RUBBER-BAND POWERED CAR
Follow Up Experiments

Once your car construction is complete you can work on improving the distance travelled by the car.

You might investigate some or all of the following (*Note: it is advised to do the 'Adding Weights' experiment first*):

- Adding Weights https://video.deakin.edu.au/media/t/0_kjxa8t4n
- Changing the Weight Distribution
- Rubber-Band Winds
- Changing Surfaces https://video.deakin.edu.au/media/t/0_kjxa8t4n
- Changing Type of Rubber Band

Adding Weights

https://video.deakin.edu.au/media/t/0_kjxa8t4n

Questions:

1. Do you think adding weight will increase the distance the car will travel? Why? Why not?

2. Do you think there will be a point where the added weight begins to reduce the distance the car travelled? Why? Why not?

For this experiment you must measure your car's initial distance travelled, then add a small amount of weight (e.g 50g), fix weight in place via tape or blue-tack, and remeasure the distance travelled. Add more weight in even amounts (50g at a time) and enter data into table below.

Note: All other variables must remain constant. E.g. The surface the car travels on, the number of winds around the notch.

Weight Added (g)	Distance Travelled (cm)	Observations
0		

3. Construct a graph below of your findings using appropriate titles and correctly labelled axes.

4. a. Explain what happened when you added more and more weight to the car.

b. Is there an optimal weight for the car?

c. What else could be impacting the distance travelled by the car?

Changing the Weight Distribution

https://video.deakin.edu.au/media/t/0_kjxa8t4n

For this experiment you will only use the optimal weight you found in the "Adding Weights" section and see how the location of the weight impacts how the car travels, e.g. veering left or right.

Note: All other variables must remain constant. EG. The surface the car travels on, the number of winds around the notch.

Questions:

1. Do you think changing the placement of the weight will affect the distance travelled by the car? How?

Using the optimal weight fix the weight to the back, front, left side, right side, and anywhere else you'd like to investigate. Input data and observations of the car in table below.

Weight Location	**Distance Travelled (cm)**	**Notes** E.g. Spun, flipped up, veered left

2. Did the location of the weight impact the distance travelled? Were some locations more or less effective? Please elaborate.

Rubber-Band Winds

For this experiment you will only use the optimal weight you found in the "Adding Weights" section and see how the number of times you wind up the rubber band around the notch impacts the distance travelled.

Note: Be careful not to overwind your car. Overwinding can put too much pressure on the rear axis and cause it to break. All other variables must remain constant. E.g. Surface used, weight used etc.

Questions:

1. Do you think increasing the number of winds around the notch will increase the distance travelled? Why? Why not?

2. Do you think there will be a point (before over winding the car and causing the rear axis to break) where the number of winds will be detrimental to the car? Why? Why not

3. What do you think will happen if the car has too many winds?

For this experiment you must measure your cars distance using only 1 wind, then increase the number of winds and enter data and other observations into table below.

Note: All other variables must remain constant. EG. The surface the car travels on, the weight used in the car.

Number of Winds	Distance Travelled (cm)	Observations

4. Construct a graph below of your findings using appropriate titles and correctly labelled axes.

5. Was there an optimal number of winds for the car? What was it?

6. a. Could you wind up the car too much? What would happen?

b. What could you do to improve this?

Changing Surfaces

https://video.deakin.edu.au/media/t/0_kjxa8t4n

For this experiment you will only use the optimal weight you found in the "Adding Weights" section. Experiment using the car on a variety of surfaces (e.g. carpet, linoleum, grass) and see if the distance travelled has been impacted at all?

Note: All other variables must remain constant. E.g. the number of winds around the notch, weight placement etc.

Questions:

1. Do you think changing the surface the car is used on will impact the distance travelled? Why?

2. a. If a surface has a lot friction what do you expect will happen?

   b. What if there is little to no friction?

Using the optimal weight fixed to one spot, wind the car up and use it on any surface you would like to investigate (e.g carpet, sandpaper). Input data and observations of the car in table below.

Type of Surface	**Surface Description** E.g. Slippery, rough	**Distance Travelled (cm)**	**Observations**

3. Describe what happened when using different surfaces. Was the car always propelled forward? If not, where did the potential energy go?

4. Choose one surface and theorise how you could improve the distance travelled by the car.

Changing the Type of Rubber-Band

For this experiment you will only use the optimal weight you found in the "Adding Weights" section and see how type of rubber-band impacts how the car travels.

Note: Be careful not to overwind your car. Overwinding can put too much pressure on the rear axis and cause it to break. All other variables must remain constant. E.g. Surface used, weight used etc.

Questions:

1. Do you expect using a thick rubber band or a thin band will work better? Why?

2. Do you think a longer or shorter rubber band will work better? Why?

Using the optimal weight fixed to one spot, wind the car up using any type of rubber band would like to investigate (e.g. thick, thin, long, short). Wind up the car as many turns as the rubber-band allows without putting the rear axis under too much stress. Input data and observations of the car in table below.

Type of Rubber-Band	Number of Winds	Distance Travelled (cm)	Observations

3. Was it easier to wind one type of band over another?

4. How and why did the length of rubber band affect the distance travelled by the car?

Summarise

Using the experiments and data you completed above summarise what you have learnt. You should include such things as: constants and variables, friction, energy, energy loss, which activity you think had the most impact on the distance travelled? Could you combine modifications to keep improving the car?

Design Your Own Experiment

In the space below outline your own experiment and test accordingly. Be sure to include the variables you are measuring, changing and controlling. Display your data using tables, charts or graphs. Before beginning your own experiment have your teacher check your design.

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