Name _____

A Simple Examination of Freefall

Introduction:

Recall that anything falling solely under the influence of gravity is considered to be in freefall. Something in freefall accelerates at a rate of 10 m/s (or 1000 cm/s) each second.

Consider a simple experiment, a long piece of string with hexagonal nuts taped on, dropped from a height close to the ceiling. If there is a pie tin directly under the falling hex nuts, then the nuts will make a clanging sound as they fall.

The goal of this activity is to determine how to space the hex nuts such that they hit at equal time intervals. Each time a clang is made on the pie tin, we will call it a "beat." Once you've calculated the correct spacing and taped the hex nuts to the string, you will test your experiment by listening for equally spaced beats.

Equipment:

6 hex nuts
string
masking tape
meter stick
pie pan

Procedure:

Choose a group member (preferably a tall one) that will do the experiment. Have this person <u>safely</u> stand on your table and measure out a length of string that stretches from the raised hand to the floor. Tape or tie your hex nuts at intervals such that they make equally spaced beats when you drop the string onto an upside-down pie tin. Make sure that the first hex nut rests on the top of the tin when you release the string and that the second nut is 10 cm from the first. Then, using what you know about kinematics and freefall, decide what the distance between successive hex nuts should be so that there are equally spaced beats.

Sample Calculations: (list any equations/constants used)

Recall: $d = \frac{1}{2} g t^2$ (Where does this come from?)

Beat	Position (cm)
1	**10**
2	
3	
4	
5	

Table 1: Position of Hex Nuts and Corresponding Beats

Questions:

1. Were the hex nuts evenly spaced? Explain.

2. A student drops a ball from the top of a tall building; it takes 2.8s for the ball to reach the ground.
(a) What was the ball's speed just before hitting the ground?

(b) What is the height of the building?