

## Unit A – Kinematics – Lab Investigation – Uniformly Accelerated Motion

Purposes:

- (A) You will participate in a series of experiments that will produce data which reinforce the concept of UNIFORMLY ACCELERATED MOTION.
- (B) You will analyze the data to produce the appropriate DT and VT graphs
- (C) You will analyze the resultant graphs to reinforce the mathematical concepts associated with uniformly accelerated motion

Materials & Method:

I have set up a series of 3 lab stations. At each station, you will find an experimental procedure outlining how to perform your experiment in order to gather your data, as well as an explanation as to how to analyze your data. You will then perform your experiment, record your data and obtain a copy of your required graphs. You will then analyze your data as directed and then present your results & conclusions. You will finish by analyzing the experiment by citing potential error sources and how to correct them.

### STATION 0

Define uniformly accelerated motion:

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### STATION A

You will use a motion detector and demonstrate uniformly accelerated motion, by walking in front of the motion detector in a manner of your choosing AS LONG AS THE MOTION DEMONSTRATES uniformly accelerated motion.

Data to record and collect:

- (A) Obtain a copy of the DT & VT graphs from the computer

Analysis:

- (A) Explain how a DT graph shows uniform acceleration
- (B) Explain how a VT graph shows uniform acceleration

### STATION B

Perform the Gravity Lab.

## STATION C

Perform Experiment #6 - Ball Drop Experiment.

### Uniformly Accelerated Motion Lab #1 Marking Rubric

Assessment Criteria	"C" Level	"B" Level	"A" Level	Student Check
Definition of UAM	Definition is incorrect	Definition is partially correct	Definition is correct & uses appropriate scientific terminologies	
Describe your motion in front of the detector and tell me why your motion is an example of UAM	Description is incorrect and explanation of WHY is inappropriate	Either the description is correct or the explanation of WHY is appropriate	Description is correct and explanation of WHY is appropriate & uses appropriate scientific terminologies	
Obtain a copy of the DT & VT graphs from the computer	Both graphs are NOT included in the report		Both graphs are included in the report	
Analysis: (A) Explain how a DT graph shows UAM (B) Explain how a VT graph shows UAM	Explanations are incorrect	Explanations are partially correct OR One explanation is correct and the other is incorrect	Explanations are correct & use appropriate scientific terminologies	

### Uniformly Accelerated Motion Lab #2 - Gravity Lab Marking Rubric

Assessment Criteria				
Data Table	Tables prepared incorrectly	Tables are prepared but are missing either headings, labels or units	Tables are properly prepared with headings, labels, units	
Plot a graph of distance versus time and draw a best fit <i>curve</i>	Graphs incorrectly done	Graphs are prepared but are missing either headings, labels or units	Graphs are properly prepared with headings, labels, units	
MATH ANALYSIS METHOD1 - the average velocity method	Average velocities are incorrectly calculated and 2 sample calculations are included	Most average velocities are correctly calculated and 2 sample calculations are included	All average velocities are correctly calculated and 2 sample calculations are included	
MATH ANALYSIS METHOD 2 - the tangent method	Tangent lines are drawn incorrectly and/or slopes are incorrectly calculated	Most tangent lines are drawn correctly and slopes are correctly calculated	All tangent lines are drawn correctly and slopes are correctly calculated	
Graph the 2 VT graphs	Graphs incorrectly done	Graphs are prepared but are missing either headings, labels or units	Graphs are properly prepared with headings, labels, units	

Analyze the VT graphs	Incorrect slope calculation & incorrect interpretation	Correct slope calculation & interpretation is partially correct	Correct slope calculation & correct units & interpretation	
Analysis: How do you know that the lab results are showing that the ball is accelerating uniformly?	An incorrect explanation that is inconsistent with your data	A partially correct explanation that is partially consistent with your data	A correct explanation that is consistent with your data	
Analysis: Determination of acceleration from experiment & calculation of the experimental error	Neither acceleration calculation nor error calculation are correct	Either acceleration calculation is correct, or error calculation	Acceleration calculation is correct, as is error calculation	
List and describe some sources of error that could account for any discrepancies.	No valid experimental error sources are identified	One valid experimental error sources are identified	Two valid experimental error sources are identified	

### Uniformly Accelerated Motion Lab #3 – Ball Drop Lab Marking Rubric

Assessment Criteria				
Predictions of DT, VT, AT graphs & rationale for prediction	Predictions are inconsistent with an inappropriate rationale	Predictions are partially consistent with an appropriate rationale	Predictions are consistent with an appropriate rationale	
Include DT, VT, AT graphs	Graphs are not included		All graphs are included	
Analysis Q1c – Reading DT, VT, AT graphs	Position, velocity, acceleration are incorrectly identified for 3 points	Position, velocity, acceleration are correctly identified for 2 points	Position, velocity, acceleration are correctly identified for 3 points	
Analysis Q2 – Draw 3 tangent lines and find instantaneous velocities at these points	Tangent lines are drawn incorrectly and/or slopes are incorrectly calculated	Most tangent lines are drawn correctly and slopes are correctly calculated	Tangent lines are drawn correctly and slopes are correctly calculated	
Analysis Q3 – Determine the slope of the VT graph	Incorrect slope calculation & incorrect interpretation	Correct slope calculation & interpretation is partially correct	Slope is correctly determined and interpreted & units & interpretation are correct	
Analysis Q4 – Determine the constant value of the horizontal line on the AT graph	Value is incorrectly stated and units are correct		Value is correctly stated and units are correct	
Analysis Q5 – Percent error determination and error sources	Error calculation is incorrect and no valid experimental error sources are stated	Error calculation is correct and 1 valid experimental error sources are stated	Error calculation is correct and 2 valid experimental error sources are stated	