

# LAB #3 INVESTIGATING PROJECTILE MOTION

## PHYS 1110 CONCEPTUAL PHYSICS

Instructor: \_\_\_\_\_  
 Results: \_\_\_\_\_ (20 pts max)

Name: \_\_\_\_\_  
 Date: 02/20/20

### GETTING STARTED

- Open Google Chrome or other compatible browser and disable all browser pop-up blockers.
- Go to <https://phet.colorado.edu/en/simulation/legacy/projectile-motion>
- Click Play symbol "▶" and select "OK" in the pop-up dialog box.



### OBJECTIVES

- Predict how varying conditions will effect the path of a projectile and explain your reasoning.
- Use the PhET simulation to confirm or disprove your predictions.
- Explain why your predictions were correct or incorrect.

### DATA COLLECTION

1. Look at the "height" box at the top. What kinematics term does it actually stand for, and what point is it relative to? (Hint: shoot the cannon once and watch the number closely). Explain your reasoning.  
It stands for displacement above initial point where the objects are fired.

2. Fire the projectile launcher straight upwards (angle = 90°) at 18 m/s. Using kinematics, determine:

a. the time it should take the projectile to reach maximum height

$$+y \quad \downarrow a = -9.8 \text{ m/s}^2$$

$$\uparrow \quad v_f = 0$$

$$-y \quad v_i = 18 \text{ m/s}$$

$$t = ?$$

$$a = ?$$

$$v_f^0 = v_i + at_{up}$$

$$\frac{-v_i}{a} = t_{up} = \frac{-(18 \text{ m/s})}{-9.8 \text{ m/s}^2} = 1.84$$

$$t_{total} = 2t_{up} = \boxed{3.7 \text{ s}}$$

b. the maximum height reached by the projectile

$$v_f^0 = v_i^2 + 2ad$$

$$\frac{-v_i^2}{2a} = d = \frac{-(18 \text{ m/s})^2}{2(-9.8 \text{ m/s}^2)} = 16.5 \text{ m}$$

height above cannon's level →  
 height above ground = 16.5 m + 1.2 m =  $\boxed{17.7 \text{ m}}$

c. Now, using the measuring tape, measure the actual height reached by the projectile (remember to measure from the little plus sign at the base of the cannon). Was your answer to (b) the same as this measurement? If it wasn't, check your math over and find your mistake.

If the calculations + measurements were done correctly it should be the same.

# Projectile Motion Simulation Lab Answers

**Yijin Wang**



## **Projectile Motion Simulation Lab Answers:**

*Modeling Problem Solving in Physics with Simulated Experiments* Andrzej Sokolowski, 2025-12-04 Discover the joy of physics with this engaging collection of lab activities Designed to ignite curiosity and sharpen problem solving skills this book features instructional support to explore free online simulated experiments that bring physics to life Perfect for high school and undergraduate students these lab activities are adaptable for both online and in class learning environments Students will predict outcomes explore phenomena and use inductive or deductive reasoning to derive key formulas transforming hypotheses into tangible testable results Each activity fosters interactivity and critical thinking ensuring a rich and rewarding learning experience Dive into a wide range of topics including mechanics electricity and magnetism waves optics and modern physics These self guided activities are ideal for pre lecture preparation concept review or independent exploration of the natural world and its fascinating principles Whether used as assignments or standalone learning tools they empower students to connect theory with practice in an immersive way Embark on a journey of discovery and see how physics comes alive through exploration and scientific inquiry

The Software Encyclopedia 2001 ,2001 College Physics Jerry D. Wilson,2000 Applied Mechanics Reviews ,1989 The Electronic Classroom Erwin Boschmann,1995 Energy Research Abstracts ,1993

**Electronically Enhanced Education** David G. Brown,1999-04 **AAPT Announcer** American Association of Physics Teachers,1987 **Educational Resources for Microcomputers** ,1986 Scientific and Technical Aerospace Reports ,1983 Lists citations with abstracts for aerospace related reports obtained from world wide sources and announces documents that have recently been entered into the NASA Scientific and Technical Information Database Government Reports Announcements & Index ,1995 Government Reports Announcements ,1974

