Create Impact Crater Experiment

Interactive Student Handout

Testing for Velocity

Question

How does the **speed** of an asteroid affect the size of a crater made upon impact?

OR IN OTHER WORDS...

How does _____ing the **velocity** of an asteroid _____ the size of the crater it makes?

Hypotheses

What are your choices for filling in the blanks? _____, _____, or _____ _____ _____.

*If we increase the **velocity** of the asteroid, then the **diameter** of the crater will _____.*

*If we increase the **velocity** of the asteroid, then the **depth** of the crater will_____.*

What is a controlled experiment? An experiment where all the possible variables except the i_____ variable are kept c____t. These variables that are kept c_____ are called c_____d variables.

Describe the Variables for Testing for Velocity Experiment

Independent Variable (what you change):_____

Dependent Variables (the results of the experiment) _____

Constants:(what you keep the same) _____

Check for Teacher Approval Before Collecting Data

Experiment 2: Asteroid Velocity vs Crater Size

1. Get one asteroid and weight in grams. Then **record grams as kilograms on Table 2**. (example: 52 grams = 52 kilograms)
2. Fill the pan with moist sand, then use a ruler to smooth the surface of the sand.
3. Using a measuring tape or meter stick, hold the asteroid above the level of the sand, NOT above the level of the table and test for three different heights (suggestion: try .5 meters, 1 meter, 2 meters)
4. Dead drop the asteroid onto the sand.
5. Pick up the asteroid from the sand, being careful not to enlarge or change the crater.
6. Lay the ruler gently across the crater.
7. Being very careful not to poke a hole into the bottom of the crater, measure the **depth** in millimeters from the bottom of the crater to the ruler with a wooden splint. **On Table 1, record the millimeters as meters.**
8. Before picking up the ruler, record what the diameter of the crater is in millimeters. **On data sheet record millimeters as meters.**
9. Fluff then flatten the sand again to get it ready for the next trial.
10. Calculate the velocity of the asteroid: **velocity =** $\sqrt{2 \times gravity \times height}$ **(gravity = 9.8m/s^2)**
11. Calculate the kinetic energy of the asteroid: KE = $\frac{1}{2}mv^2$

Table 2 -Testing for Velocity

Height (m)	**Mass** (kg)	**Velocity** (m/s^2)	**Kinetic Energy of Impact m/s^2 (round to nearest Joule)**	**Crater Diameter** (m)				**Crater Depth** (m)			
				Trial 1	Trial 2	Trial 3	Average	Trial 1	Trial 2	Trial 3	Average

Testing for Velocity: Graphing and Analysis

Graph Instructions

- X axis = Independent Variable: _____
- Y axis = Dependent Variables: _____
- Graph Leger for data points: triangles  , clear triangle for diameter , shaded diameter for depth
- Scale graph to fit range of variables

Experiment 2: Velocity vs Size

1. Copy and paste both your hypotheses for changing velocity in the Crater Experiments here.

2. What was the independent variable in this experiment?
   We purposefully changed the _____

3. What were the dependent variables in this experiment?
   We recorded the crater's _____ and _____ .

4. What are controlled variables?
   Controlled variables are variables that we *could* _____ but purposefully keep the s_____.

5. What were two controlled variables in this experiment?
   The two variables we kept the s_____ were the asteroid's m_____ and a_____ that we launched it at.

6. Explain how your data proved or disproved your hypotheses.
   Our first hypothesis was correct/incorrect because when we increased the h_____ from ____ to ____, the diameter _____ from ___ to ___.
   Our second hypothesis was correct/incorrect because when we increased the h_____ from ____ to ____, the depth _____ from ___ to ___.