2.3 Weight

Task

How "heavy" is a mass?

With a spring balance the weight which different "mass pieces" experience at the surface of the earth is determined. The law that connects weight and mass is found.

Use the space below for your own notes.

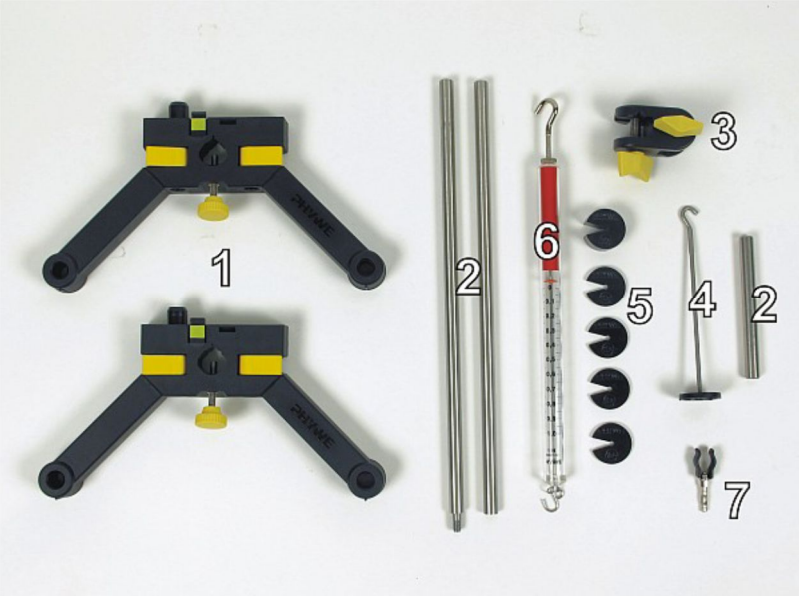
Material

Material from "TESS advanced Physics Set Mechanics 1, ME-1" (Order No. 15271-88)

Position No.	Material	Order No.	Quantity
1	Support base, variable	02001-00	1
2	Support rod with hole, stainless steel, 100 mm	02036-01	1
2	Support rod, split in 2 rods, *l* = 600 mm	02035-00	1
3	Bosshead	02043-00	1
4	Weight holder for slotted weights, 10 g	02204-00	1

5	Slotted weight, black coloured, 10 g	02205-01	4
5	Slotted weight, black coloured, 50 g	02206-01	1
6	Spring balance, transparent, 1 N	03065-02	1
7	Spring balance holder for transparent Spring balances	03065-20	2

Material required for the experiment



Setup

Screw the splitted support rod together (Fig. 1). Set up a stand with the support base and the support rod as you can see in Fig. 2 and Fig. 3.

Fig. 1

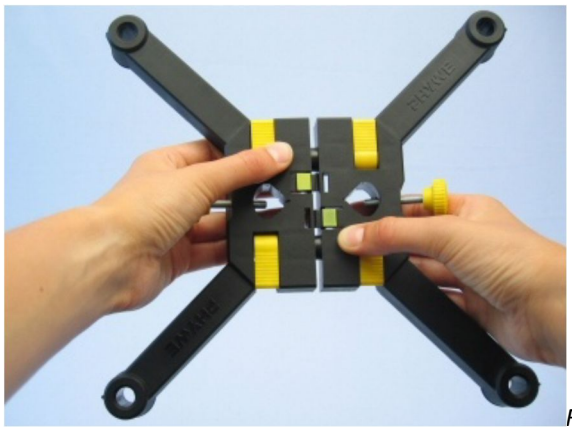


Fig. 2

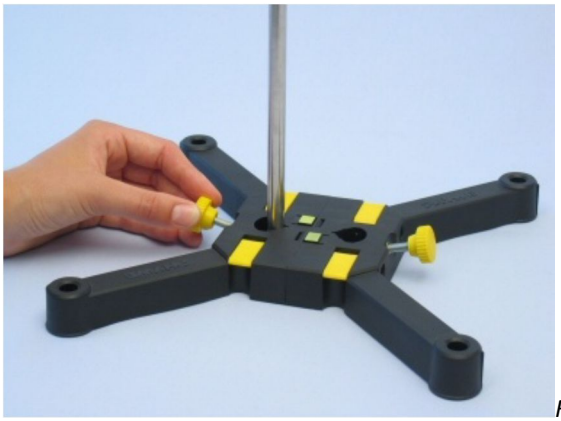


Fig. 3

Insert the spring balance holder in the blind hole in the short rod (Fig. 4). Clamp this short rod in the bosshead (Fig. 5).

