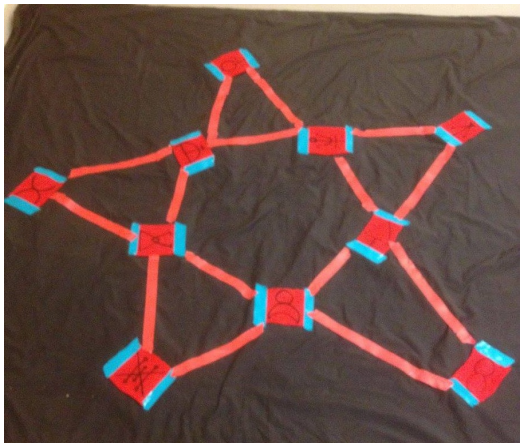
Earth Puzzle: Pressure Plates



Puzzle Challenge: *Answer a series of trivia questions. Each answer contains underlined letters which equate to elements on the periodic table. Each plate is labeled with a symbolic representation of an element. Press the correct combination of plates at the same time to trigger a complete circuit and light an LED.*

Learning Component
Content: *Circuits and Electricity*
21st Century Learning Skills: *Critical Thinking, Creativity*
Scientific and Mathematical Practices: *Defining problems, Developing and using models,*

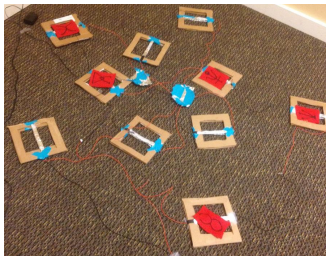
How to Make it:

1. *Create 5 pressure plates.*

Cut a square out of a piece of cardboard. Stretch a rubber band over the square hole with two pieces of foil attached on the inside. These are your contact plates. When they are stepped on, the foil connects and can create a circuit.

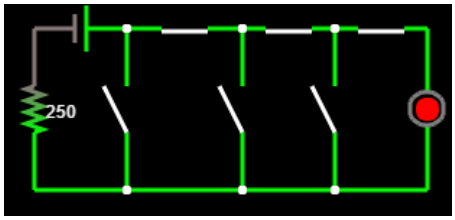
2. *Connect the 5 plates, LED light, and battery with wire to create a series circuit.*

3. *Add in some additional cardboards plates as distractors.*



Extensions and Modifications

- *Simplify: Create only 2 pressure plates that are connected to an LED light and battery.*
- *Extend: Make the distractor plates short circuit (diagram below), so the LED will not light if they are pressed.*



In this diagram the three inner switches are the distractor plates, which bypass the LED.

Materials

- *Cardboard*
- *(recommended) Extra-thick rubber bands*
- *Aluminum foil*
- *LED light*
- *9V battery*
- *Insulated copper wire*
- *Tape*

Water Puzzle: Brew a Potion

Puzzle Challenge: *Add the proper amount of water and salt to the container to complete a circuit and light an LED.*

Learning Component

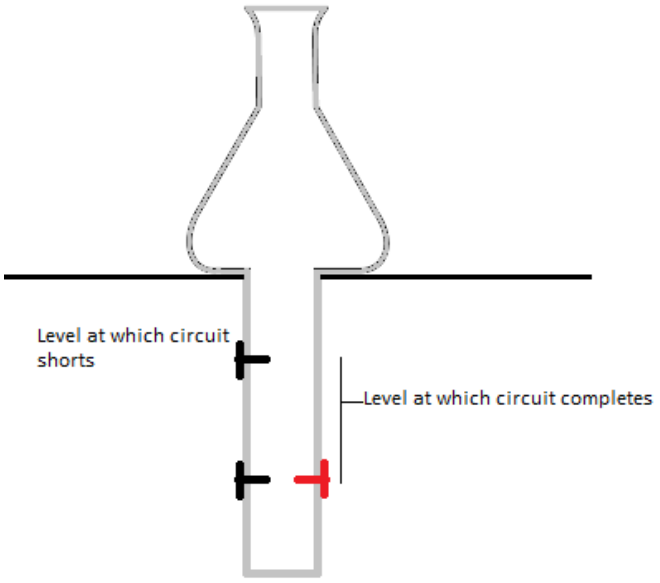
Content: Properties of materials: *Conductivity; circuits and electricity*
21st Century Learning Skills: *Critical thinking, creativity*
Scientific and Mathematical Practices: *Planning and carrying out an investigation, designing solutions*

How to Make it:

1. *Drill two screw-holes in a PVC pipe. They should be near the bottom of the pipe and roughly opposite one another.*
2. *Insert two short screws with the screw-heads on the outside. These are your contact plates. The heads may covered with glue gun, gorilla glue, or electrical tape for waterproofing.*

