**Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Bell \_\_\_\_\_\_\_\_**

**Rube Goldberg - Physical Science**

**2nd Quarter Project**

Sometimes designing a silly, roundabout way to do something can enable one to better understand the inner details of the more practical, direct solution. Whenever a machine is made too complicated to do a simple job, it is called a “Rube Goldberg”. Rube Goldberg’s award-winning cartoons satirized machines and gadgets. These cartoons combined simple machines, energy transfer, and common household items to create complex and wacky contraptions that accomplished mundane and trivial tasks.

In this project, you will design and build a Rube Goldberg machine. The machines that you build are different from the machines people are used to seeing. A good Rube Goldberg machine incorporates the everyday machines people are used to seeing and connects them in ways that may seem idiotic or ingenious. It is your mission to construct a machine that uses at least 6 individual steps/stages to complete a simple task (examples on next page).

Your machine may take some time to put together. You will have 5 weeks outside of class to plan and build this machine. You will be responsible for turning in a blueprint for your machine, building analysis and reflection, and final project (presented in class or recorded video). The due dates for this project are:

Planning & Blueprint: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Building Analysis & Reflection: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Final Presentation: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Rube Goldberg Project Guidelines**

**Your mission:** to create a deliberately over-engineered or overdone machine that performs a very simple task in a very complex fashion, usually including a chain reaction.

1. Your machine must complete a simple task.

* **Examples include:** turning off your alarm clock, turning the page of a book, pushing in a chair, turning on a lamp, fill a cup with water, ring a bell, staple two pages together.

1. Your machine must be designed such that a single action starts the machine.

* **Examples include:** pressing a button, letting go of a marble, cutting a string, removing a barrier, etc. No other additional human actions are required once your machine has started.

1. Your machine must have at least 4 distinct steps.

* **Definition of a Step:** A single step is defined as a transfer of energy, or 1 cause through 1 effect.
* **Examples of Steps:** ball rolls down a ramp and springs a mousetrap, the mousetrap pulls a string causing a scissors to cut, the scissors cut a cord, causing a weight to fall, weight drops on tin foil, causing light bulb to turn on. (4 Steps)

1. You may use almost any object that you can find. You are limited to “safe” things.

* **Suggested materials:** cardboard, paper clips, sand, plastic containers, wood, string, toothpicks, slingshot, toys, coins, marbles, plastic tubing, magnets, balloons, nuts and bolts, straws, rubber bands, scissors, dominoes.
* **Prohibited materials:** firecrackers, dangerous chemicals, fire, power tools, weapons. You should be able to bring any of the materials you use to school.
* If you would like to use matches, candles, or other materials that may be considered dangerous, you MUST bring in a note from a parent stating that you have permission to use those items. Notes are due at least 2 weeks before the final due date.
* You should NOT go buy all of your materials for this project. You are strongly encouraged to use materials you can find around the house.
* Points will be deducted for lack of diversity in your building materials (for example, your entire machine should not be made of Legos.)

1. Your machine should run smoothly all the way through. You will be penalized 5 points EACH TIME you interact with your machine after its initial start, for up to 8 points lost.
2. You may not hold any of the components of your machine. You should be able to leave the room and your machine will still run successfully.
3. Your machine must include at least 2 types of energy transfer.

|  |  |
| --- | --- |
| Potential Energy (stored) Forms | Kinetic Energy Forms |
| Gravitational… in height  Chemical… in bonds of fuel/food  Elastic… in stretched or compressed objects  Magnetic… in magnetized objects  Nuclear… in the nucleus of atoms  Mechanical… in stored movement | Mechanical… in moving objects  Electrical… in charges  Thermal… in heat/friction  Electromagnetic… in light/photons |

**Project Grading**

1. **Planning & Blueprint: (10 points)** Planning worksheet is completed and turned in on time.
2. **Building Analysis & Reflection: 2nd quarter Project Grade (10 points)**

