Name _____ 84

The SINGLE Pringle Crunch

Part 1

Purpose:

To design, engineer, and build a container to protect a SINGLE PRINGLE potato chip from being crushed using only one meter of tape and one sheet of 8.5" x 11" paper. You must protect the chip from a free falling mass (water bottle) of 1000 grams from 1.5 meters high.

Rules & Guidelines:

1. You will use a SINGLE PRINGLE potato chip provided by your teacher.
2. No substance may be applied to the chip, or the chip altered in any way and the chip has to be secured **inside the container** ready to be tested.
3. The maximum dimensions for the container are 8 cm wide and no taller than 12 cm.

Procedures

1. **Draw** a simple design of your container. Show this design to the teacher before collecting supplies

2. After collecting the supplies (paper and tape) **build** a container to protect the single Pringle.

3. **Test** the container by placing it and the Pringle on the center of the piece of wood on the floor at your station. Then take the large pipe and set over your container. Make sure the nail is in the hole on the large pipe labeled 1.5 meters. Slide the water bottle inside the top of the large pipe. Pull out the nail and hold your breath, hopefully the single Pringle potato chip doesn't break. Pull the large pipe off the container and remove the mass and piece of wood. Carefully check your Pringle and clean up the mess (if the Pringle is crunched).
4. After observing how your container protected the chip, list 2 things that were successful and 2 things that were not.

Successful

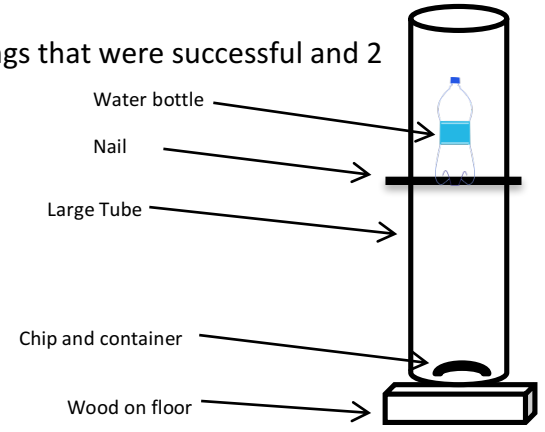
1 –

2 –

Not successful

1 –

2 –



5. **Redesign** & **Retest** – Make modifications to your design and test the container with modifications. You may get a new Pringle chip, piece of paper and tape for the redesign.
6. After observing how your container or shield protected your chip, **explain** how the changes affected the damage to the single Pringle. _____

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Part 2
Purpose:

To calculate the potential and kinetic energy of the water bottle used in the Single Pringle Crunch experiment. For all of the calculations mass is the mass of the water bottle and height is the height the water bottle is dropped inside the large pipe. These numbers are given to you at the top of the other side of this paper.

Potential Energy Formula:

PE = mass (g) **x** 9.81 m/s^2 x height (m)

PE = 1000 g **x** 9.81 m/s^2 x 1.5 m = _____

Kinetic Energy Formula

KE = (Mass x $Velocity^2$) x .5 v = distance (m) / time (s)

distance = how far the mass fell and time = how many seconds it takes to hit the wood on the floor.

First find velocity using the formula v = d/t. You will repeat the experiment by timing how long it takes the water bottle to fall 1.5 meters down the large pipe. To measure the time it takes the water bottle to fall 1.5 meters, repeat the experiment in part 1, **without the Pringle and container**. Start the timer when the nail is pulled and stop the time when the water bottle hits the block of wood that is on the floor. Repeat 3 times and find the average. Use the average time to solve the equation for kinetic energy.

Time trial 1	Seconds
Time trial 2	Seconds
Time trial 3	Seconds
Average Time (use this in equation)	Seconds

Velocity = Distance (m) / Time (s)

V = 1.5 m / ____ s = ____ m/s

KE = Mass (g) **x** $Velocity^2$ x .5

KE = 1000 g **x** ____ ^{2} m/s x .5 = _____

Questions: Answer the following questions using complete sentences.

1. What modifications to the container do you think will need to be made if the mass of the water bottle was increased?

2. What modifications to the container do you think will need to be made if the height the water bottle fell was increased?

3. How do you think potential energy will change if you dropped the mass from 2 meters?

4. How do you think kinetic energy will change if you decreased the mass of the water bottle in this experiment?

5. Explain how energy is transferred from one object to another in this experiment.