

Velocity and Acceleration

Acceleration-

Acceleration is a change in velocity – either speed or direction. In this lab we will focus on a change in speed.

Newton's 2nd law states that acceleration should be directly proportional to the net force, should act in the direction of the net force, and be inversely proportional to the mass of the object.

To keep our experiment as simple as possible, we will limit our net force to the force of gravity (slightly minimized by air resistance), and will examine the acceleration of a variety of different masses and shapes as they fall through the air.

$$a = F/m$$

Acceleration of different masses

In this experiment we will drop objects of different mass, but similar size and shape from the bleachers.

Which object do you think will hit the ground first? Explain your hypothesis.

Draw a sketch showing the forces acting on your object(s).

Procedure:

1. Prepare three plastic containers of similar size and shape, but containing very different masses.
2. Carefully measure and record the mass of each container.
3. Drop all three objects from the bleachers at the same time and observe which hits the ground first, if any.
4. Drop the objects one at a time and measure the length of time that it takes for each object to fall.
5. Record your data and repeat the drop for each object until you have three measurements each.
6. Repeat steps 1 through 5 using the flat sheets of different mass.

Analysis:

Do objects of different mass fall at different speeds?

Describe your observations.

Is the difference more noticeable for the cylinders or the flat sheets?

Explain why you think this shape has the greater difference.

Compare the falling time for cylinders and sheets of similar mass. Which falls most rapidly?

Explain why you think this is the case.

Try to design an experiment that you can perform using the available equipment that will minimize the effect of air resistance on the smaller mass.

If you can successfully reduce the effect of air drag, do you think that the objects' accelerations will become more similar or more different? Explain.

