

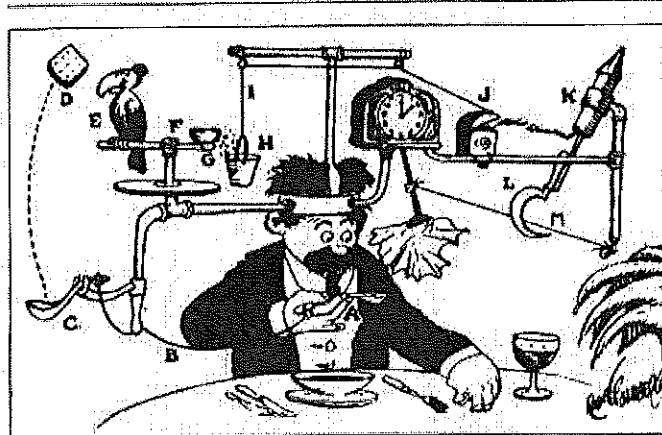
## Ring the Bell

Your team is tasked with performing the critical task of ringing a bell. Your device needs to achieve this task using several transfers of energy in the most overly complicated, creative, humorous, and innovative way possible. This type of machine is commonly known as a Rube Goldberg Machine (Device). You must plan a series of steps using items available to you (supplied in class or from home) to complete the task. The more steps the better, but it needs to work in the end.

The focus of this project is on the transfer of energy between different types of energy from one step to the next and within each step. Your group's Rube Goldberg Machine must have a minimum of 5 energy transfers, but the more the better!

Grading for the group portion of this project will be based on the complexity, number of steps, demonstration of understand of energy transfer/storage, how well it works, and teamwork.

Self-Operating Napkin



### Requirements:

- Device must ring a bell as the final step, and all steps must lead towards that goal.
- Device must have a minimum of 5 unique steps with energy transfer.
- Device must start by releasing a metal marble no more than 30cm off the table top.
- Device must use at least 3 different types of energy to accomplish your goal.

### Limitations:

- Once the device is started it can have no human input of energy until the task is completed.
- It must be able to be set up, run, and taken down in half of a class period.
- It must take up no more than the allotted space on your lab table.
- Safety must be a top priority! Safety glasses/goggles must be worn at all times. No fire can be used. See me if you will be using any projectiles or chemicals.

### Development Steps:

1. Each team member must come up with 3 possible steps on their own, with no help from or discussion with anyone else in the room. Try to use everyday objects you can bring from home. (5 minutes) These 3 steps should be in your scientific notebook.
2. Share your ideas with your group and create a single initial design for the entire group and determine what needs to be brought in from home and who will bring it. (15 minutes)
3. Build and troubleshoot your device until it is working reliably. (1½ class periods)

**Be creative and have fun!!!**

Name: \_\_\_\_\_

Date: \_\_\_\_\_

Period: \_\_\_\_\_

### **Rube Goldberg Device: Pre-Build Questions**

1. Is it possible for any step of the device to have more kinetic energy than the original total energy of the marble used to start the device? Explain. If yes, where does the additional energy come from?
2. An initially stationary ball rolls down a ramp, explain the energy transfer happening assuming this is an isolated system during the ball's descent.
3. A small nudge from a fly landing on a large book that is on the edge of a shelf causes it to fall. How is it possible that such a small input of energy can cause the falling book to have a much higher amount of energy. (After answering this question, go back to number 1 and re-think your answer, modify it as necessary)
4. Give examples of some possible types of energy that may be present in your RGM before or during it running.
5. On your own, brainstorm 3-4 possible steps with energy transfer that could be incorporated into your final design. Next class bring in several items that you feel will be useful in making your Rube Goldberg Machine.