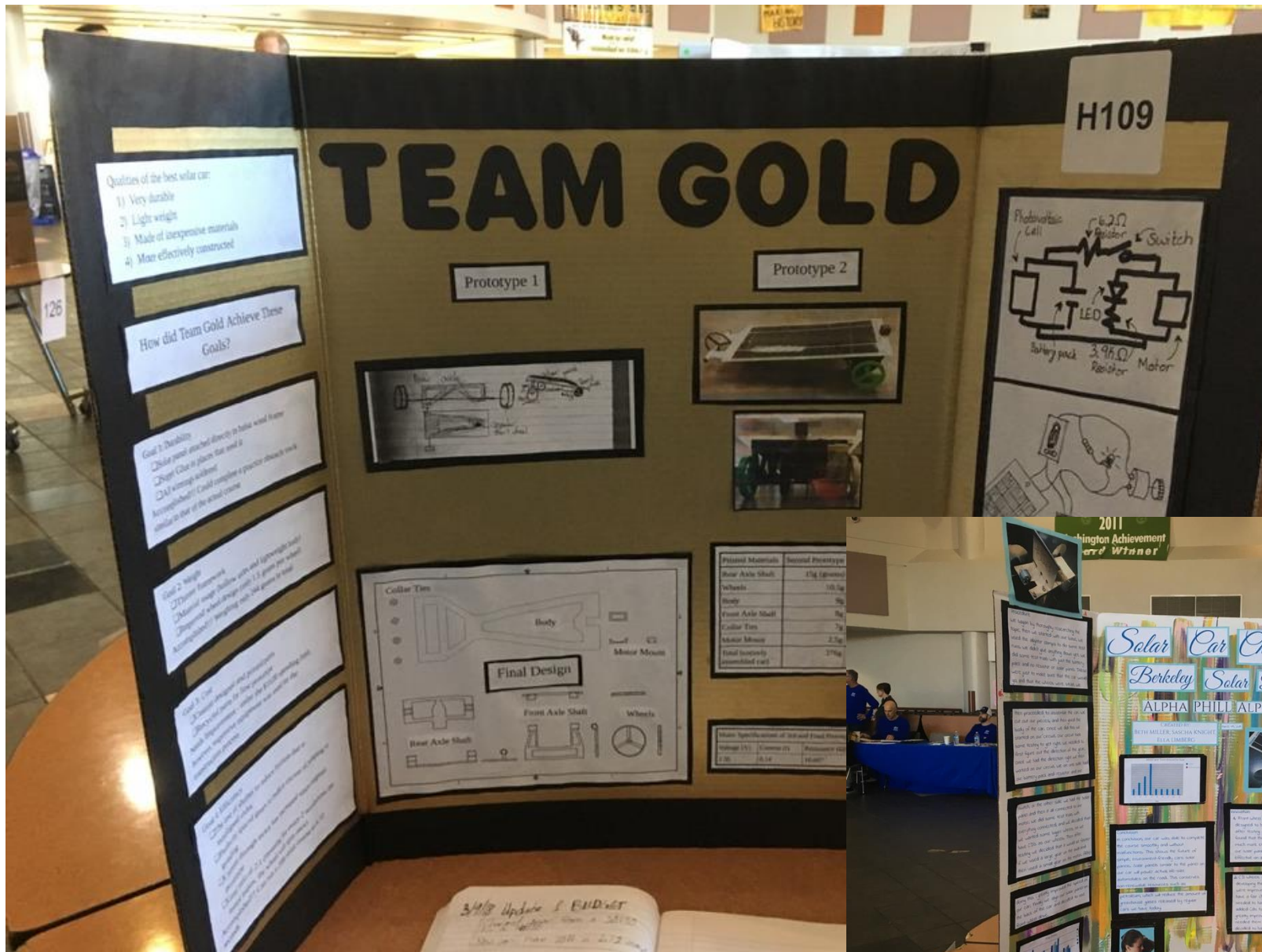
Other Challenge Requirements

Design Documentation

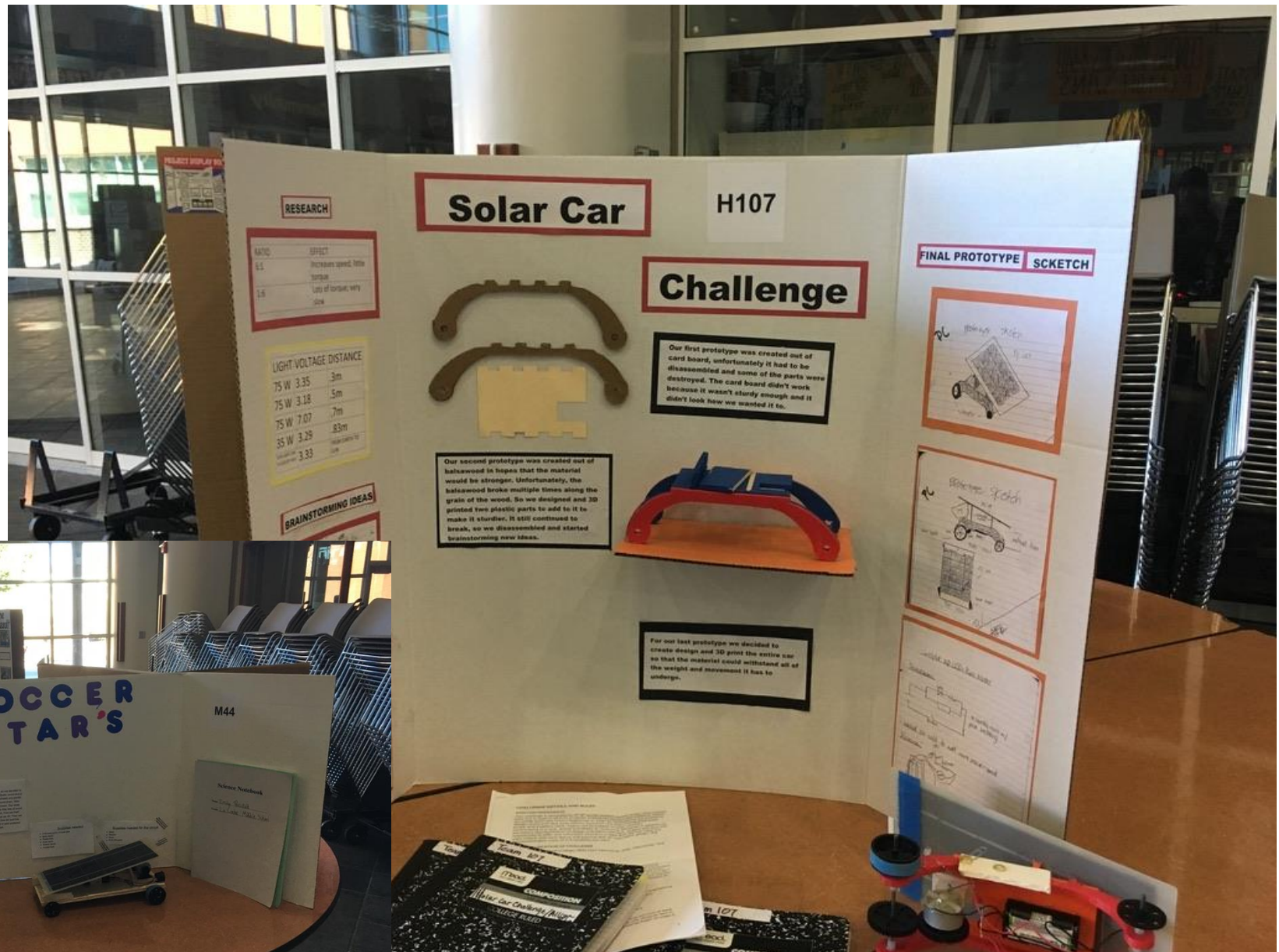
- Poster (trifold/table top)
- Engineering Notebook
- Poster presentations
- Interviews with judges



