Motions
Free fall

Determining the acceleration of gravity with a baffle plate and electronic stop clock

Objects of the experiment

1. Measuring the time of fall *t* of a body for different distances of fall *s*
2. Calculating the acceleration of gravity *g*

Setup

- In order to reduce the magnetic adhesion of the ball, stick a strip of adhesive tape to the front side of the holding magnet.
- Adjust the screw of the holding magnet so that the ball just adheres to the magnet.

In order that the holding magnet and the contact plate are always aligned exactly one above the other, a plumb should be used.

Determining the distances of fall:

- Suspend the ball from the holding magnet.
- Slide the contact plate along the stand rod up to the lower edge of the ball.
- Using the felt tip pen, mark this point at the stand rod as the zero (upper edge of the Leybold multiclamp) .
- Measure distances of 0.2 m, 0.4 m, 0.6 m, 0.8 m, and 1.0 m from the zero, and mark them at the stand rod as well.

Apparatus

1 Holding magnet	336 21
1 Contact plate, large	336 23
1 Electronic stop-clock P	313 033
1 Metal rule, 1 m	311 02
1 Stand base, V-shape, large	300 01
1 Stand rod, 150 cm, 12 m diam.	300 46
1 Stand rod, 25 cm, 12 mm diam.	300 41
2 Leybold multiclamps	301 01
2 Connecting leads 32 A, 200 cm, red	501 35
2 Connecting leads 32 A, 200 cm, black	501 38
1 Black felt-tip pens, medium size, set of 5	667 019ET5

Carrying out the experiment

- Position the contact plate at a distance of 0.2 m from the holding magnet.
- Release the motion by pressing the START/STOP key of the stopclock.
- Read the time of fall from the stopclock.
- Reset the stopclock to zero by pressing the RESET key.
- Position the contact plate at distances of 0.4 m, 0.6 m, 0.8 m, and 1 m from the zero. Repeat the measurement for each distance.
- Calculate the acceleration of gravity *g* from the quotient $\frac{2s}{t^2}$.

Measuring example

Distance *s* in m	*Time *t* in s	Acceleration of gravity *g* in m/s²
0.2	0.20	10.00
0.4	0.29	9.52
0.6	0.35	9.83
0.8	0.41	9.52
1.0	0.46	9.43
		Mean value: 9.66

*Time *t*: mean value of three measured values

Evaluation

The mean value for the acceleration of gravity calculated from the measured values is: $g = 9.66\ \mathrm{m/s^2}$.

The table value is: $g = 9.81\ \mathrm{m/s^2}$.

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