Name_____ Date _____

Cratering Lab

Instructions

Drop beads and marbles of a range of masses into a smooth sand surface, measure the resulting crater diameters, and plot crater diameter *D*:

. . . as a function of impactor mass *m*, for one height *h*.

. . . as a function of drop height *h*, for one impactor mass *m*.

Don't use an impactor that's larger than the depth of the sand.

Assumptions

These are low-energy impacts: assume the K.E. of the impact goes solely into creating the crater.
Assume the impactor starts with zero speed and falls only under the influence of gravity.
Ignore air resistance.
Assume that the crater shape will be roughly hemispherical.

The Experiment

1. *Crater diameter as a function of mass*

a. Use Physics I concepts to predict how *D* depends on *m*:

b. Select beads and marbles of ~8 different masses. Impactors should range from ~ ¼ g to 20 g. For smaller impactors you may have to measure the mass of 10-20 beads and average. Drop each bead twice from a height of 1 meter. Measure the crater diameter and record the results.

bead description	mass	diameter 1	diameter 2	average *D*

2. *Crater diameter as a function of impact drop height*

a. Use Physics I concepts to predict how *D* depends on drop *h*:

b. Choose one of your medium mass beads. You have already dropped it twice from 1 m; drop it twice from each of 4 more heights, at least one of which is higher and at least one of which is lower than one meter. Please don't drop it from more than ~1.5 m—sand splashes. Record your data.

bead description, mass	drop height	diameter 1	diameter 2	average *D*

3. *Data analysis and interpretation*

Use Excel or its equivalent to plot *D* vs. *h* and *D* vs. *m* and add line fits (try both linear and power law fits). Do the properties of the line fits agree with your predictions? Comment on why the data and fits may not exactly match your predictions.