

GYROSCOPE WHEEL

LA30-930

**Included:**

- 1 x Gyroscope Wheel
- 4 x Masses
- 1 x 4 m Pull Cord
- 1 x Bungee Cord

1. Introduction

A question every Physics student should know the answer to, is 'why does a bicycle wheel stay upright when in motion?' Explain this, and more with the Lascells Gyroscope Wheel. This apparatus is a fantastic

way to visualise rotational mechanics and help explain concepts such as torque, angular momentum and gyroscopic precession.

2. Safety

- Take care when stopping the wheel from spinning – we recommend applying a light frictional force with your fingers on the side of the wheel without the masses, to avoid any protrusions. This will gradually slow the wheel to a stop.
- Ensure all masses are secured before spinning up the wheel.
- It is recommended for the person pulling the pull cord during spin up to be wearing **eye protection** to defend from a flying pull cord.
- If using with a Rotary Platform (see e.g. LA30-050), take care when stepping on and off the Platform.
- Ensure the handles of the gyroscope are tight before use – they can be tightened using screwdrivers placed through the holes of the handles, turned in opposite directions.

3. Operation

i) Spin up wheel

Hold the knot on the end of the pull cord against the circular section of the key recess on the pulley. Lay the pull cord through the straight section of the key recess, and secure in place with several turns of the cord. It is essential that the cord is secured in this way to prevent the pull cord from slipping whilst pulling. Continue to wrap the full length of the cord around the pulley.

With one person holding the handles of the gyroscope wheel at arm's length, have another person quickly pull the cord to get the wheel spinning- it is recommended to have

the person holding the wheel to take a front stance (one foot in front of the other), to take the strain of the pulling force.

ii) Gyroscopic precession

For this demonstration, it is useful to also show that a non-spinning gyroscope wheel will not precess – to do this, suspend the wheel from the bungee cord and release your hand from the opposite handle. The wheel will fall due to gravity. Once the wheel has been spun up and has angular momentum, it will precess.

To demonstrate precession, thread one hook of the bungee cord through the hole in the wheel handle. Hold in place and spin up the wheel. Once spinning at high speed, suspend the gyroscope wheel from the bungee cord. Do this by holding the free hook of the bungee cord and release your hand from the opposite handle. The wheel will *precess*, or rotate around the bungee cord.

iii) Conservation of angular momentum

This demonstration requires the use of a Rotary Platform (LA30-050). For best results, ensure the Rotary Platform is placed on a flat, level surface. Spin up the wheel, then step onto the Rotary Platform. Apply a torque to the wheel by tilting it from vertical to horizontal, and witness the wheel exert an equal and opposite torque on you, spinning you around on the platform: this provides a memorable demonstration of the conservation of angular momentum.

iv) Additional masses

It is possible to add, remove or change the position of the masses on the gyroscope wheel. A 4 mm Allen key is required to remove/attach the masses. With additional mass, a higher angular momentum can be achieved. Masses can be placed on

the inner ring, or the outer ring, allowing for an investigation of mass distance from axis of rotation. Additional masses are available separately.

Note that the masses should be distributed evenly to ensure that the wheel is balanced during spinning.

v) Timing

The label on the gyroscope wheel can be used as an easily identifiable, high contrast marker for timing within a video analysis software suite, e.g. Tracker (open source freeware).

4. Assembly

i) Insert axle

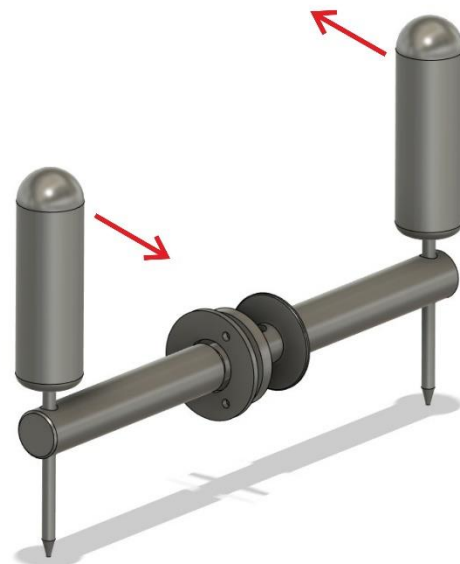
Insert the pre-assembled handle and axle arrangement with the bearing aligned to the available pocket in the pulley.



ii) Tighten handles

Screw the second handle in place on the free end of the axle. Tighten both handles by hand pressing the second bearing into its pocket.

Once in place insert two screwdrivers or similar bars into the holes in the handles. Then turn to fully tighten the handles.



LA30-930 Gyroscope Wheel

Also available from Lascells:

LA30-050 Rotary table


LA30-935 Additional Mass Set

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