ripples
from
a
hazy
source
UNIVERSE CUPCAKE RECIPE

Ingredients:

- Dark Chocolate Frosting (69% of total cupcake)  
  - Water: 25.1%  
  - Cocoa Powder: 2.3%  
  - Flour: 17.9%  
  - Baking Soda: 0.6%  
  - Salt: 0.2%  
  - Baking Powder: 0.1%  
  - Butter: 12.4%  
  - Sugar: 27.3%  
  - Eggs: 12.5%  
  - Vanilla Extract: 0.3%  
  - Instant Coffee: 0.1%  

- Dark Chocolate Frosting (26.4%)  
  - Unsalted butter, softened: 27.5%  
  - Vanilla Extract: 0.7%  
  - Salt: 0.3%  
  - Cocoa Powder: 2.6%  
  - Powdered Sugar: 63.1%  
  - Heavy Whipping Cream: 13.8%  

- Sprinkles (4.6%)
  - Sprinkles: 100%

*Measurements to preference

Directions

- For cake batter:
  1. Find a cupcake tin that is large enough to hold the total contents of your cake once it has risen. Prevent the batter from sticking to it.
  2. Heat oven.
  3. Combine cocoa powder and water at around 373.2 K. Over time the cocoa will be evenly dispersed through the water.
  4. The dry ingredients will be observably white when mixed together. The other ingredients when combine will hold all more spirals and a peaked shape.
  5. When combined together they will create a dark, thick batter (not too thick).
  6. Pour into the cupcake tin and put in oven. At an internal temperature of 372 K the cake will be completely uniform in texture.
  7. Remove from oven and allow to cool enough to not melt frosting.

- For frosting
  1. Cream together butter, vanilla and salt. Add the other ingredients. It should look dark and uniform.

- Combine appropriate amounts of cake (69%), frosting (26.4%) and sprinkle (4.6%)
BOLOMETER ANALOG

Materials:
- Geranium lens
- Thin Plastic Shopping Bag
- Thermochrome Liquid Crystal
- Section of Acrylic Tube the Diameter of the Lens
- Black Spray Paint

Directions:


**n-BODY GRAVITATIONAL LENS ANALOG**

**Materials:**
- Clear Acrylic Water Basin
- Drawing Pins (Tacks)
- Carbon Fiber Rods
- M3 Screws
- Plastic Washers
- Fuji X-Pro 2 (or Camera of Equivalent Strength)
  With XF60 mm F2.4R Macro Lens (or Equivalent) and
  Large f-Stop ≥ 16

**Directions:**
To produce a gravitational n-body lensing analog, fill a clear acrylic pool with water. Attach two carbon fiber rods to either end of one side of the basin (Diameter Φ = 0.5 mm). With M3 screws and two plastic washers, attach n solid discs (drawing pins) to support rods with super glue so the flats of the pins are held above the unperturbed water level. Mount the basin in such a way that you can view through it with a camera. To calculate the slope of the liquid surface perturbation \( z = f(x, y) \), use the linearized Young-Laplace equation

\[
\frac{\nabla^2 f}{d^2} = \alpha f
\]

where \( \alpha \) is the capillary length of the water, and solve for the proper boundary conditions. Light will be reflected at the interface \( f \) by an angle

\[
\theta = (n-1) \theta_0
\]

where \( \theta_0 \) is the gradient operator of the liquid acting on the xy-plane. Use a distant conventional whitish LED light as a light source. Set up the camera under the water basin to record the lensing of light.

To look at a single mass gravitational lens \( (n=1) \), for the case of a single tack of radius \( R \), set \( f(R) = R \), and the angular Einstein Ring radius \( \theta_e \) \((1.0 mm, 1.2 mm)\) may be computed for the approximate profile \( f h \exp(-r/R) / a \). In experiments, \( \theta_e / R \approx 1 \).

Credit: "An Optical n-body Gravitational Lens Analogy" (Selmke, Markus)
THOUGHT EXPERIMENT

Go outside and sit silently on the ground for several minutes, until you hear or see something you can't immediately explain. Without moving, write down everything you can observe around you that might have caused it.