TriFolds



TriFolds



Engineering Notebooks

Problem Statement cont...

4 Areas of judging

1. Speed (40%)

- completing track: 10pts
- 1st place: 25pts
- 2nd place: 20pts
- 3rd place: 15pts

2. Obstacle (15%)

- same as speed track w/ strips of carpet along the course. Minimum of one run Maximum of 3 runs timed.

- Complete track: 5pts
- 1st, 2nd, 3rd place: 5pts

3. Documentation of Design (25%)

- Knowledge should be communicated through a team poster and Engineering notebook
- group poster should be a summation of the groups knowledge

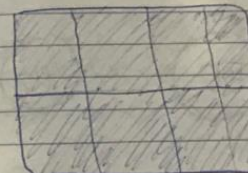
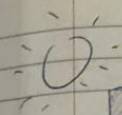
4. Interview (20%)

- Each team will be interviewed by a judge.
- points will come from Content, Clarity, Teamwork, and preparedness

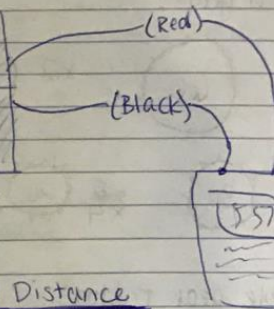
01/03

Power Motor w/ PV Cell

01/03



Photovoltaic Cell
(Light → Volts)



Light	Voltage	Distance
75w	3.35	.3m
75w	3.18	.5m
75w	3.07	.7m
350W	3.29	.83m
Sunlight on cloudy day	3.36	sun