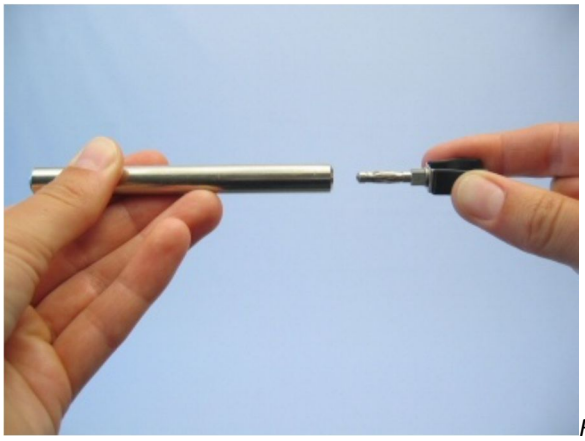


Fig. 4

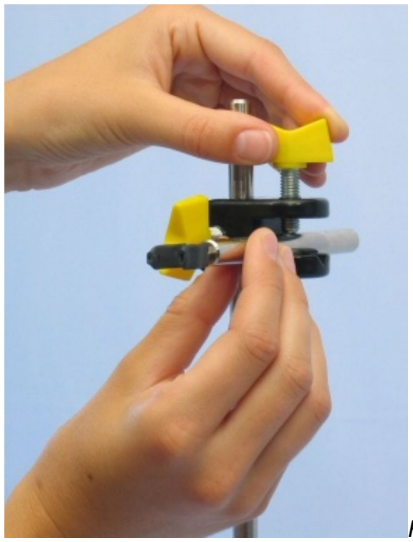


Fig. 5

Clamp the spring balance vertically in the spring balance holder. If it is necessary, you should set the indicator of the spring balance to zero, by using the screw (Fig. 6).

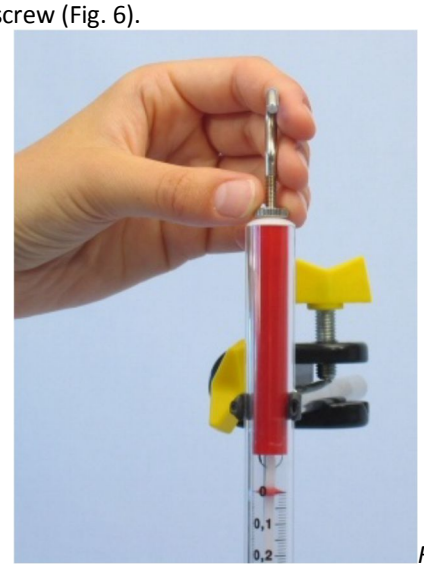


Fig. 6

Action

- Hang the weight holder (m = 10 g) on the spring balance and note its weight F_g (Fig. 7).
- Use the four 10 g and the 50 g weights to increase the weight by 10 g increments to 100 g and note the indicated value each time in Table 1 on the Results page.

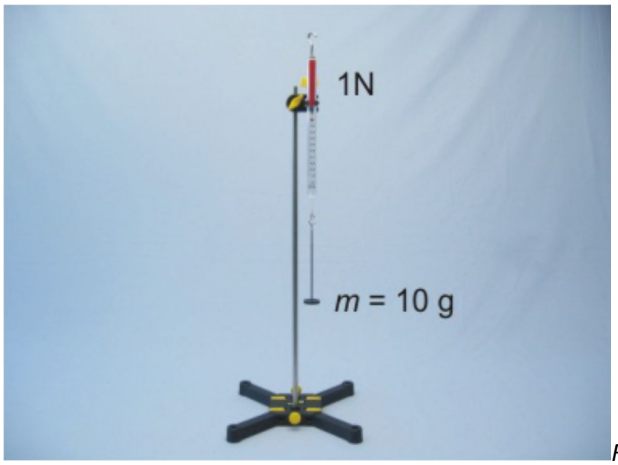


Fig. 7

For fixing the slotted weight to the weight holder, you should slip the slotted weight over the top end of the weight holder (Fig. 8).

