Free Fall

Procedure

We will use the formula $y_f = y_o + v_{oy} t + \frac{1}{2} a_y t^2$, valid for constant acceleration, to calculate the acceleration due to gravity, g, in Dallas.

- Supply electrical power to the timer.
- Load the ball bearing in the clamp at the top of the Behr freefall apparatus. It is critical that you perform this operation **gently** so that you do not alter the height of the clamp from one trial to the next.
- Measure the height from the ball bearing to the timer pad on the floor using the two-meter stick. Do this more than once.
- Reset the timer.
- Release the ball bearing. The timer will begin counting thousandths of a second, and will stop when the ball bearing strikes the pad on the floor. Record the freefall time.
- Reload the ball bearing, reset the timer, and repeat for several trials.

Error analysis

- Find the free-fall acceleration and its propagated error: $g \pm \Delta g$.
- Is your free-fall acceleration in agreement with the standard value 9.80 m/s^2 $\pm$ 0.01 m/s^2 (that is, do the error ranges overlap)?
- Should you measure the height from the **top**, **middle**, or **bottom** of the ball bearing to the timer pad on the floor? Why?
- Identify at least two sources of statistical error.
- Identify at least two sources of systematic error.