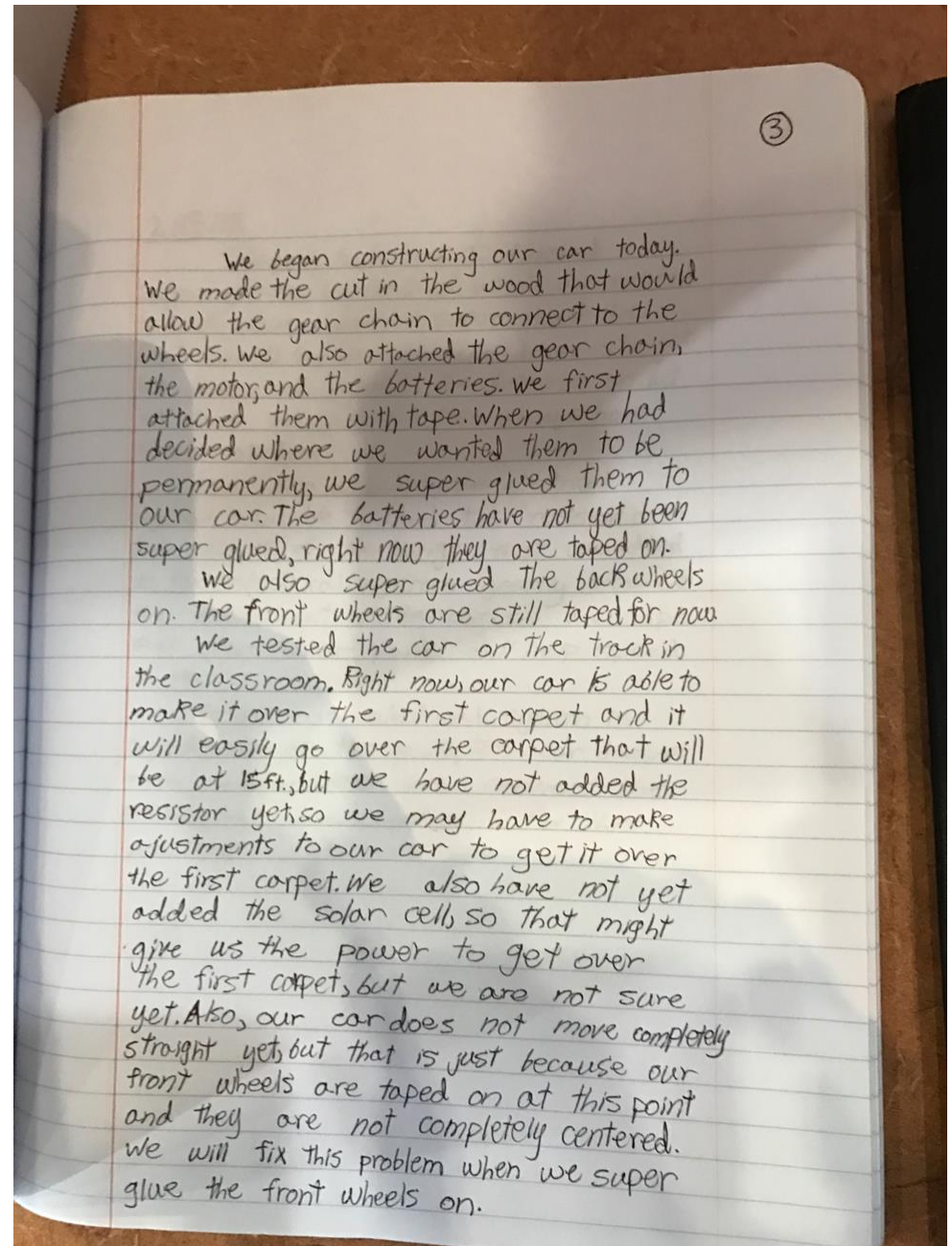
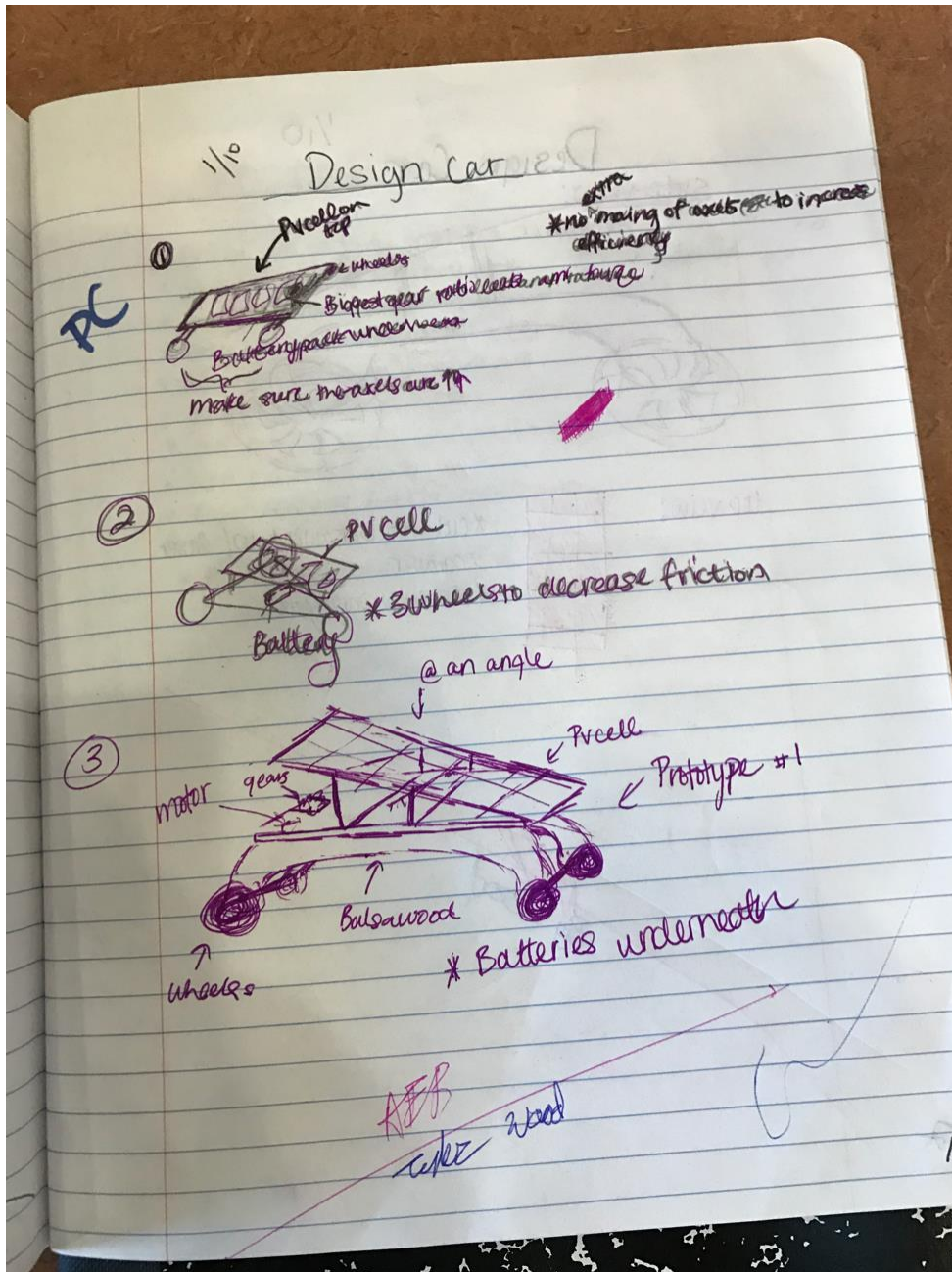
} distance from the cell decreases the amt. of Voltage in the PV cell

more Watts = more volts

* Tilting the PV cell reduced the voltage very slightly
↳ the 4 on the vehicle shouldn't be much of a problem

APB
type

Engineering Notebooks



Equipment Sizes

Track Size

- ~6 m long
- 31.75 cm wide lanes
- Starting gate at 40 cm
- Lights positioned 32" above track
- Illumination at 3 in above track is a minimum of 200-300 W/m²

Track materials

- PVC Sides (1" diameter)
- Gym floor

Max Vehicle Size

- 38 cm long
- 30 cm wide
- 30 cm tall



Activity Guide

- Left open for modification in your classroom in a variety of settings
- Focus on providing general structure for engineering process
- Tools to build process into engineering notebooks
- Developed closest to middle school grade bands in order to scale up or down easier

Demo Car Design

Several Routes:

1. Build Demo using takeaway materials

- Can use team design or individual ideas
- Model off the balsa wood templates
- Use command strips rather than hot glue for motor attachment

2. Build circuit separately first (recommended for those with minimal circuit experience)

- Can solder in the future

Demo Car Tips

- You can use pre-cut bodies as a stencil
- Measure twice, cut once!
- Check gear sizing for clearance before attaching
- Do NOT glue anything unless you are certain you won't change design

