ROTATIONAL ENERGY

MED 10.06

Material

Item-no.	Qty.	Description
DS600-00	1	Lab table "NTL", mobile
DS600-10	1	Assembly for lab table "NTL"
DS500-1G	4	Screw clamp, jaw width approx. 50 mm
DS101-50	1	Stand rail, universal, L=500 mm
DS600-6G	1	Board holders, pair, magnetic
DS402-3B	1	Pivot bearing with transverse hole, on saddle
DS200-04	1	Stand tube, H=40 mm
P7240-1G	1	Support rod, round, L=500 mm, D=10 mm
DM372-5G	2	Flat weight, 500 g
DG200-1S	1	Cord, D=1.7 mm, L=5 m
DM121-6A	1	Weight on hook 500 g, profi
DG270-1A	1	Labels adhesive, pack
DE722-1W	1	Stop-watch "inno"
DE722-2W	1	Remote control for laser and stopwatch "inno"

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Purpose
To demonstrate the energy that can be found at a rotating body -
Conversion from potential energy into rotational energy and vice versa.

Preparation
Fix the table setup with the four screw clamps to the lab table.

Fix the 500 mm stand rail to one of the rails on top of the table setup, afterwards fix one board holder to the protruding part of the 500 mm stand rail.

Now you can mount the pivot bearing on the board holder. The stand tube is inserted into the pivot bearing and fixed there, it serves as prolongation.

Put the 500 mm support rod through the transverse hole of the pivot bearing and fix it in the centre after it has been balanced in horizontal position.

Fix the two flat weights on this support rod at a distance of 7 to 10 cm.

Cut off a cord with a length of 160 cm and make loops at the end of the cord.

Fix the cord with one loop to the axial screw of the pivot bearing.

Afterwards wind up the cord on the axis of the pivot bearing by turning the support rod – make sure that the cord is not wound up crosswise.

The two flat weights must also be balanced and screwed firmly onto the support rod.

Now position the pivot bearing at the upper part of the board holder as shown on the images.

Stick one the labels 30 cm below the pivot bearing onto the board holder, this serves as an initial marking position.

Connect the remote control to the stop-watch and place them clearly visible on the table assembly.

Set the measuring range to 1/100 seconds (10^2 s) and turn the stop-watch on.

Hang the 500g weight into the other loop of the cord.
This weight is now winded up so that the bottom edge of the weight is exactly at the tip of the arrow.

Hold the support rod in this position.

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Experiment 1
Let go of the support rod with the attached flat weights and start the stop-watch in the same moment.

As soon as the flat weight has unwound the cord (= reached the lowest point) stop the time.

Time 1: ..... s

Due to the rotational energy that is still present, the cord is wound up in the other direction of rotation and the weight is lifted again.

At the highest point there is no rotational energy anymore and thus the support rod can be stopped safely.

Remove the weight on hook.

Afterwards unwind the cord and wind it up again as we did for the 1st experiment.

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Experiment 2
Place the two flat weights on the outer ends of the support rod.

Again the two flat weights must also be balanced and screwed firmly onto the support rod.

The weight on hook is brought into the same starting position as in the 1st experiment.

Set the stop-watch to 0 before starting the experiment.

Again let go of the support rod with the attached flat weights and start the stop-watch in the same moment.

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As soon as the flat weight has unwound the cord (= reached the lowest point) stop the time.

Time 2: ..... s

Result
If the flat weights are placed further inside, the weight will reach the lowest point more quickly.

The speed of rotation is higher because the moment of inertia is lower.

The weight has a certain potential energy due to its high starting position. If you let go of the rod, the potential energy is converted into rotational energy and later into potential energy etc.

Hint for experimenting
If it is possible to wind up the cord without a fixed link the rotational energy remains visible after the weight has dropped. The potential energy has changed into rotational energy.

Note
Applications of energy storage in the form of rotational energy are e.g. B. Flywheels.

For special applications in which energy is required quickly but only for a short time, large-volume cylinders are rotated and a generator can be coupled to them if necessary.