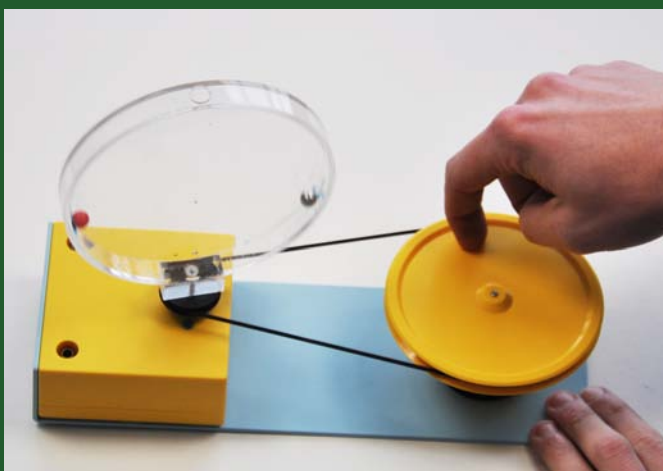


# *Student Experiments*

Manual

## **CIRCULAR MOTION**

P9160-5D



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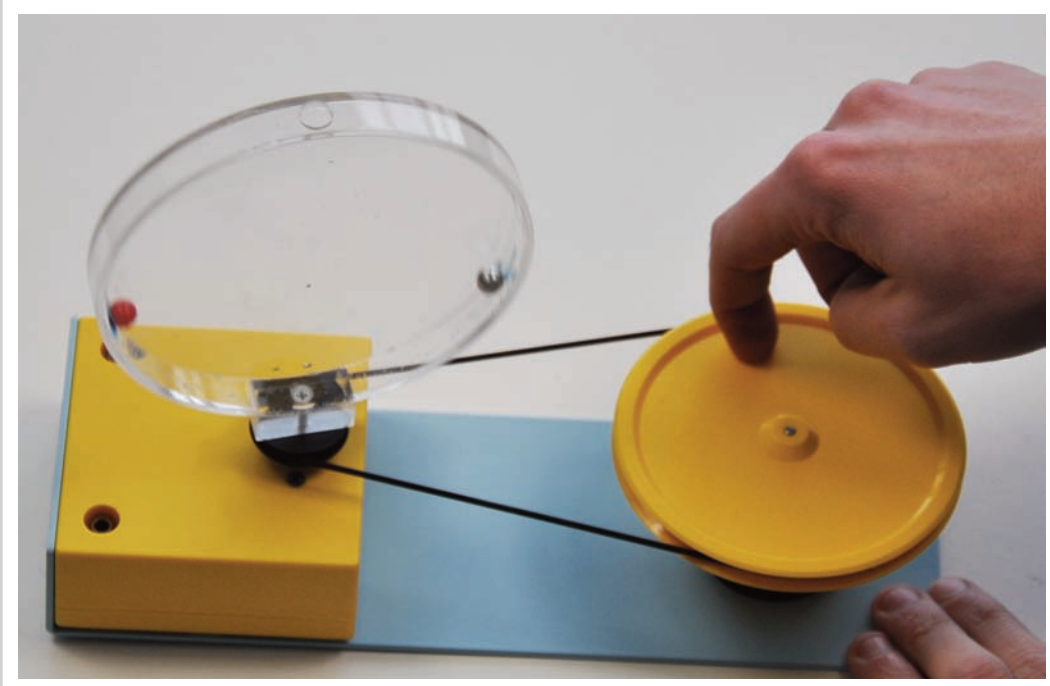
- MEC 041 Centrifugal force
- MEC 042 Centrifugal force - pending balls
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# CENTRIFUGAL FORCE - PENDING BALLS

MEC 042

## Required Kit:

P9901-4R Circular motion



## Material:

- 1x P3410-4A Drive pulley "compact"
- 1x P3410-1A Assembly platform for MBCs
- 1x P3410-5A Drive belt "compact"
- 1x P1345-1D MBC pivot bearing with transmission ratio
- 1x P1340-2K Rotational dynamics paradox/accelerometer
- 1x P1345-1M Magnetic base for drive pulley "compact"



# CENTRIFUGAL FORCE - PENDING BALLS

MEC 042

We demonstrate the centrifugal force in this experiment.

## Experiment set-up:

The MBC pivot bearing plus drive pulley mounted on the magnetic base get placed on the assembly platform. The centrifugal hoops unit gets mounted on the MBC pivot bearing. The drive belt gets clamped-in between.

## Experiment:

The centrifugal hoops unit gets put into rotation.

Consequently, the centrifugal force acts on the pending balls:

$$F_Z = m r \omega^2$$

Because of the centrifugal force the pending balls get pressed outside and "climb up" the wall of the vessel. The height of the balls is nearly the same. The mass must be considered for the weight as well as for the centrifugal force. At a given device the respective ceiling is therefore only dependent on the agitator speed.

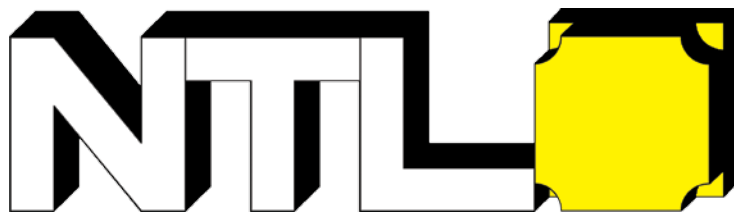
## Advice:

The closer the balls' circular path is at its resting place, the more quickly the balls rise.

If the height (distance between the plane of the circular path and the point of rest) of the ball changes from 0 to 0.5 cm, the distance to the axis of rotation changes for 2.4 cm. (Rise of the flat tangent in the illustration).

If the height changes from 0.5 to 1.0 cm, the radius only changes for 0.9 cm. If the height changes from 4.5 to 5.0 cm, the radius for the circular path changes for 0.1 cm.

Since the radius (distance to the axis of rotation - mentioned in the formula for centrifugal force) is linear, the centrifugal force changes directly proportional to the radius. This means that the centrifugal force increases faster at the beginning.



# *Student Experiments*

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