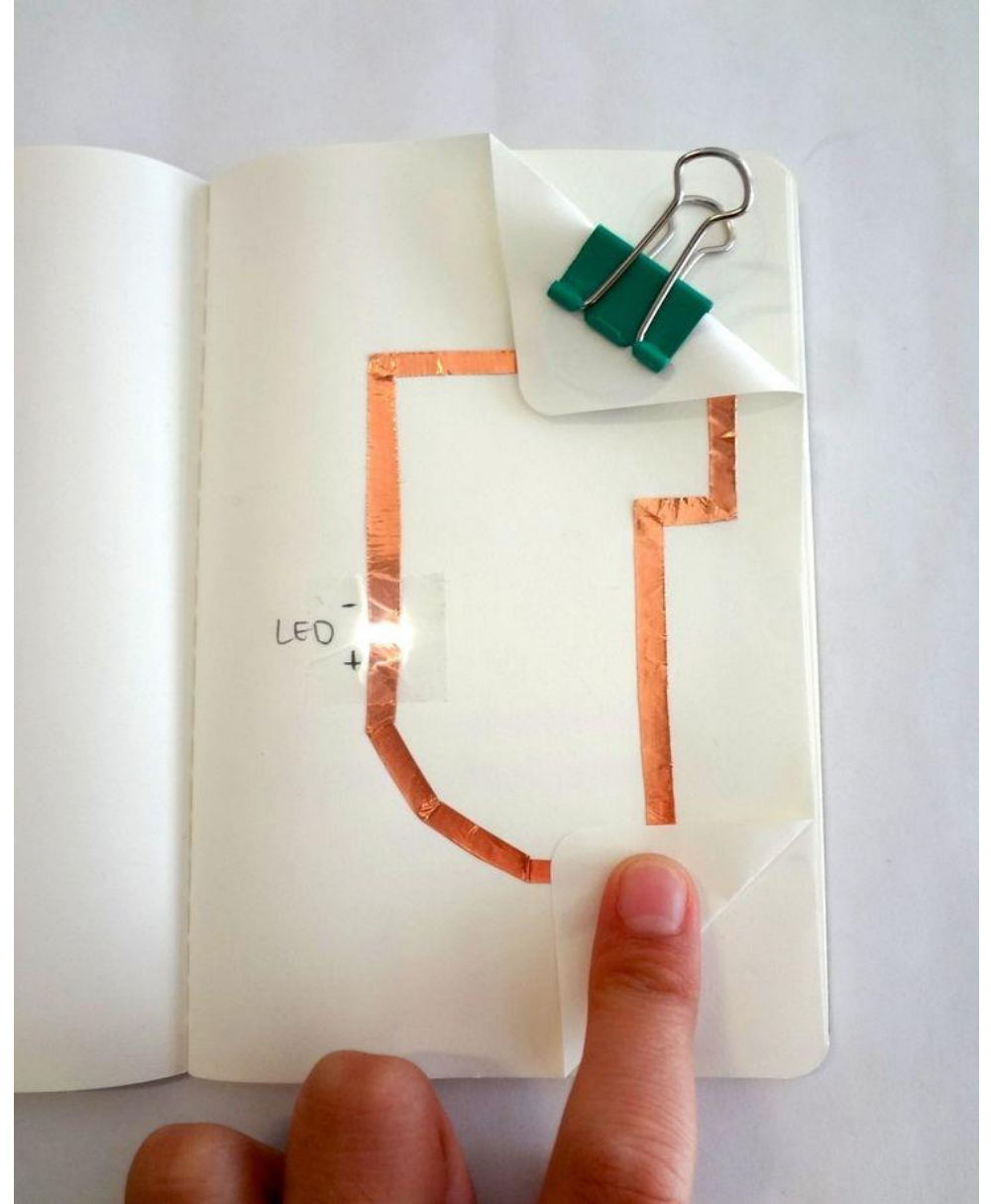
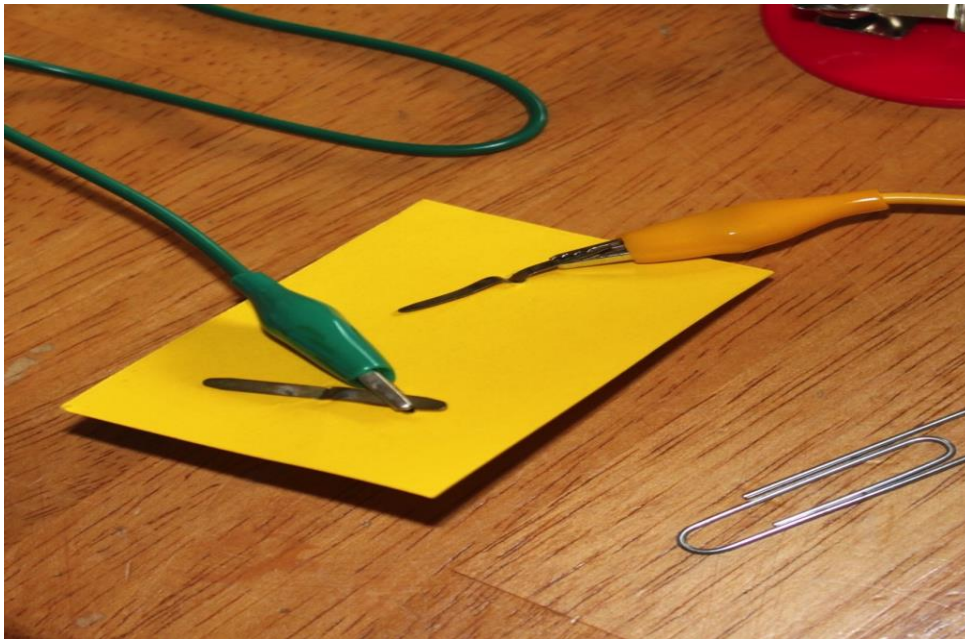


Vehicle Circuitry

Design a circuit with the following criteria and constraints:

