

Name _____
AP Physics
Period _____

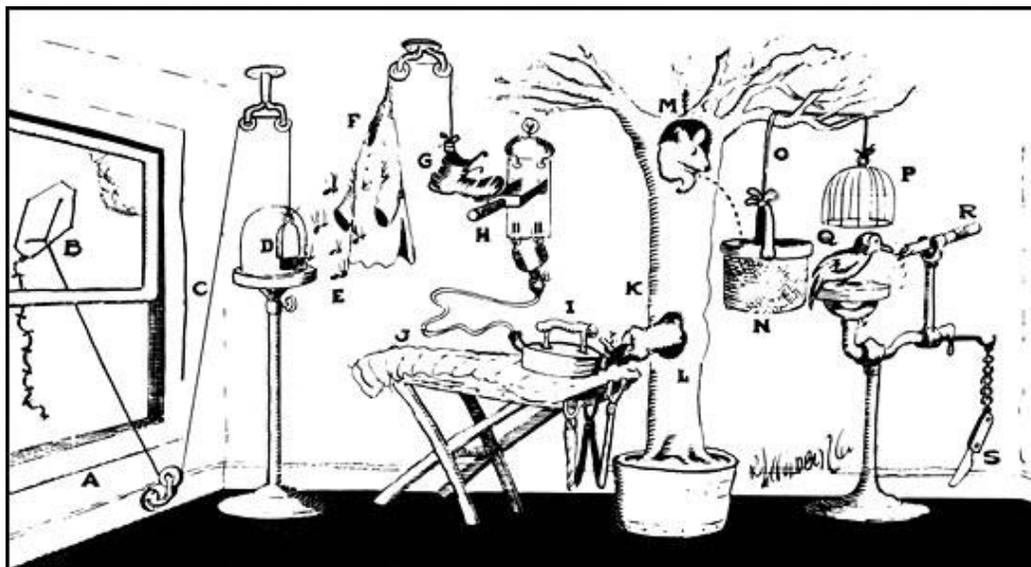
Date _____
Final Project
Mrs. Nadworny

Partner(s):

Due Date _____

Rube Goldberg Project – Coronavirus Edition

A Comprehensive Project



Open window (A) and fly kite (B). String (C) lifts small door (D) allowing moths (E) to escape and eat red flannel shirt (F). As weight of shirt becomes less, shoe (G) steps on switch (H) which heats electric iron (I) and burns hole in pants (J). Smoke (K) enters hole in tree (L), smoking out opossum (M) which jumps into basket (N), pulling rope (O) and lifting cage (P), allowing woodpecker (Q) to chew wood from pencil (R), exposing lead. Emergency knife (S) is always handy to sharpen the pencil in case opossum or the woodpecker gets sick and can't work.

Overview

In this project, you will demonstrate your knowledge of principles in physics by designing, creating, and explaining a Rube Goldberg device. This project is to pay homage to Goldberg, a satirical cartoonist best known for his designs of ridiculously complicated gadgets that performed the simplest tasks in whimsical, roundabout ways. It will count as one test in the 4th Quarter.



Task

Your task is to construct a Rube Goldberg type machine with the objective of completing a basic task related to the theme of your device.

- Example – deposit a coin in a “piggy bank”, apply toothpaste to a toothbrush, pour equal amounts of milk and cereal into a bowl, etc. . .
- BONUS – extra points may be received for completing a task in the middle of the process that is necessary for the completion of the final task.

Device (50 pts)

- Using actual hardware, design your Rube Goldberg device and package it in a manner that makes it presentable to the public. You should have a theme AND a name for your machine.
- Your Rube Goldberg device needs to include a minimum of 5 (five) CLEARLY VISIBLE steps from start to finish, each step utilizing some principle of physics. Your device must also have at least **two** different simple machines that can be used several times in your final product.
 - Do a literature search to find out about simple machines and how they work. In addition to resources listed in the textbook, there are a variety of resources on the Internet. Determine what machines would be best for your situation (example: screws, levers, inclines, pulleys, etc.)
- For safety reasons, you may not use flames or chemicals or other hazardous materials. Your design should not include any offensive materials or themes. Your device cannot be plugged into an electrical socket to operate, nor can it include live animals. Battery power is allowed.
- Your Rube Goldberg device needs to illustrate at least **three** principles of physics. Principles of physics include kinematics/projectiles, dynamics, torque, centripetal motion, energy, momentum, rotational motion, fluids, sound, light/optics, electrical circuits, and magnetism.
- Your device should be constructed from materials that you scrounge from home or family or friends or work. The total cost for your device should not exceed \$20.00. The final product should be sturdy and professional looking. (HINT – Be sure to change things quickly if pieces break like rubber bands & mouse traps)
- Your device needs to be reliable. In other words, once you start the first step, the remaining steps should follow without any human intervention. In addition, you should be able to reset the machine quickly for another run. Your device should have two complete run-throughs.
- Extensive use of commercial kits (*Legos, Kinex, etc.*) is prohibited.
- Class time will be dedicated to the research of your device as well as completion of the schematic and paper. Construction of the contraption and the majority of work should be done outside of school.

