Name: _____ Date: _____

BUILDING A GYROSCOPE

— AND STUDYING ANGULAR MOMENTUM —

BIG IDEA

A spinning wheel resists changes to its orientation due to angular momentum.

OBJECTIVES

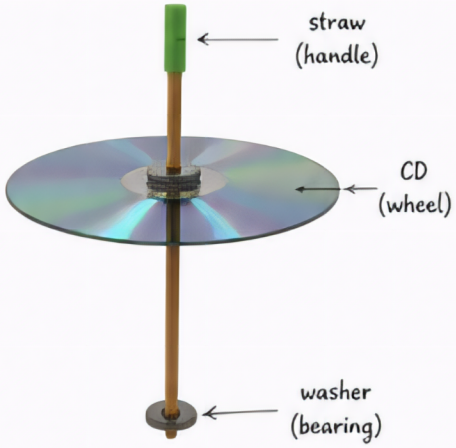
- Build a simple gyroscope.
- Observe how a spinning gyroscope resists changes in its orientation.
- Relate your observations to the concept of angular momentum.

MATERIALS

- 1 CD or DVD (disc)
- 1 plastic straw
- 1 wooden skewer (or metal rod ~20 cm)
- 2 washers (or nuts with large holes)
- Tape
- Hot glue or strong glue
- Scissors or utility knife (adult use)
- Marker
- Stopwatch (or phone timer)
- Optional: string and tape (for a simple gyroscope stand)

BUILD YOUR GYROSCOPE

1. **Prepare the Axle:** Insert the wooden skewer through the center hole of the CD.
2. **Add Bearings:** Slide a washer onto each end of the skewer. These will act as low-friction bearings.
3. **Add the Handle:** Slide a short piece of straw onto the top end of the skewer. This will be your handle for spinning.
4. **Secure (Optional):** Add a tiny drop of glue where the washers meet the skewer so they don't wobble.
5. **Test Spin:** Flick the CD with your fingers to make sure it spins freely on the washers.



PART 1: OBSERVATIONS – THE GYROSCOPE IN ACTION

Spin the gyroscope using the straw handle. Try each activity below and record what you observe.

ACTIVITY	WHAT DO YOU OBSERVE?
1. Hold the spinning gyroscope by the handle. Tilt the axis in different directions.	
2. While spinning, try to turn the gyroscope wheel 90° so the axle goes from vertical to horizontal.	
3. Place the bottom end of the axle on a table (point on the washer) and spin it. Gently push the top.	
4. Let the gyroscope wobble freely on the table while spinning.	

PART 2: THINK & EXPLAIN

1. What happened when you tried to change the direction of the spinning wheel?

   _____

2. What made it hard to change the wheel's orientation?

   _____

3. How do your observations relate to angular momentum?

   _____

4. Where might gyroscopes be useful in the real world? Give at least two examples.

   _____

VOCABULARY

Angular Momentum: The quantity of motion of a rotating object; depends on its mass, speed, and distribution of mass.

Axis: An imaginary line a body rotates around.

Gyroscope: A device with a spinning wheel or disc mounted on an axis that can rotate in space.

Precession: The slow change in the orientation of the axis of a spinning object.

CHALLENGE (OPTIONAL)

Build a simple gyroscope stand using string and tape so your gyroscope can spin freely without touching the table. Observe how it behaves. Does it precess? Describe what you see.

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_____

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EXTEND YOUR LEARNING

Research gyroscopes used in smartphones, airplanes, or spacecraft. How do they work? What problems do they solve?

Science is observing the world, asking questions, and discovering how things work! ☆