Group Members:

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Cratering

For many of the bodies in the solar system like our moon, Mercury and the moons of Jupiter and Saturn, the main surface features are due to meteorite impact. Such craters are also found on the terrestrial planets including the Earth. The craters on the Earth are difficult to recognize because they are quickly eroded. In this activity you will learn some of the factors influencing the size of an impact crater.

Theory

There are several factors that can influence the size of an impact crater. Obviously, the size of the object that hits will affect the crater size; larger objects will form larger craters. One would also expect that the mass of the striking object would have some part to play in crater size. Finally, the speed of the striking object at impact will help determine the size of the crater. This activity will examine one of these factors: impact speed.

For objects falling near the surface of the earth, the speed the object is falling at is dependent on the height from which it was released. The equation that relates the release height and the speed is

$$v = \sqrt{2gh} \qquad \text{(Equation 1)}$$

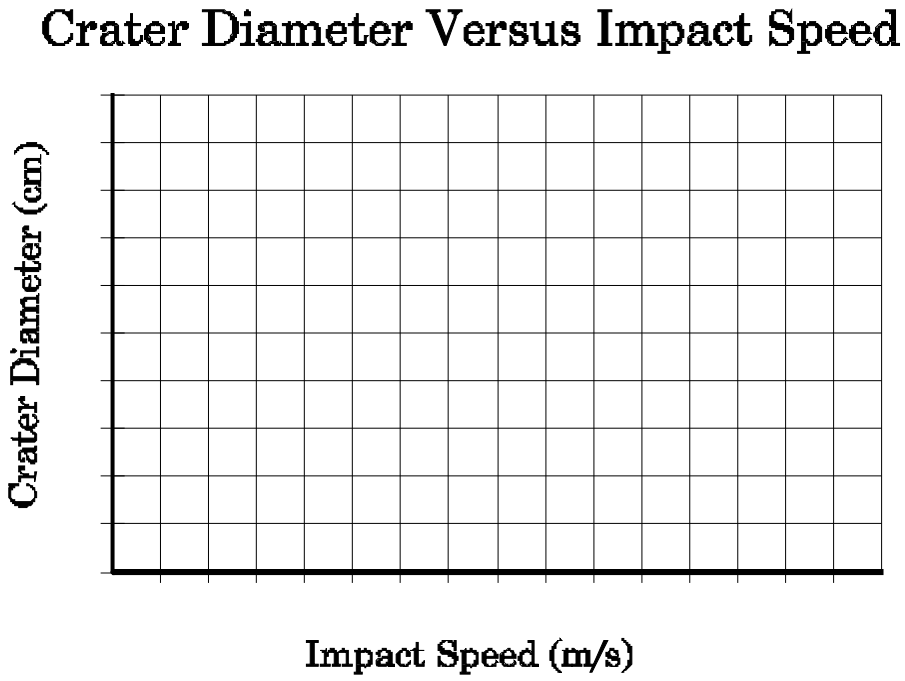
where v is the speed at impact in meters per second, h is the release height measured in meters and g is the acceleration due to gravity: 9.8 meters per second squared.

Data Collecting

Each group will have a tub filled with sand, a steel ball (1.9 cm in diameter), a tape measure to measure the drop height and a set of calipers to measure the diameter of the impact crater. You will be assigned a height range from which to drop your ball and measure the crater diameters. Smooth the sand with a ruler before each drop. Drop the ball five times for each of the heights you are assigned and measure the diameter of the crater formed after each drop. Find the average crater diameter for each of your drop heights. Record the information in Table 1 below. Once you have completed your drops, write your drop heights and average crater diameter data on the board in the classroom.

Analyzing The Data

1) After all the groups have written their drop height-crater diameter data on the blackboard, copy the information into the first two columns of Table 2 for your report.
2) Use Equation 1 to calculate the impact speed for each of the drop heights. Write this in the third column of the table.
3) Make a graph of the Crater Diameter versus Impact Speed below using the total class data. You will have to figure out what the increments on your scale should be. Be sure and mark in your scales. It should not be a straight line but you can still try to draw a smooth curve through the points. **Do not** "connect the dots".



- What sort of curve do you see (it may be more obvious for the first few points on the graph)?

- Does the curve still apply for very large drop heights? Why or why not?

Table 1: Drop Height and Crater Diameters

Drop Height (meters)	Crater Diameter (cm)	Average Diameter (cm)
	1 2 3 4 5	
	1 2 3 4 5	
	1 2 3 4 5	
	1 2 3 4 5	
	1 2 3 4 5	

Table 2: Class Totals

Drop Height (meters)	Average Crater Diameter (cm)	Impact Speed ($^{m}/_{s}$)

Table 2: Class Totals (Continued)

Drop Height (meters)	Average Crater Diameter (cm)	Impact Speed ($^{m}/_{s}$)