

Name: \_\_\_\_\_

Date: \_\_\_\_\_

# Solar Car Challenge Engineering Outline

## LEARNING TARGETS:

- ED: 7.4D.2 Student can design a problem that addresses a need and identify science principles that may be related to possible solutions.
- ED: 7.4D.3 Student can design, construct and test a possible solution using appropriate tools and materials. Student can evaluate proposed solutions to identify how design constraints are addressed.
- E&S: 7.2E.3 Student can evaluate natural processes and human activities that affect global environmental change and suggest and evaluate possible solutions to problems.

## Scoring Rubric

Working Toward	Nearly Proficient	Proficient	Highly Proficient
I attempted to create a solar car that will go straight, far, and fast but it doesn't work. I attempted to describe how my solution met or didn't meet my criteria, based on the evaluation of my data but lack substantial details. I attempted to describe how solar panels create energy, but my explanation may be substantially incorrect or incomplete.	I can create a solar car that will go straight, far, or fast. I can describe how my solution met or didn't meet my criteria, based on the evaluation of my data but might not have enough data to support it. I can describe how solar panels create energy but don't have enough supporting facts.	I can create a solar car that will go straight, far, and fast. I can describe how my solution met or didn't meet my criteria, based on the evaluation of my data. I can describe how solar panels create energy.	I can create a solar car that will go straight, far, and fast and will win the race in the top 10%. I can describe how my solution met or didn't meet my criteria, based on the evaluation of my data and make suggestions for future improvements to my design I can describe how solar panels create energy and relate it to current energy use and global environmental change.

## The Problem

**The Problem:** (Why do we need to build solar cars? Why would anyone build solar cars? What problem(s) are they trying to solve?)

**Criteria:** (What does our car need to be able to do?)

**Constraints:** (What are the limiting factors you need to deal with in order to build the solar car?)

## Background:

Background information includes how solar energy works and how to design a solar car. It may also include information about the environmental impact with our current use of energy and the need for change.

## Evaluate Existing Solutions:

Do some research on Google to discover some current solar car designs that you find interesting.

<b>Describe the solar car design</b>	<b>How does this design meet the criteria and constraints?</b>	<b>How does this design not meet the criteria and constraints?</b>	<b>How could this design idea be improved to better meet the criteria and constraints?</b>

### Team Brainstorm:

- Now that you have looked at several different existing solutions, spend a few minutes writing out on a blank piece of paper your ideas on how you would like to solve the problem and how it meets the criteria and constraints. Draw a diagram on your solution and label the parts.
- Next, work with your team members and share your ideas. Each person shares their idea about how to solve the problem and the diagram they drew. The rest of the team does not get to make any judgments about the solution presented, but can ask clarifying questions. Write each person's ideas in the grid below.
- After each team member has presented their ideas, use yellow stickies to give feedback on each other's diagrams.
- Evaluate the ideas all together and decide on one solution—it could be one person's idea or a compilation of the ideas.

<b>Describe Solution Idea</b>	<b>How does this design meet the criteria and constraints</b>	<b>How does this design not meet the criteria and constraints?</b>	<b>What are the tradeoffs that must be made to use this idea?</b>	<b>How could this design idea be improved to better meet the criteria and constraints?</b>

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## The Solution: Iteration #1

**Claim:**

What will your solar car look like in order to meet the criteria and constraints?

### Building a Prototype

(Making a model of your solution)

**Materials List** (List all items, sizes and quantities needed to build the prototype)

**Procedures for building the prototype** (List step-by-step in a numbered list the process taken to build your prototype)

**Schematic of your prototype** (draw a picture of your design solution to scale and label the parts)

**Solutions Briefing for Iteration #1**

Your group will prepare a presentation of your design to share with your classmates.

**Our Design Team’s Presentation:**

TOPIC	ANSWER
How is your design constructed?	
What materials did you use?	
Why did you design and build it the way that you did?	
How does the design meet the criteria?	
How did the challenge constraints affect the design?	
What problems remain?	

## Solution Briefing Notes About Other Groups' Presentations:

Design Group	How Well It Works	Design Ideas	Construction Ideas	Science Ideas
<b>Plans for our next iteration:</b> 				

## Iterations

When you make changes to your design, make them one at a time and evaluate each change before moving on to the next iteration.