Current Index to Journals in Education ,1997 The software catalog microcomputers Menu (Firm) (Fort Collins, Colo.),1989 Physics Briefs ,1989 Announcer American Association of Physics Teachers,2000 Analysis of Multiple Instructional Techniques on the Understanding and Retention of Select Mechanical Topics Sara Elizabeth Fettsco,2010

**Three-Dimensional Simulations of Normal Impact of Projectiles on Moving Targets** ,1993 Three dimensional simulations of normal impact of 38 16 mm long steel cylinders of L D 6 on thin 1 59 mm aluminum plates which are themselves in motion have been conducted using the HULL code on Cray supercomputers HULL is an Eulerian code that uses a finite difference scheme to solve partial differential equations of continuum mechanics An elastic perfectly plastic model was used to describe the strain response of the target and the projectile Simulations for projectile velocities of 219 m s and 876 m s with die plates moving laterally edge on at 40 m s and 160 m s respectively are compared with cases when the plates are stationary The transverse plate motion perpendicular to the projectile results in a time dependent alteration of projectile motion and produces a tearing of the plate in addition to the plugging that would occur if the plate were stationary The results of the simulations are presented as graphic time histories of the physical quantities including sum waves in rod

plate interaction These results show that if an armor plate is set in relative transverse motion with respect to an incidental projectile it acquires a greater protection capability than the corresponding stationary plate This has implications for armor applications for live fire testing and for vulnerability and lethality analyses

**Validation of the U.S. Army Research Laboratory's Gun Dynamics Simulation Codes for Prototype Kinetic Energy**, 2003 This report compares a priori gun projectile dynamic simulations to experimental ballistic jump test data for seven 120 mm prototype kinetic energy KE projectiles and describes the methodology used for the comparison The projectiles contain significant differences in their charge subprojectile and sabot designs that span the design parameters encountered in KE cartridge development In such tests four or more sets of orthogonal radiograph images x rays which are typically used to characterize the state of the projectile at muzzle exit can be directly compared to predictions from ARL's gun projectile dynamic simulation GPDS codes The results from these comparisons show that the GPDS codes were able to predict the ballistic experimental results except for the transverse center of gravity jump velocity in two cases For the two cases the difference in predicted and experiment is shown to occur when a high average rate is seen at the muzzle exit and is probably due to the timing error associated with muzzle exit

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the first is if the immersed boundary now implemented in openfoam extend3 2 can handle the the multiregion problem such as heat transfer between two regions i think maybe now the ib just act as a wall boundary is that correct the second is if the stl surface need closed because i want to add cyclic boundary for the left and right side of the

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rep power 13 i am experiencing with the implementation of ibm in openfoam i am working with simpleibfoam it would be great if this method could be implemented in the future version of openfoam ext by default as it is a very powerful method however i did not find the current implementation robust enough yet

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oct 1 2020 in this paper we present the algorithm and implementation of an open source immersed boundary code sdfibm which is based on openfoam v6 and written in c the immersed boundary method ibm of the name treats the velocity field as the volume average of fluid and solid velocities and applies the volume average discrete forcing to

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apr 30 2023 foam extend is one of the main three branches of openfoam which is an open source c code used for the development of customized cfd solvers 1 view abstract this paper reports the verification and validation of the immersed boundary methods implemented in the open source toolbox foam extend version 4 0 and

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keywords immersed boundary non conforming mesh direct cell cutting unstructured mesh finite volume openfoam this paper describes a new method of handling non conforming immersed

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this study extends the existing immersed boundary method ibm in the open source toolbox openfoam for solving fluid structure interactions involving the immersed structure with changeable shapes

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apr 1 2020 in this work an openfoam integrated numerical solver is developed using the immersed boundary method ibm to model incompressible multiphase and turbulent flow over a solid obstacle

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this repository has the code and cases for the y adapative wall function in immersed boundary method the new method helps smooth the wall shear which is important for sediment transport the code is developed with openfoam v3 0 1

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this code was adapted and further extended by iconcfd but it does not seem to have been made available to the public implementation of a moving immersed boundary method on a dynamically refining mesh with automatic load balancing

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