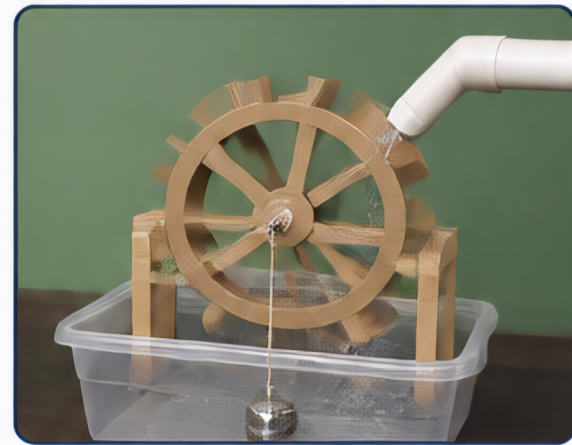




Making a Water Wheel and Measuring Its Power Output



Question: How much power can a water wheel produce?

In this experiment, you will build a water wheel, use moving water to turn it, and measure its power output.



MATERIALS

- Cardboard or plastic (for wheel and paddles)
- Wooden dowel or pencil (axle)
- Straw or small tube (axle support/bearings)
- String
- Small bucket or cup (for water)
- PVC pipe, gutter, or other spout (to direct water)
- Plastic bin or tray (to catch water)
- Mass (e.g., washers or small weight)
- Stopwatch
- Ruler or measuring tape
- Tape, scissors, glue
- Balance or scale (to measure mass)



SAFETY FIRST

- Use water carefully. Keep the area around the experiment dry to avoid slips.
- Do not overfill the tray. Keep electrical items away from water.
- Ask an adult for help when cutting or using tools.



BACKGROUND

A water wheel is a simple machine that uses the energy of moving water to do work. When water pushes on the paddles, the wheel turns. The wheel can lift a weight. By measuring how much weight it lifts and how fast, we can calculate the power output.

Power tells us how quickly work is done.

$$\text{Power (W)} = \frac{\text{Work (J)}}{\text{Time (s)}}$$

$$\text{Work (J)} = \text{force (N)} \times \text{distance (m)}$$

$$\text{Force (N)} = \text{mass (kg)} \times 9.8 \text{ m/s}^2$$



CALCULATIONS

1. Force (N) = mass (kg) $\times$ 9.8
2. Work (J) = force (N) $\times$ height (m)
3. Power (W) = work (J) $\div$ time (s)

Show your calculations for each trial in the data table.



PROCEDURE

1. Build the Water Wheel

Make a wheel with paddles around the edge. Mount it on an axle so it can spin freely. Place it over a tray.

2. Set Up the Water Source

Position a spout or pipe above the wheel so water flows onto the paddles. Adjust for a steady flow.

3. Attach the Load

Tie a string around the axle. Hang a known mass from the string so the wheel must lift the weight as it turns.

4. Collect Data

Start the water flow and timer at the same time. Let the wheel lift the weight. Measure how high the weight is lifted and the time it takes. Repeat for each trial.

5. Calculate Power

Use the data and formulas below to calculate the power output for each trial.



DATA TABLE

Trial	Mass (kg)	Height Lifted (m)	Time (s)	Work (J)	Power (W)
1					
2					
3					



REFLECTION QUESTIONS

1. What affected the power output the most? _____
2. How would more water flow change the power? _____
3. How could you improve your water wheel design? _____