Extensions and Modifications

- *Modify: Build the container from any waterproof material; for example, a paper cup or molding clay.*
- *Extend: Add a third contact above the other two. Connect this contact to ground. The LED will not light if the container is filled past this level.*



Extended version

Materials

- *PVC Pipe or other container*
- *Metal contacts -- screws or nails*
- *Insulated copper wire*
- *9V Battery*
- *LED*
- *Distilled water*
- *Salt*

Heat and Light Puzzles

Puzzle Challenge: *Holding the heat riddle to a heat source reveals a code. Assembling the light puzzle and holding it to a light source reveals the solution.*

Learning Component

Content: *Energy and Light; Patterns*
21st Century Learning Skills: *communication, creativity*
Scientific and Mathematical Practices: *Make sense of problems and persevere in solving them, Look for and make use of structure*

How to Make it:

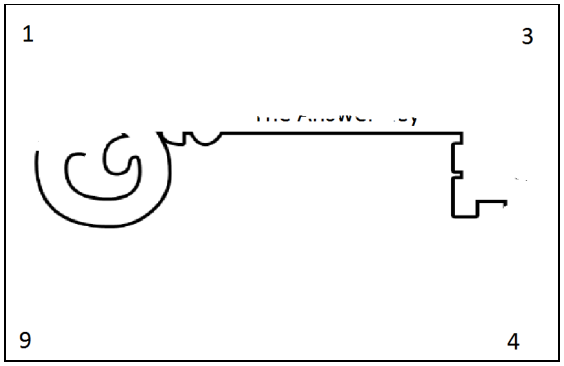
1. *Create the heat riddle.*
    a. *Erasable ink works by a chemical reaction involving heat. Use a regular pen to write the revealed portion of the puzzle. Use an erasable ink pen to write distractions that hide the solution.*
2. *Create the light puzzle.*
    a. *Draw the completed puzzle on a single sheet of paper. Trace overlapping sections onto three or four separate sheets of paper. When a light is shined through all pages at once, the image becomes visible. An example is given below.*

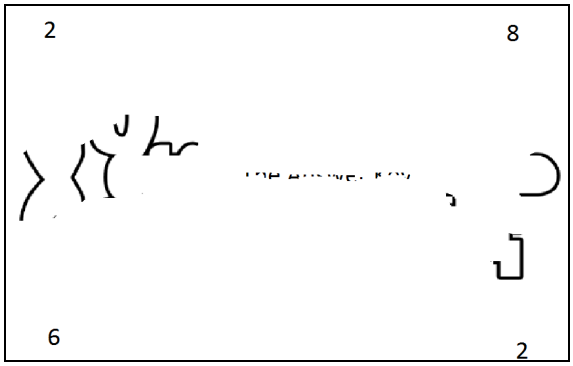
Extensions and Modifications

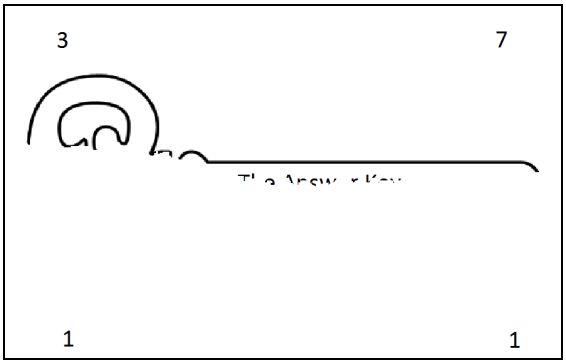
- *Extend: Draw the light puzzle on square sheets. Add a code or clue to help determine the correct orientation of the sheets.*

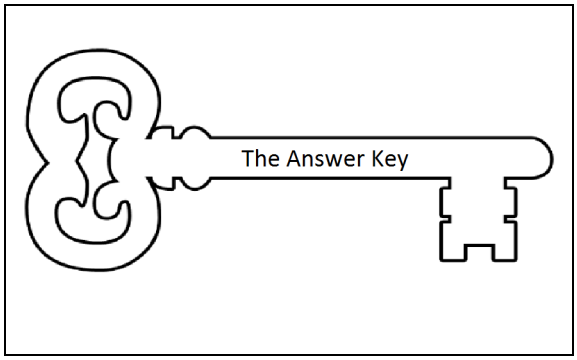
Materials

- *Frixion erasable pen*
- *Regular pen*
- *Paper*
- *Cardboard*
- *Bright light source (doubles as a heat source!)*









Components of a shine-through light puzzle. The numbers in the corners can be decoded to correctly orient the components. The code used here is this arithmetic teaser: x6 +18 -2 /2 .

The pages should be oriented so that each operation returns the given values.