

## **Measuring the Gas Mileage of 5 Different Models of Cars**

Notice that the lab title is bold, centered and in 18 pt font.

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**Mrs. Berkey Period #1**

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Your name should be listed first (as shown above) followed by your lab partner's FULL names. Your instructor name and period number come next on a new line and are followed on the next line by the date you submitted your report as shown

**ABSTRACT:** Five different 2019 production model cars were tested under identical weather and road surface conditions to determine which car obtained the highest gas mileage [Notice that the purpose is described in the first sentence]. 1.00 gallons of identical Chevron gasoline were placed in each car and then driven around the same track until the engine was exhausted. Mileage was then measured at that location to the nearest .10 miles and the gas mileage was determined by simple algebra using a Texas Instruments TI-83 calculator [methods and materials are summarized]. The Toyota Prius obtained the highest gas mileage of 57.92 mpg as expected [Relevant data is summarized here]. However, the Ford Mustang achieved the second highest mileage (52.3 mpg) which was wholly unexpected and further work needs to be done to evaluate those findings. [The conclusion is succinctly summarized here]

<<Your abstract should be between 75 and 125 words. This example is 109 words in length>>

Note that the purpose, measurements, methods, and conclusions are all summarized succinctly!

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**Your lab SHOULD be divided into sections as follows using Roman Numerals in ALL CAPS as shown:**

## **I. PURPOSE**

We conducted this investigation to determine which of the five production models we tested would achieve the highest gas mileage.

The purpose should be clear and concise. There should be no doubt at all about the purpose of your lab.

## **II. MEASUREMENTS & DEVICES**

The cars that we tested were 2019 production models of a Ford Mustang V6 manual transmission, VW Beetle 1.8 L 4-cylinder automatic transmission, Honda Accord, manual transmission 2.4 L 4-cylinder, Toyota Prius 1.8 L 4-cylinder and Jeep Wrangler manual transmission 3.6 L V6.

We measured 1.0 gallon of Chevron Regular Techron gasoline into each car using a Purex 2.0 gallon graduated cylinder with 1.0 milliliter markings.

Notice reference to control variables

We measured the distance each car traveled on 1.0 gallon of gasoline using Wolgie Industries Laser Guided Distance Finder Model w123abc with accuracy to 1.0 mm.

Gas mileage (mpg) was calculated using a Texas Instruments TI-83 calculator.

## **III. METHODS**

To conduct this experiment all five models of car were lined up on the start line at Seattle International Raceway. Each car was totally emptied of gas, and then one gallon of Chevron Techron regular gas was put in each car. All cars were driven at the same time to make sure the temperature and wind conditions were the same. Each car was driven by a person weighing 185 pounds. The drivers drove their cars around the track until each car ran out of gas. The car's distance travelled was then measured using a laser guided distance finder and that data was recorded.

This process was repeated for four more trials for each car.

We determined, however, after conducting the trials that some drivers had been flooring their cars and going as fast as they could, while other drivers were driving at slower speeds. Since gas mileage of the models was being investigated having the cars driven at different speeds might have messed up the data. To correct this problem we re-tested the cars in the same way the following day, but all drivers were required to maintain a constant acceleration and a constant cruising speed of 45 mph.

Notice that our NEW lab process allows and encourages mistakes, retries and repeated attempts. Those should be shown here as well as WHY those retries and repeats were necessary.

We then found that our Wolgie brand laser guided distance finding device was faulty. We reordered a new model from Wolgie industries and restarted our investigation as before with no further error.

We found that different drivers drove their cars in such different ways that our data was inconsistent. We changed our approach so that the same driver drove all the cars in all trials using the same methods described previously and our final data is reported in the table below.

#### IV: SAMPLE CALCULATIONS

All mileage calculations were done as follows:

(distance travelled in miles)/(gallons of gasoline)

For example, the Ford Mustang Trial #1 was measured as follows:

53.0 miles/1.0 gallon = 53.0 miles/gallon

Averages were calculated by adding all trials and dividing by the number of trials:

$(53.0 \text{ mpg} + 51.9 \text{ mpg} + 52.0 \text{ mpg} + 52.4 \text{ mpg}) / 4 \text{ trials} = 52.325 \text{ mpg average}$

= 52.3 mpg rounded to appropriate significant figures

This section comes to us from the University Physics Course Lab Handbook from Baylor University. The goal here is show the method/process you conducted various calculations. Rather than show each and every calculation you show just **ONE sample calculation** and then put the results of further calculations in your data table in the RESULTS section below:

#### V: RESULTS

Gas Mileage of Different Car Models					
	Gas Mileage (in miles/gallon)				
Car Models	Trial 1	Trial 2	Trial 3	Trial 4	Average
Ford Mustang	53.0	51.9	52.0	52.4	52.3
VW Beetle	35.5	35.6	35.6	35.5	35.6
Honda Accord	33.9	34.1	34.3	34.3	34.1
Toyota Prius	57.5	58.3	58.0	57.9	57.9
Jeep Wrangler	16.8	17.2	17.2	17.1	17.1

**NOTICE** that descriptions are present for each row and column. A title is prominently shown and is clear and concise. Units should be prominently listed or described, and **averages should be included** when numerically appropriate.

## VI: DISCUSSION

**Claim:** The Toyota Prius consistently obtained the highest gas mileage of the 5 cars we tested.

**NOTE:** Please notice how the claim both summarizes the results of the investigation but also ties that back to the purpose of the lab. It is important that the claim is clear and concise. Avoid unnecessary language such as "According to our hypothesis we found that the result of our lab..."

**Evidence:** The Prius achieved an average of 57.9 miles per gallon which was 5.5 miles per gallon greater than the second best performing car, the Ford Mustang which achieved an average of 52.4 miles per gallon.

Notice that the average data is used here. Do not simply repeat the data in your data table, and by all means please do NOT list all the data averages from each type of trial. Instead, try to put the results in context to the other data in your investigation.

**Reasoning:** The Prius achieved the highest gas mileage because it uses a hybrid engine which sometimes runs on electricity. On those occasions the car is not consuming gasoline, but it is still achieving mileage (using electricity). Therefore, the total mileage achieved by the car is extended while the amount of gasoline consumed is lessened. Since mileage is measured as the change in mileage achieved divided by the amount of gasoline consumed, a hybrid car will achieve a higher miles per gallon rating than a car that runs only on gasoline.

The reasoning section should explain the science/engineering that supports your results.

**Error Discussion:** We occasionally spilled gasoline when pouring it into the cars' gas tanks. We estimate the spills to average about .10 gallons per spill. That meant that those cars achieved approximately 1/10<sup>th</sup> less gas mileage than it should have. That would have been particularly important in the results for the VW Beetle and the Honda Accord because they were only 1.5 mpg different, so the order of finish may have been affected. We will run additional trials to verify that.

AVOID freshmen type error analysis including but not limited to: "We may have measured the time wrong. We may have jiggled the table. The stopwatch might be wrong". Those sorts of analysis are always possible but should be ignored. If they DID occur in your lab you should restart that trial and make note of the retry in your METHODS section.

Notice also the importance of tying your error back to your results. That is particularly difficult and will require extra effort on your part.