Name: _____ Date: _____ Hour: _____

Motion Lab

Background: Have you ever wondered how bats can fly around in the dark without bumping into things? A bat makes squeaks that reflect off walls and objects, return to the bat's head, and are processed by its brain to give clues as to the location of nearby objects. This is called echolocation. Today we are going to experiment with motion detectors that essentially carry out echolocation and generate graphs for us to analyze.

Materials: 1 motion detector, 1 cable, 1 TI-84 calculator, writing utensil, tape, meter stick

Experiment:

1. Place the motion detector on a table or lab counter so that its beam is about chest high.
2. Make sure that you spread out from other groups so the motion detector picks up only on your motion and not a nearby group.
3. From where you are sitting your motion detector, measure off 1 meter increments with a meter stick and put a strip of tape down on the floor. Measure out to 5m if the detector will pick up a reading.
4. Plug the cable into the motion detector and calculator. A screen should activate saying Easy Data and your detector will start clicking. Stand at the measured 1 meter mark and see if your detector reads about the same value. You may have to calibrate (move) the tape by marking where the motion detector picks up a 1m, 2m, and other values.
5. With your detector on, click on setup and select distance (the first option), set the detector to start making measurements, stand at the 1m mark and back away slowly from the device. Observe the graph that was made. Now repeat the scenario except move away faster and again observe the graph.
6. What did you notice about the two graphs? Similarities? Differences?

7. Stand at the far end of the tape and slowly approach the detector and observe the graph. Now try it again walking faster and observe the graph.
8. What did you notice about the two graphs in this instance? How were these two graphs different from the first two that you observed?

9. Now try backing away slowly from the motion detector, stopping and then approaching it quickly.
10. Sketch the graph of this motion below:

11. Now move exactly how you did in step 5. Once the graph is made, select plots and click on velocity vs. time graph. Sketch this graph below:

12. Try repeating step 7 and once the graph is made, select plots and click on velocity vs. time graph. Sketch this graph below:

13. How do the velocity - time graphs look different from the distance - time graphs? When the line is below the x-axis, what is this telling you?

14. What does the slope of the line tell you on a distance - time graph? What about a velocity - time graph?

15. Finally, describe what is happening in each of these distance - time graphs below:

Fig. B

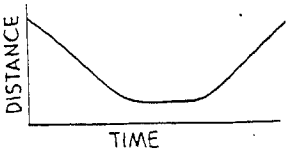

Fig. C

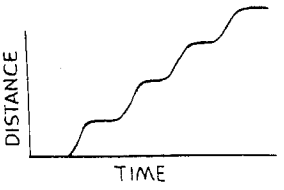

Fig. D

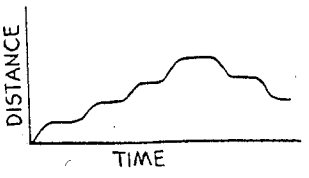

Fig. E