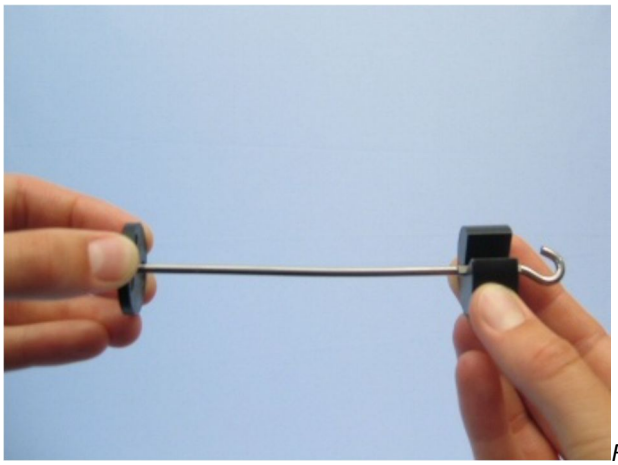


Fig. 8

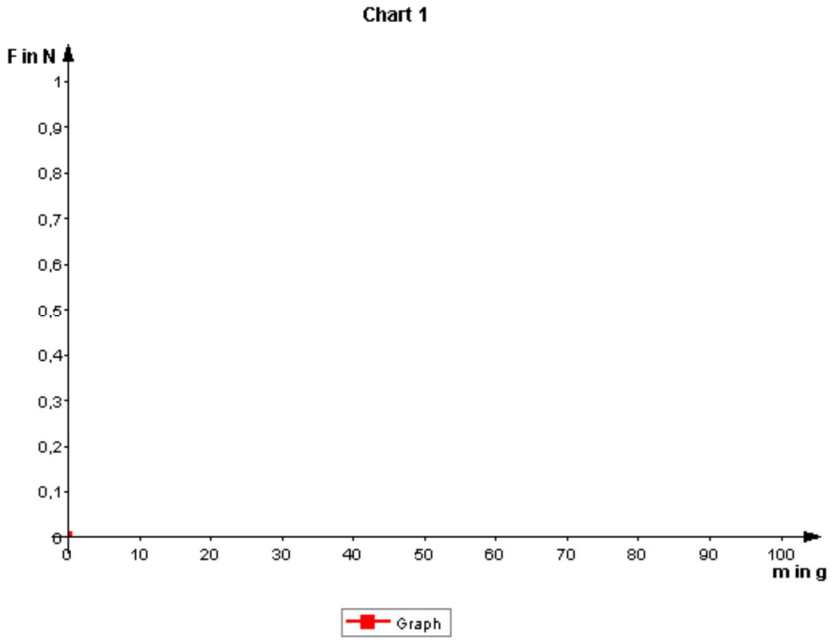
In order to disassemble the support base you should press the yellow buttons (Fig. 9).


Fig. 9

Results

Table 1

m in g	*F* in N
10	
20	
30	
40	
50	
60	
70	
80	
90	
100	



Evaluation

Question 1:

Record all the measured values in Table 1 on the Result page. Watch the plot.

Question 2:

What kind of curve do you obtain?

Question 3:

Explain the correlation between the two quantities as a "the ... the" relationship.

Question 4:

What is the mass of a 1 N weight?

Question 5:

Determine the slope (the proportionality factor) g from the graph in Table 1 on the Results page according to $F_g = g \times m$.

g = ____ N/g

Additional Task

Since, according to Newton, the following relationship is valid:
force = mass × acceleration, the proportionality factor g in the graph in Table 1 is also an acceleration - the acceleration of gravity. For the unit of force the following is true:

1 N = 1 kg m/s^2.

Determine the value of the acceleration of gravity g, which a mass m experiences in the gravitational field of the earth:

g = ____ m/s^2.