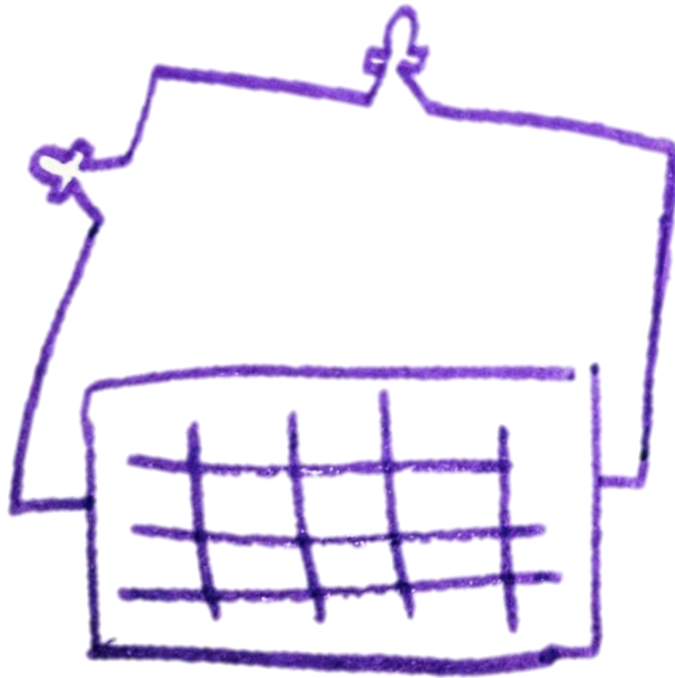
- Must use 2-AA batteries, solar panel, and motor
 - Student team kits will include a battery holder with a built-in switch
 - Design your own switch, or model where it will go!
- Batteries must be wired in series with switch
- Motor must spin
- **Middle School:** Include 1 LED
- **High School:** Include 1 Red LED light and resistor wired in series with batteries and switch

DIY Switches

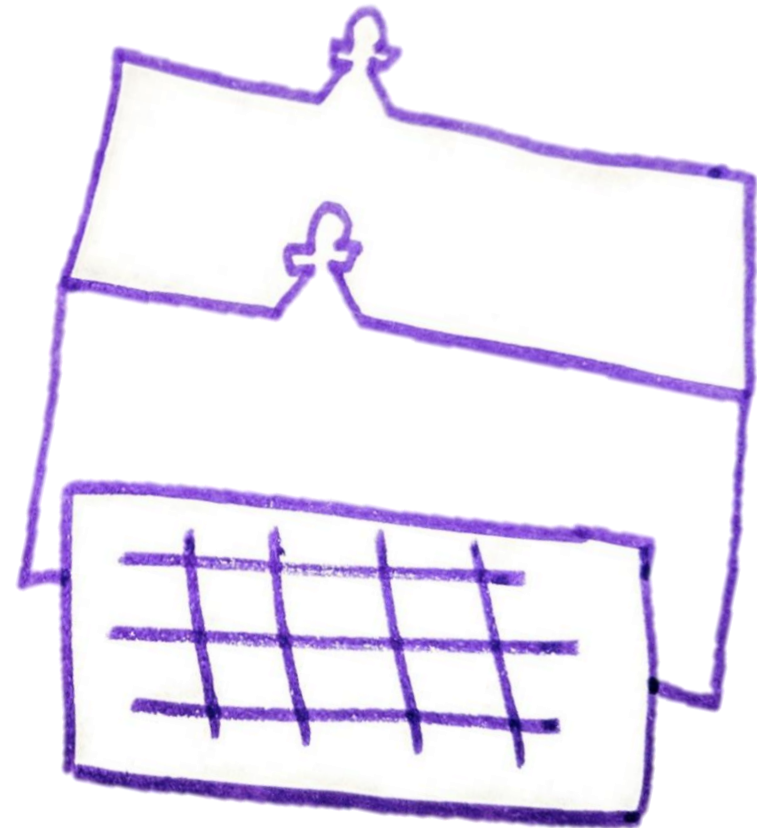


Circuit Review

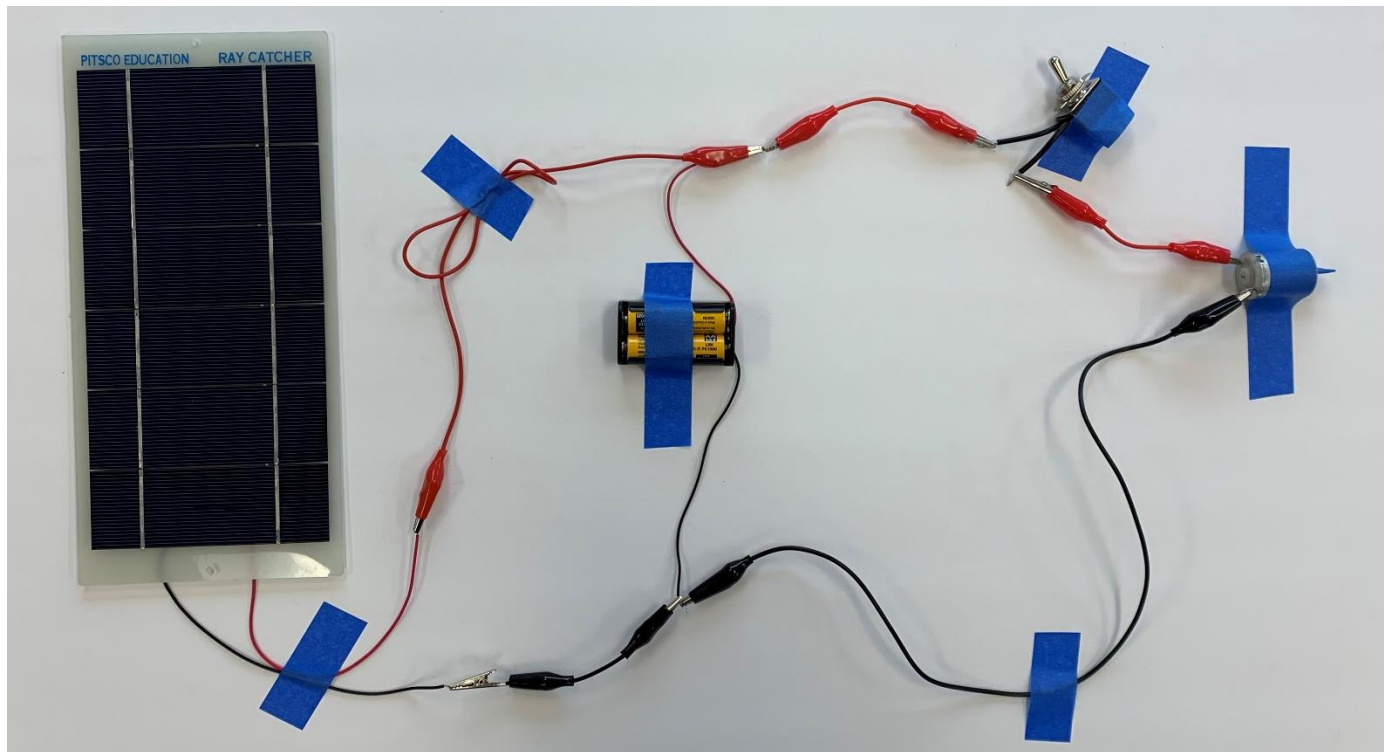
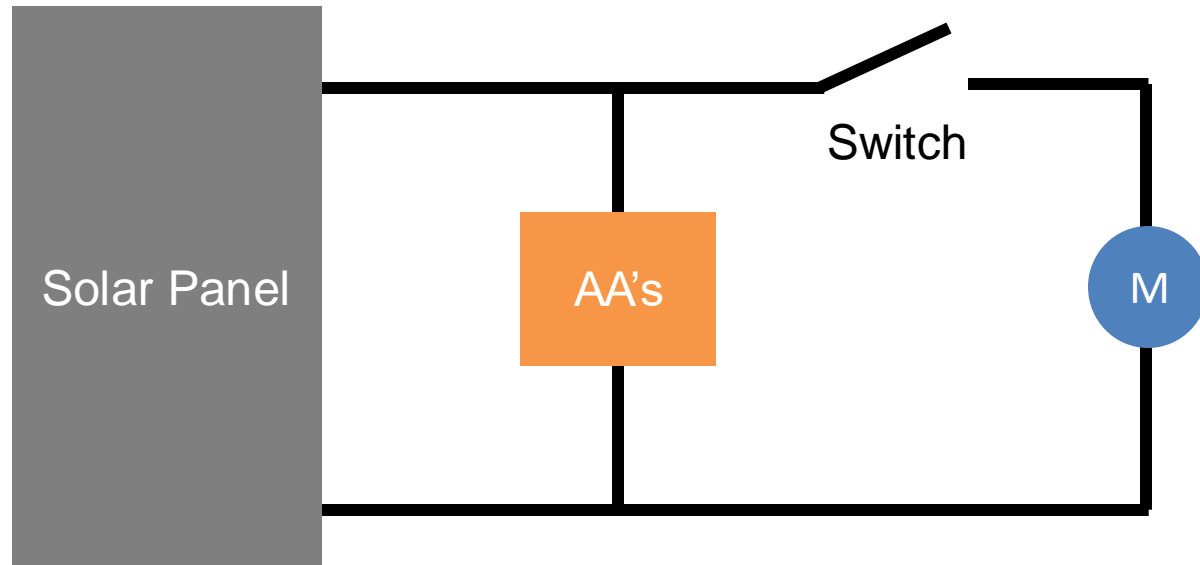
Series