Presentation (10 pts)

- Each person will have 5 – 10 minutes to present a video and PowerPoint of their contraption.
 - Your video must
 - be accessible through Google Drive.
 - contain an introduction to your device, a general explanation of the steps, and footage of a complete run of your device without any pauses or edits.
 - Optional – your video may have additional effects like zooming in, slow motion, bloopers, etc.
- Be prepared to answer questions from class members and/or instructors.
- Your presentation grade will be based on:
 - Quality of speaking
 - Try not to read word for word from the slides
 - Presentation of video & schematic
 - Visibility of each step
 - Clarity of explanations
 - Powerpoint of each step with pictures (see page 6 for details)

Paper (40 pts)

- Paper Format
 - Typed (12 font and double spaced)
 - Correct grammar and spelling
 - Clear organization
 - Appropriate use of illustrations and tables/charts

Your paper should have a cover page and then be divided into the following sections:

1. Purpose

- Describe the purpose of your project. In a few sentences, explain the name and theme of your device, describe the scenario you are trying to model and identify the goal that you will be attempting to accomplish. The statement should be a purpose statement. You should also include the date, time and location that the device was built and filmed. Procedural steps should not be discussed.

2. Complete Schematic

- A well-drawn diagram of your machine with all equipment labeled. Each step in your diagram should be labeled with a number that corresponds with the written description.
- Complete material list

3. Description of the Model

- A numbered list of each step should include:
 - A detailed description of the different parts of the device
 - Explanation of how each device and simple machine used functions
 - Description of the Physics principles involved
 - Clarification of how each step interacts with the next step
 - References to information from the literature search should be included here.
 - A discussion of the ability of the individual machines in the device to perform their duties (were things reliable?)

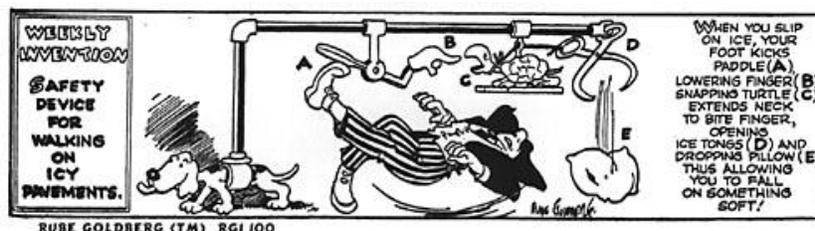
4. Data Section

- This should include a record of variable changes that had to be made as the design process unfolded with specific results included. For example, if the launch velocity of a projectile to reach a certain point is too high for the launch device, what will be altered and how? Organize your data in a meaningful way using a tabular format.

5. Discussion of Results

- Describe the successful final (we hope) version of the model you have constructed. Describe in detail any problems or difficulties this device had in completing the goal. Discuss its reliability (example, can it get repeatable results?) Discuss the possible energy losses or machine malfunctions, which might take place over time.

6. Signed Task List



Rube Goldberg Project Rubric

		(8 – 10 pts)	(4 – 7 pts)	(1 – 3 pts)	0 pts	Points
Device	Steps	Required (or more) number of steps, 4 simple machines, Every step is CLEARLY visible	Required number of steps, Most steps are clearly visible, 2-3 simple machines	Required number of steps NOT MET, Most steps are difficult to discern, 1 simple machine	Device doesn't work, Desired outcome not obtainable	
	Physics Principles	Six or more physics principles are clearly demonstrated	3 - 5 physics principles are present	1 – 2 physics principles are present	No physics principles are present	
	Layout & Materials	Layout of contraption is neat and organized, Device is well-made and materials are in good condition	Layout of contraption is clear, Device is secure and materials are in suitable condition	Layout of contraption is disorganized, Device is poorly fastened, Unsuitable materials used, or thrown together at last minute	Layout of contraption is extremely disorganized, Device in disrepair, Unsuitable materials used.	
	Creativity	Inventive theme and name for device. Energy is transferred in a creative and unique way.	Suitable theme and name for device. Energy is transferred in a creative way.	Basic or missing theme or name for device	No theme and name of device	
	Function	Device clearly functions without any human intervention, Smooth transitions between ALL steps	Device functions without human intervention, Smooth transitions between most steps	Device requires periodic human intervention to function or transition between steps	Device requires human intervention to function, Transitions between steps not visible	

