Data from the experiences

1. Spring

Hooke's Law $F = -kz$ allows to determine the ratio k/g:

$$0 = -k\Delta l + \Delta m \cdot g \Rightarrow \frac{k}{g} = \frac{\Delta m}{\Delta l} \tag{1}$$

m (g)	l (cm)	Δl (cm)
m_0 $\Delta m =$		

$$\frac{k}{g} = \text{———————} = \qquad\qquad kg/m \tag{2}$$

The spring oscillation period $T = 2\pi\sqrt{m/k}$

Δm (g)	T (s)	$T_2^2 - T_1^2$
10		
20		

$$k = 4\pi^2 \frac{\Delta m_2 - \Delta m_1}{T_2^2 - T_1^2} \Rightarrow k = 4\pi^2 \text{———————} = \qquad\qquad N/m \tag{3}$$

Known k from the expression (3) and k/g from (2) is easy to deduce g:

$$g = \frac{k}{k/g} \Rightarrow \frac{k}{k/g} = \text{———————} = \qquad\qquad m/s^2 \tag{4}$$

2. Simple Pendulum

Data from the metallic sphere (pendulum bob):

$m = 33,0$ g; $d_1/2 = 1\,\text{cm}$

Pendulum length:

$L =$ cm

Pendulum period T (s):

$T =$ s

$$T = \frac{2\pi}{\omega} = 2\pi\sqrt{\frac{L}{g}} \Rightarrow g = \frac{4\pi^2}{T^2}L = \frac{4\pi^2}{\qquad} = \qquad m/s^2\,. \tag{5}$$

3. Parabolic Throw

Height H:

$H =$ m

Horizontal displacement x_A:

$x_\text{A} =$ m

Drop time t_A:

t_{A1} (s)	t_{A2} (s)	$t_\text{A} = t_{\text{A2}} - t_{\text{A1}}$ (s)

$$g = \frac{2H}{t_\text{A}^2} = \frac{2}{\qquad} = \qquad m/s^2\,. \tag{6}$$