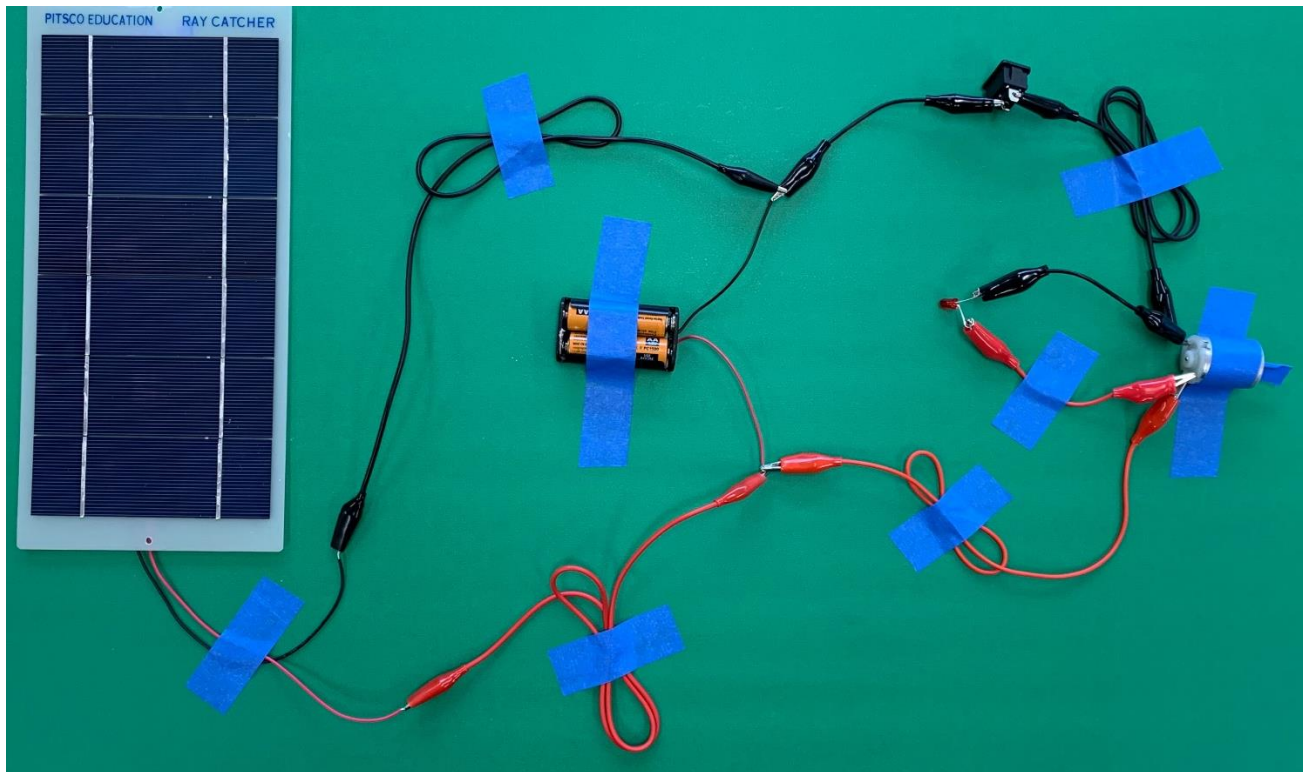
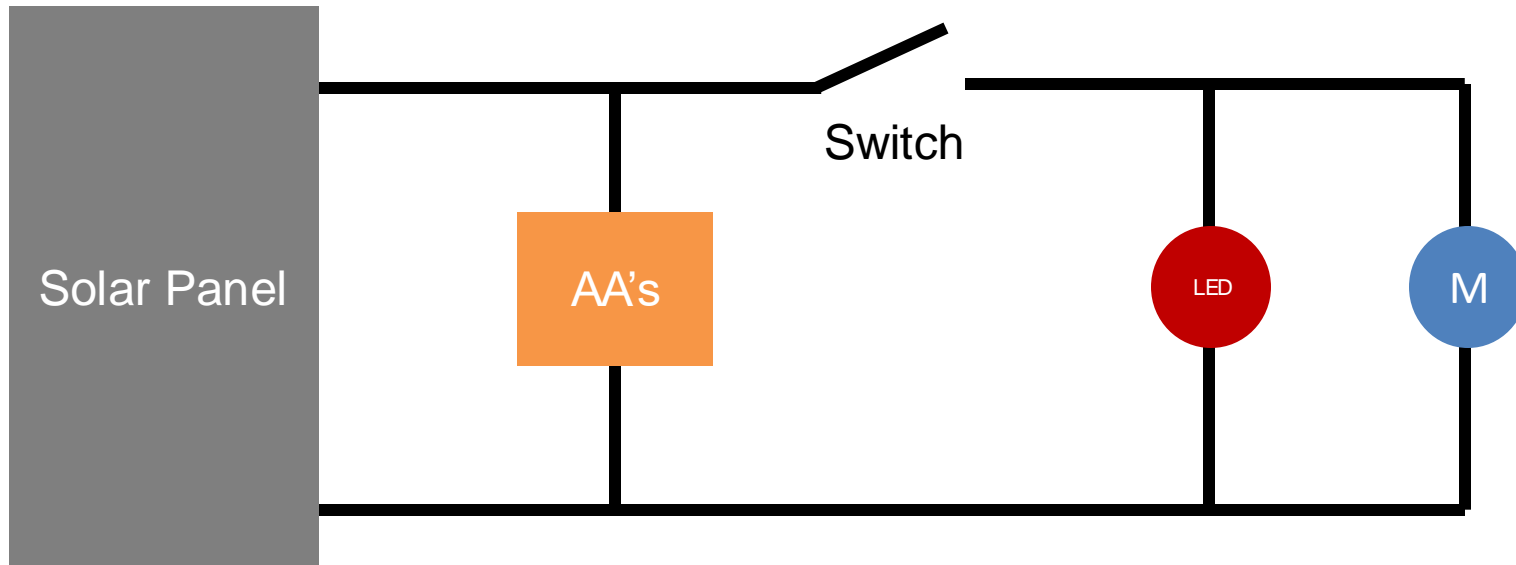
Parallel