Building Analysis worksheet is completed and turned in on time

Building Analysis reflects thought and effort

1. **Presentation of Machine: 2nd quarter Project Grade (20 points)**

Machine uses approved household materials

Machine video is cleanly shot/edited or brought to school pre-assembled (

Machine has at least 4 distinct steps and 2 unique energy transfers

Machine runs successfully with no human interaction

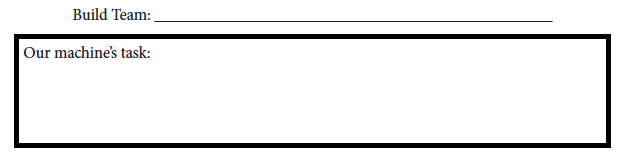
**Project grade for 2nd quarter: 40 points**

**Helpful Hints to Students**

1. Start EARLY; don’t wait until the week before the due date to begin your project.
2. Plan it out. It will be much more fun if you spread the time out over several weeks or several weekends, and you won’t have to race to get it done!
3. Communicate with your partner, parents, and your teacher on a regular basis regarding your progress. If you are having difficulty with any aspect of the project, ask for help early.
4. Watch videos of Rube Goldberg machines online to gain inspiration.
5. Share the experiences you have along the way with your family, teachers, peers, and community. You will probably find a lot of support for your STEM efforts.
6. This is to be a fun process. “Success” is a completed project where you had fun and learned a lot. Enjoy the fun!

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**Planning and Blueprint**



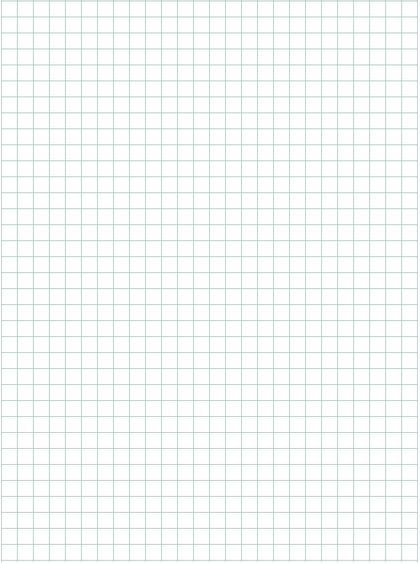
Materials:

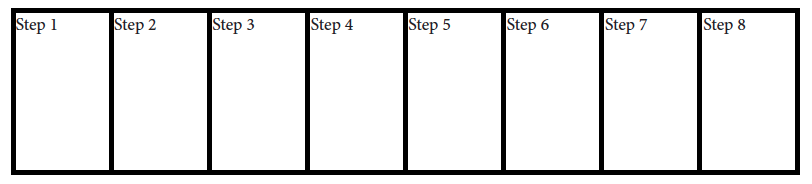
Energy Transfers Present

|  |  |
| --- | --- |
| **Energy Transfer** | **Action** |
| Example: Chemical to Mechanical | A battery operated toy moves (Step 3) |

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Blueprint – Your blueprint MUST be a fairly accurate drawing numerical of your finished product.



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Step 1: Step 5:

Step 2: Step 6:

Step 3: Step 7:

Step 4: Step 8:

Draw a picture/diagram of each step of your machine.

Then, state the type of energy transfer occurring in each step.

**Reflection**

**Write a two paragraph reflection using the following questions as a guide. Be sure to include scientific language you have learned about energy transfer.**

**Guiding Questions:**

**What was your process in building your machine?**

**What challenges did you face?**

**What was the simplest part of the process?**

**If you were to rebuild your machine how would you improve it?**

**Rube Goldberg Scoring Rubric**

**Name:**

|  |  |
| --- | --- |
| **Video / Presentation Requirements** | **Your Score** |
| **Machine uses approved household materials – 5 points** |  |
| **Machine video is cleanly shot/edited or brought to school pre-assembled and presented – 5 points** |  |
| **Machine has at least 4 distinct steps and 2 unique energy transfers – 10 points** |  |
| **Machine runs successfully with no human interaction 5-points** |  |

|  |  |
| --- | --- |
| **Building Analysis/ Reflection Requirements** | **Your Score** |
| **Building Analysis is completed and turned in on time 5 points** |  |
| **Reflection written and turned in on time 10 points** |  |

**Total Score \_\_\_\_/40**