	(8 – 10 pts)	(4 – 7 pts)	(1 – 3 pts)	0 pts	Points
Presentation	Great speaking skills (eye contact, memorization of lines, voice projection), Clear & detailed explanation of physics portrayed, Video queued, Video engages audience	Acceptable speaking skills, minor inaccuracies in explanation of physics portrayed, Video not queued, Acceptable video engagement	Poor speaking skills, inaccurate explanation of physics portrayed, Improper equipment, video lacks engagement	Inaudible, No mention of physics, No display of device	

		(8 – 10 pts)	(4 – 7 pts)	(1 – 3 pts)	0 pts	Points
Paper	Purpose & Formatting	Completely understood the problem and successfully utilized at least 4 simple machines, Proper formatting & grammar	Mostly understood the problem and/or successfully utilized at least 2-3 simple machines, Suitable formatting & grammar	Vaguely understood the problem and/or utilized fewer than 2 simple machines, Improper formatting & grammar	Didn't understand the problem and didn't successfully utilize any simple machines, Paper not typed or formatted, inappropriate grammar	
	Schematic	Engineering grade drawings with complete, precise and detailed labels and notations. Complete, detailed materials list included	Good graphics with good labels and explanations. Materials list is complete	Fairly well drawn schematics with some labels. Most materials are listed	Drawing of poor quality with few explanatory labels and notes. No materials list, or list is extremely incomplete	
	Description/ Physics Explanations	All energy transfers are identified and very well explained using physics.	Most energy transfers are identified and are explained using physics.	Few energy transfers are identified and the explanation is lacking in detail and depth.	No energy transfers are identified or those that are listed are poorly explained.	
	Data & Results	The group produced a complete log of the construction in process from start to finish including intermediate results	The group produced an incomplete log of the construction in process from start to finish including intermediate results	The group produced an incoherent log of the construction in process from start to finish including intermediate results	The group failed to produce any log of the construction in process from start to finish	

A 1 point deduction will result for each day a lack of effort is evident during class.

-10 pts per day	Deducted Points
Handed in past due date	

This project will count at two test grades in the fourth quarter.

Total _____

Project Schedule

Directions – You are expected to complete the following tasks within or before the following time frames.

Week 1 May 18 to May 22

Tasks

- Watch videos of other Rube Goldberg Machines
 - a. Ex - Myth Busters, OK Go music video, and example videos of former students
 - Device Theme: _____
 - Device Name: _____
 - Final Objective: _____
 - Completion of tasks by Friday _____
- Teacher Signature _____ Date _____

Week 2 May 26 to May 29

Tasks

- Identify THREE Physics Principles to be used in project
 - _____
 - _____
 - _____
 - Literature Search of Simple Machines
 - Identify TWO Simple Machines to be used in project
 - _____
 - _____
 - Rough Sketch of Devices on graph paper or plain paper
 - Submit pictures of construction & filming of machine.
 - Submit a log of any modifications needed to achieve desired results.
 - Completion of tasks by Friday _____
- Teacher Signature _____ Date _____

Weeks 3 and 4 June 1 to June 12

Tasks

- Complete Paper
 - See project guide for detailed requirements of each section.
 - Cover Sheet with project name and your name
 - Purpose
 - Complete schematic of machine
 - Description of model
 - Data section in tabular format
 - Discussion of results
- Presentation
 - PowerPoint Presentation
 - Introduction with objective and theme
 - At least one slide per step
 - Include
 - labeled picture
 - short description of each step
 - list physics concepts involved
 - identify any simple machines used
- Complete filming and edits of video
 - Video should include
 - Introduction of Machine
 - General explanation of the expected results of each step
 - A complete run of working machine without any pauses or edits in film.
 - Additional footage: zoom in on specific steps, slow motion of specific steps, bloopers, additional views of machine
- Sign-up for a presentation time
- Completion of tasks by Friday

Teacher Signature

Date

Week 5 June 16

Tasks

- Submit paper
- Upload all presentation files onto teacher's computer into the appropriate folder.
- Completion of tasks on or before the beginning of class on Tuesday, June 16
- Be prepared for your designated presentation time.