

PHY 2811

Group A

Test 1 (Sept. 8, 2008)

Answer all questions in 45 minutes.

- (1) If the diameter of a sphere is $d = 1.00 \pm 0.01$ cm, what is the percentage error of its volume V ? (10 marks)
- (2) A digital voltmeter has a specification of error: “ $\pm(0.1\%$ of reading + 2 digits)”. Now it reads 135.7 volts. What is the error of this reading? (10 marks)
- (3) Correct the following data format:
- (a) $e = (1.6021764870 \pm 0.0000000404) \times 10^{-19}$ C
- (b) $e = (1.6021764870 \pm 0.00000004) \times 10^{-19}$ C
- (c) $e = 1.602176487 \times 10^{-19}$ C $\pm 5 \times 10^{-5}\%$
- (15 marks)
- (4) A simple pendulum consists of a rigid body (mass m) suspended by a string.

For small displacement, the period of the oscillation is

$$T = 2\pi \sqrt{\frac{\ell}{g}} \quad [1]$$

The length of the pendulum ℓ is measured with a ruler.

The period T is measured with a stopwatch.

Suppose the minimum distance you can read with a ruler is

0.5 mm and the stopwatch is accurate to 0.01 s.

- (a) Discuss briefly all possible errors (instrument error, human error, systematic error, random error) of ℓ and T . (20 marks)
- (b) How can you measure T accurately with a stopwatch? (5 marks)
- (c) Table 1 shows a set of data.

What kind of graph should you plot in order to verify Eq. [1]? (5 marks)

Fit the data by Excel & find the value of g and its (standard) error. (35 marks)

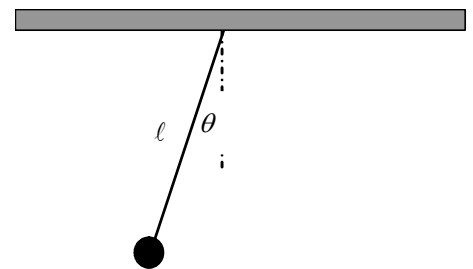


Fig. 1 A simple pendulum.

Table 1 Simple pendulum data

ℓ	T
(m)	(s)
0.943	1.96
0.793	1.80
0.636	1.63
0.524	1.49
0.370	1.25