Continue to sit where you are and go through your list, attempting to the fullest extent of your ability to prove it.

If you reach the end of that list without a provable conclusion, write down all the things that could have conceivably caused it, regardless of whether you can observe it in your immediate vicinity. Without moving, go through your list and attempt to the fullest extent of your ability to prove each hypothesis. If you reach the end of your list without a provable conclusion, write down what happened and what caused it.
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**FOUR-BODY GRAVITATIONAL LENS ANALOG**

**Materials:**
- Clear Acrylic (Water-Basin)
- Plastic Fish Friends
- Contact Paper Tissue
- 7-10 Small Stones
- 10-20 Small Gravel
- 20-50 Small Pebbles

**Directions:**

1. **Setting Up:**
   - Place the4-Ball System in a 3-Dimensional Model in a Water-Box.
   - Attach a 4-Body Paper Roll and a 10-Body Paper Roll to the Side of the Basin (Demonstrating the 3-Body System).
   - With 5-10 Small Stones and 10-20 Small Pebbles, attach 10-20 Small Pebbles to the Side of the Basin (Demonstrating the 3-Body System).

2. **Arrangement:**
   - Place the 4-Ball System in a Water-Box and attach a 3-Ball Paper Roll to the Side of the Basin (Demonstrating the 3-Body System).
   - With 5-10 Small Stones and 10-20 Small Pebbles, attach 10-20 Small Pebbles to the Side of the Basin (Demonstrating the 3-Body System).

3. **Observation:**
   - Observe the system of the 4-Ball System in the Water-Box and note the patterns formed by the light rays. The 3-Ball system will be reflected at the interfaces of the light rays.

4. **Details:**
   - When using the 3-Ball Paper Roll, the reflected light will be observed in the 3-Ball System. A Distinct Curvature Light will be observed due to the light rays reflecting at the interfaces of the light rays.
   - The 3-Ball System will appear as a Distinct Curvature Light in the 3-Ball System. Set up the system under the 3-Ball System for proper observation.

5. **Conclusion:**
   - To observe the 3-Ball System in the 3-Dimensional Model, place the 4-Ball Paper Roll in the Water-Box. The patterns formed by the light rays will be reflected at the interfaces of the light rays.
   - The 3-Ball System will appear as a Distinct Curvature Light in the 3-Dimensional Model. Set up the system under the 3-Ball System for proper observation.
POLYMER ANALOGS

Materials
- PVC pipe
- Pipe fittings
- PVC cement
- Flow sensor

Preparation
- Cut the PVC pipe into desired lengths.
- Assemble the pipe fittings according to the flow sensor specifications.

Procedure
- Connect the flow sensor to the PVC pipe system.
- Test the system for leaks.
- Collect data on the flow sensor's performance.

Conclusion
- Analyze the collected data to determine the effectiveness of the flow sensor.
- Make adjustments if necessary and repeat the procedure.
UNIVERSAL CREASE RECIPE

Ingredients:
- 1 cup flour
- 1/2 cup sugar
- 1/2 cup milk
- 3 eggs
- 1/2 cup vegetable oil
- 2 teaspoons baking powder
- 1 teaspoon vanilla extract
- 1/4 teaspoon salt

Equipment:
- Mixing bowl
- Whisk
- Measuring cups
- Measuring spoons
- 9-inch baking pan
- Oven

Preparation:
1. Preheat oven to 350°F (175°C).
2. In a large mixing bowl, combine flour, sugar, baking powder, and salt.
3. Add eggs, milk, and oil, and beat until smooth.
4. Stir in vanilla extract.
5. Pour batter into a prepared 9-inch baking pan.
6. Bake for 25-30 minutes or until a toothpick inserted into the center comes out clean.

Tips:
- For a moist cake, add 1/4 cup of sour cream or yogurt to the batter.
- For a lighter texture, substitute 1/2 cup of buttermilk for the milk.
- Add 1/2 cup of crushed pineapple to the batter for a tropical twist.
- For a chocolate version, substitute 1/2 cup of cocoa powder for the flour and add 1/2 cup of chocolate chips to the top.