

“Downward Acceleration” Answers

PROCEDURE:

3. If there was no air, the acceleration for each object would be **9.81 m/s²**.
6. The average acceleration for each object is found from the equation in the lab manual.

$$d = 1/2at^2$$

Need to solve for t.

$$\text{Multiply both sides by 2} \quad 2d = at^2$$

$$\text{Divide each side by } t^2 \quad \frac{2d}{t^2} = a$$

Use the average time for each object to calculate the average acceleration of each object

7. The final velocity is found from multiplying the average acceleration you calculated by the average time it took for the object to fall.

$$\mathbf{v_f = at} \quad \mathbf{\text{final velocity} = (\text{average acceleration})(\text{average time})}$$

QUESTIONS:

- 1) Surface area is the biggest factor in this experiment. For example, a Styrofoam ball and a feather have a lot of nooks and crannies to catch air molecules.
- 2) An error in measuring the time it took for the object to fall would result in a large error for acceleration because time is squared (so your mistake is squared).
- 3) The process is...

$$a_{\text{air}} = 9.81 \text{ m/s}^2 - (\text{average acceleration calculated})$$

If an average acceleration was 7.96 m/s², then...

$$a_{\text{air}} = 9.81 \text{ m/s}^2 - 7.96 \text{ m/s}^2 = 1.85 \text{ m/s}^2 \text{ (up)}$$

- 5) All of the objects would take the same amount of time to reach the ground if there was no air.
- 6) There is more air resistance when you drive **fast**.

Summary: Air resistance has can have a large affect on the rate of acceleration of an object when it is dropped. We found that lighter objects were more affected by the air resistance than heavier objects were.