Change that you plan to make to your design	Materials you will need	Procedure for making the change on your car	Diagram of your change


Evaluation

**Testing Procedures:** How will you test your model to see if it meets the criteria and constraints? List these step-by-step.

**Controlled Conditions:** What constants will remain the same in your tests?

**Data:** What will you measure?

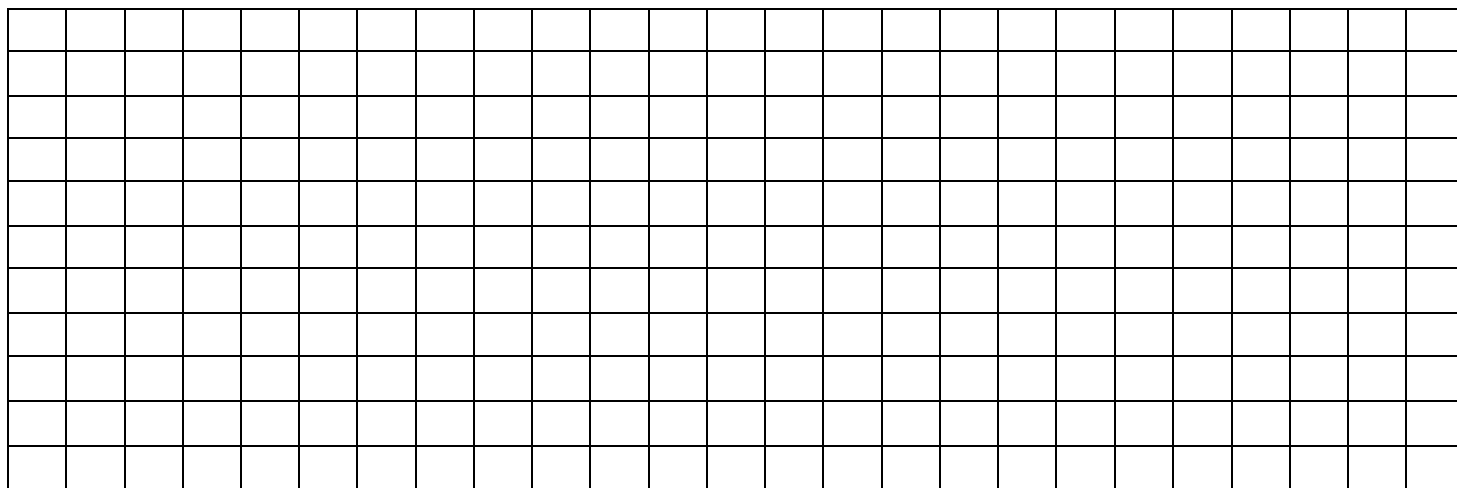
**Data Table:** How many rows and columns will you need? What kind of data and units will you record? Be sure you include a row and a column for labels. You will need a new row of data for each design iteration. You should test each iteration at least three times before making a change.

## Time for 50-meter Solar Car Run for Different Iterations:

Iteration #	Trial 1	Trial 2	Trial 3	Average

## Graph:

On a separate piece of graph paper, graph your data to show relationships between the data points. Don't forget to give it a title, label each axis, and include units.



## Results of the Design Process

**Results of the design process:** (Summarize results shown in your data and graphs. Restate the research question, and support the claim based on whether the data supports or does not support it.)

**Appropriateness of Design:** Explain how the design was successful in solving the problem or creating an opportunity.

**Evaluation of Solution:** Identify any tradeoffs that had to be made in the process of designing a solution. In other words, what did you have to give up or trade in order to create this design solution?

**Improving the Design Process:** Describe specific changes that could be made to improve the approach taken to solve the problem or create an opportunity.

**References:** Cite your sources here



## Solutions Briefing for Final Iteration

Your group will prepare a presentation of your design to share with your classmates.

### Our Design Team's Presentation

TOPIC	ANSWER
What were the results of your tests? Summarize results shown in your data and graphs	
What materials did you use?	
Why did you design and build it the way that you did?	
How does the design meet the criteria?	
How did the challenge constraints affect the design?	
What problems remain?	

### Solution Briefing Notes About Other Groups' Presentations

Design Group	How Well It Works	Design Ideas	Construction Ideas	Science Ideas