###### Name (upper left) Physical Science (upper right)

Date Teacher, Class Day & Time

Speed Lab

**Introduction** This lab deals with force and motion related to speed.

**Purpose** To determine and analyze the speed of objects using distance and time.

**Background Information**

**Hypothesis**

**Materials** **1 m** track Meter Stick Different Height Stacks

steel ball or marble Stop Watch (tenths units)

**Procedures**

A. This lab is best accomplished with two people. Designate one person to roll the object (ball) down the track and another person to time how long it takes (to the nearest tenth of a second).

B. Obtain or build a track that will allow a ball to roll 1 meter. For help in building a home-made track, watch this video: <http://somup.com/cY1lFRQbm6> .

C. Begin with one end of the track 25 cm higher than the other end (using a meter stick).

cm

1 m

**25**\_ motion object

meter

stick

**20\_**

D. Time how long it takes for the ball to roll down the 1-meter track (i.e. 1 m = 100 cm).

1. Record the time to the nearest 0.1 seconds (for example, “0.4 seconds”) *in the Calculations and Data section.*

2. Perform three (3) trials at this **25 cm** height. *Record all your data in the Calculations and Data section*.

3. Repeat procedures #1 and #2 at heights of 50 cm, 75 cm and 100 cm. *Record all your data in the Calculations and Data section.*

25 cm 50 cm 75 cm 1m

**Calculations and Data**

Be sure to show units for all measurements.

**A. Data Table for Times** [YOU MUST SHOW UNITS] … *give time to the nearest 0.1 s*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Height of Track | Trial 1 | Trial 2 | Trial 3 | Average Time |
| 25 cm |  |  |  |  |
| 50 cm |  |  |  |  |
| 75 cm |  |  |  |  |
| 100 cm |  |  |  |  |

**B. Average Speed Calculation** [SHOW ALL WORK with UNITS] ...  *to the nearest 0.1 m/s*

Using the “Average Time” from the table above, calculate the average speed of the steel ball at each height level of the track:

**V**average **= ∆d / t** average

Note: *Remember distance relates how far the ball rolled, NOT to the height of the track*.

1. Height at 25 cm **V** 25 cm **= \_\_\_\_\_\_\_\_\_\_**

Show work here 🡪

2. Height at 50 cm **V** 50 cm **= \_\_\_\_\_\_\_\_\_\_**

3. Height at 75 cm **V** 75 cm **= \_\_\_\_\_\_\_\_\_\_**

4. Height at 100 cm **V** 1 m **= \_\_\_\_\_\_\_\_\_\_**

Be sure to include images of the lab experiment (ball rolling down the track at various heights).

**C. Instantaneous Speed** Steel Ball [SHOW ALL WORK with UNITS]

|  |  |  |
| --- | --- | --- |
| Height of Track | Approximate Time | Instantaneous Speed |
| 25 cm | 0.2 s |  |
| 50 cm | 0.3 s |  |
| 75 cm | 0.4s |  |
| 100 cm | 0.5 s |  |

Using the data in the table at the right and the equation below, calculate the approximate “Instantaneous Speed” of the steel ball when it reached the end of the 1 m distance.

**~V**instantaneous **=** (10 m/s2)x **t** average

1. Height at 25 cm **V** 25 cm **= \_\_\_\_\_\_\_\_\_\_**

Show work here 🡪

2. Height at 50 cm **V** 50 cm **= \_\_\_\_\_\_\_\_\_\_**

3. Height at 75 cm **V** 75 cm **= \_\_\_\_\_\_\_\_\_\_**

4. Height at 100 cm **V** 1 m **= \_\_\_\_\_\_\_\_\_\_**

**D. Graph 1**

1. Place the title "Height of Track vs. Travel Time" at the top of the graph.

2. Use “Height of the Track (cm)” as the dependent variable (label).

3. Use “Time to Travel 1 m” as the independent variable (label).

4. Plot the points and draw a solid, best fit, **straight-line** that best represents all the points.

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25 cm

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**Graph 1 Analysis**

What is the relationship between the height of the track and the time the ball took to travel the 1-meter distance as shown by graph 1? (Give Evidence)

**D. Graph 2**

1. Place the title "Instantaneous Speed of Ball vs. Height of Track" at the top of the graph.

2. Use “Instantaneous Speed of Ball (m/s)”as the dependent variable (label).

3. Use “Height of Track (cm)” as the independent variable (label).

4. Plot the points and draw a solid, best fit, **straight-line** that best represents all the points.

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25 cm

**Graph 2 Analysis**

What is the relationship between the instantaneous speed of the ball and the height of the track as shown by graph 2? (Give Evidence)

**Conclusions**

**Address Hypothesis**

**Analysis**

**Questions**

(*Write in complete sentences that convey a complete thought*.)

1. What is the difference between "Average Speed" and “Instantaneous Speed”? (Give Evidence)

2. What is "Constant Speed"? Give an example of constant speed?

**Possible Errors**

**Bibliography**