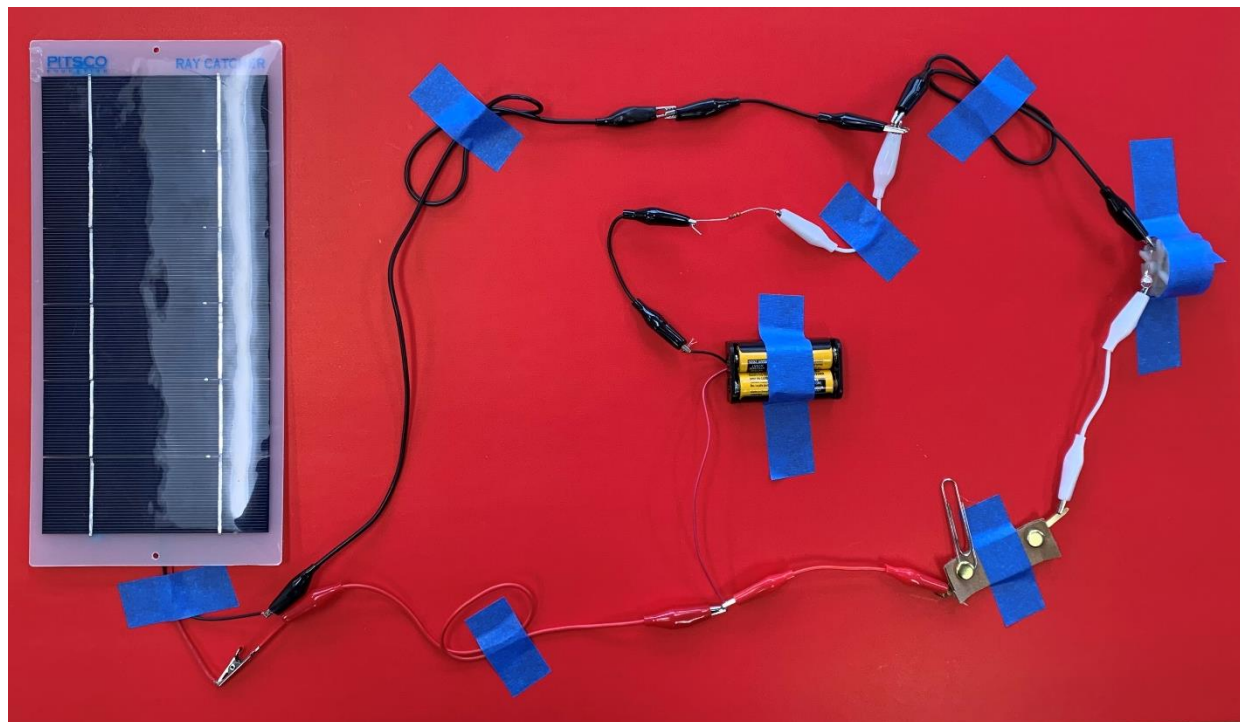
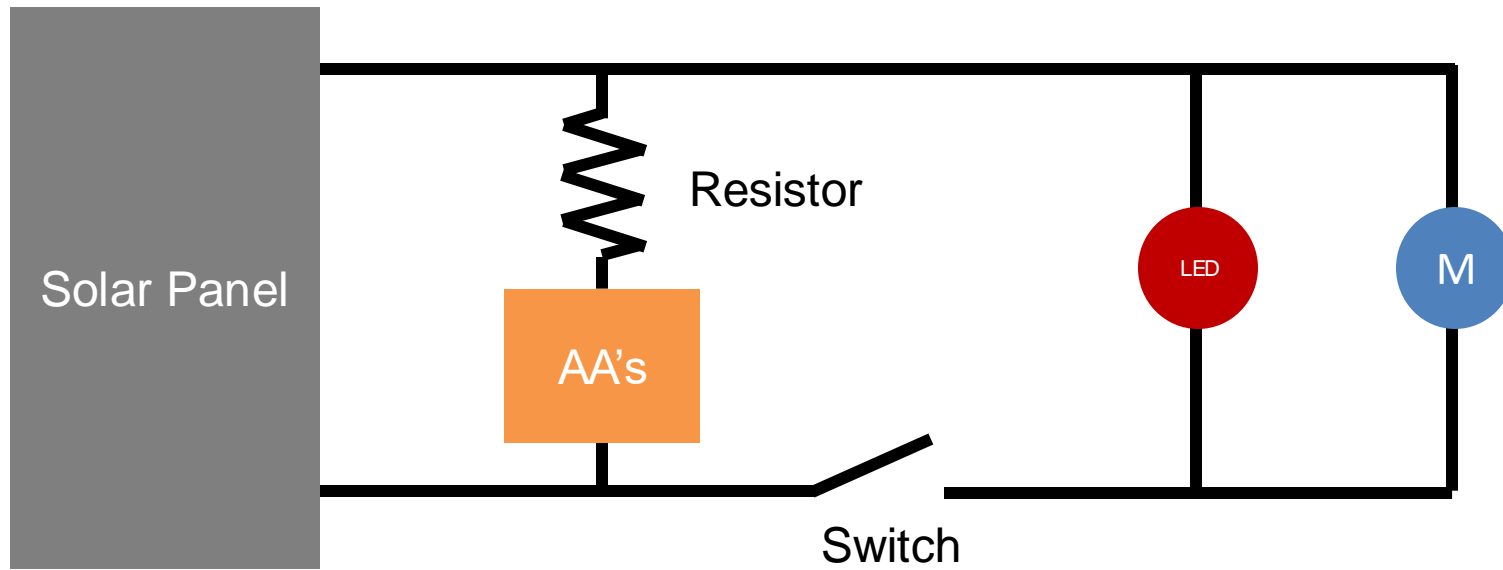
Elementary School Circuit



