SAINT JOSEPH'S PREPARATORY SCHOOL
CONSERVATION OF ENERGY
December, 2011

NAME: _____ DATE:_____ PERIODS:_____

COLLABORATORS:_____

DATE REPORT IS DUE:_____

Introduction:

This experiment attempts to verify conservation of energy indirectly. By making three linear measurements, and without resorting to the measurement of speed, the relationship between gravitational potential energy and the maximum speed of a pendulum can be determined.

When a pendulum is released from rest, the gravitational potential energy is converted to kinetic energy as it falls and, since the string supporting the pendulum does no work, the kinetic energy that the pendulum has at the lowest point in its path, is exactly equal to the work done by gravity. The speed it has at this point is, therefore, related to the height from which it is released. If the string of the pendulum is cut at the moment that it is moving horizontally, the pendulum becomes a projectile with an initial velocity that is horizontal. This initial velocity together with the height from the floor will determine where it lands. As a result, the spot where the pendulum 'bob' lands is determined by the height from which it is released.

The equations governing this situation are:

$$\frac{1}{2}mv^2 = mgh$$

$$x = vt$$

$$0 = y - \frac{1}{2}gt^2$$

Where:

- *m* is the mass of the pendulum bob,
- *v* is the speed of the object at the lowest point of its swing,
- *g* is the acceleration due to gravity,
- *h* is the height above equilibrium where the pendulum is released,
- *x* is the horizontal distance the pendulum bob travels after being cut free,
- *t* is the time of flight after being cut free,
- *y* is the vertical distance between the lowest point of the pendulum's swing and the floor. Also the vertical distance that it falls after being cut free.

Note: These equations are valid only if the pendulum is cut free at its lowest point.

Procedure:

Follow the procedure outlined by the instructor and do at least four trials and a minimum of one trial for each member of the team. Refer to the diagram for set up and remember to calculate the percent difference for each trial.