Create Impact Crater Experiment

Interactive Student Handout

Testing for Mass

Question

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

OR IN OTHER WORDS...

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

Hypotheses

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

If we increase the **mass** of the asteroid, then the **diameter** of the crater will ______.

If we increase the **mass** 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_____t. These variables that are kept c_____t.

Describe the Variables for Testing for Mass 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 1: Asteroid Mass vs Crater Size

- 1. Get one asteroid of each mass and weight in grams. Then record grams as kilograms on Table 1. (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 1 meter (100 cm) above the level of the sand, NOT above the level of the table.
- 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 Table 1, record millimeters as meters.
- 9. Fluff then smooth 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/s²)
- 11. Calculate the kinetic energy of the asteroid: $KE = \frac{1}{2}mv^2$

Table 1 -Testing for Mass

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

Testing for Mass: Graphing and Analysis

Graph Instructions

- X axis = Independent Variable (mass)
- Y axis = Dependent Variables (diameter and depth)
- Graph Leger for data points: squares , clear square for diameter , shaded square for depth
- Scale graph to fit range of variables

Experiment 1: Mass vs Size

- 1. Copy and paste both your hypotheses for changing mass in the Crater Experiments here.
- 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_____

- What were two controlled variables in this experiment?
 The two variables we kept the second were the asteroid's h_____, which really kept it's second constant, 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 m_____ from ____ to ____, the diameter ______ from ____ to ____.
 Our second hypothesis was correct/incorrect because when we increased the m_____ from ____ to ____, the depth ______ from ____ to ____.