Middle School Circuit

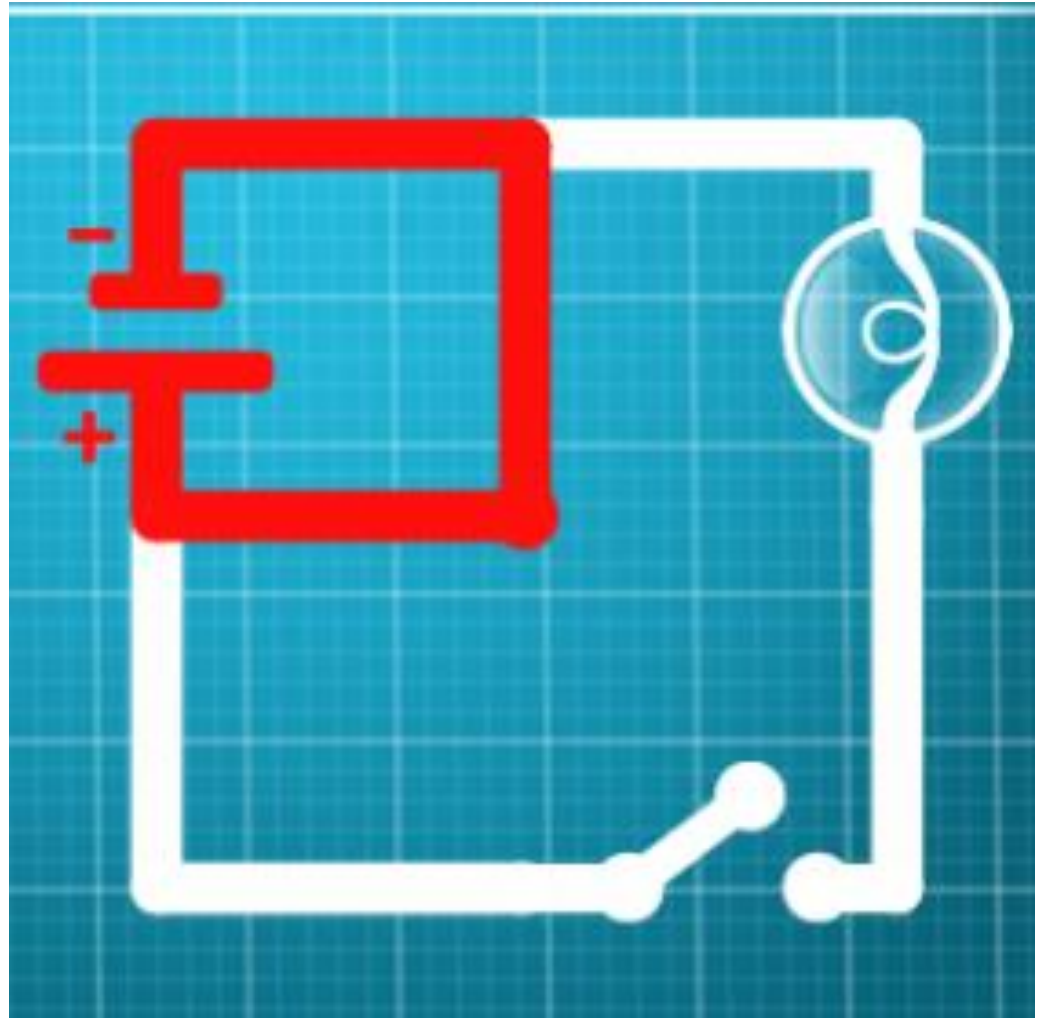


High School Circuit



Safety Tips

- Don't short circuit batteries!
- Remove batteries from battery holder for storage and to prevent short circuit



Logistics and Process

Team Registration opens Friday, November 15, 2019

- Kit Pickup:
 - Monday, December 9, 2019
 - Tuesday, December 10, 2019
- Stipends available for Afterschool Coaches



Logistics and Process

Clark Public Utilities Solar Car Challenge:

- Saturday, March 14, 2020
- Registration and set-up for teams will be scheduled by grade band
- Activities, Judging, Prizes, and Food!



Questions and Discussion



Contact Us



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