

## SUGGESTED PROCEDURE FOR VIDEO LABS

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### I. Equipment:

- a. Video camera
- b. Blank tapes
- c. VCR with pause and frame advance
- d. Monitor connected to the VCR
- e. Plastic overhead sheets
- f. Washable markers

### II. Procedure:

- a. Set up the VCR, camera, and other materials that are needed for the lab.
- b. Choose shutter speed according to how much light and stopped action you need.
- c. Film the motion at least three times so that you are sure to catch the action you want.
- d. Tape the plastic sheets to the monitor screen. Provide washable markers.
- e. Take the video tape from the camera and put it into the VCR and move through the film until you find the start of the action you want. Push pause. (Most time is spent at this step finding the start of the action.)
- f. Mark the position on the plastic sheet using a washable marker and push the frame advance button for the next position. The number of times you need to push the frame advance depends on the lab. A lab that produces about eight to ten data points seems to work well with most kids.
- g. Remove the plastic sheet and place it on a flat surface such as a table.
- h. Take the necessary measurements.

### III. Tips

- a. If you do not have a video camera, borrow one from your PE department or ask your Music department.
- b. Ask your parent/teacher organization to purchase a camera for you.
- c. Recycle video tapes. Ask your students to bring in tapes sent to their home for promotional information or annual reports. There is a spot on the back of the tape that has been pushed out. To make them usable simply cover the hole with a piece of tape.
- d. Secure the use of a second VCR to make measurements in class. This is the slowest part of the lab.
- e. Consider the background. For example if you have a dark background, use a yellow ball. If you have a light background, wrap a ball in black electrical tape.
- f. If you need more light due to changing your shutter speed, you can purchase a flood light from an old 8mm movie camera at a garage sale.

#### IV. Suggested Labs

- a. Film a toy motorized car. Show constant speed by a line on a distance versus time graph.
- b. Film a ball in freefall. Demonstrate acceleration with a parabola on a distance versus time graph.
- c. Film a nerf ball drop and show terminal velocity. Compare this to a freely falling body. Calculate terminal speed.
- d. Film a can or ball moving down an inclined plane. Demonstrate constant acceleration.
- e. Toss a ball between two people. Show constant speed on the horizontal axis and acceleration on the vertical axis.
- f. Place a small body on a chair. Take two large bodies and lift the chair at a constant rate. Film the small body dropping the ball. Show that the ball has an upward velocity from the motion of the chair.
- g. Film a 2D collision on an air table. Use the film to get the velocities of all pucks. Show conservation of momentum.
- h. Film a break of a group of billiard balls. Get all velocities from the tape. Show conservation of momentum.
- i. Film a ball moving in a circle from above and release. Show that the ball moves at constant speed and that the ball moves off tangentially when released.
- j. Film the bottom portion of a drop of a stack of coffee filters. measure the mass and calculate the weight of the stack. Get the terminal velocity from the tape. Remove a filter and repeat. Repeat eight times. Find the relationship between weight and the terminal velocity.
- k. Use a spring loaded ball and aim it over your shoulder. Film as you walk at different speeds while shooting the ball. Demonstrate relative velocities.
- l. Film two soda cans exploded apart by a firecracker. Demonstrate conservation of momentum.
- m. Film kids in a canoe in the swimming pool. Have the kids crawl across the canoe. Demonstrate center of mass motion or action/reaction.
- n. Film a horseshoe magnet as it attracts a steel rod. Demonstrate acceleration with a parabola shape on a distance versus time graph and that it is nonconstant on a distance versus time squared graph.