



BRAINIACS OLYMPIAD

GRADES 7-8

PHYSICS SAMPLE PAPER (PRACTICAL PART)



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PHYSICS SAMPLE PAPER-PRACTICAL PART

Grade: 7-8

Time: 120 minutes

Total points: 100

Equipment: Not required

TASK 1 (Physical): Period of a Pendulum

1. In this experiment, you will investigate the period of a pendulum. Carry out the following instructions, referring to Fig. 1.1 and Fig. 1.2.

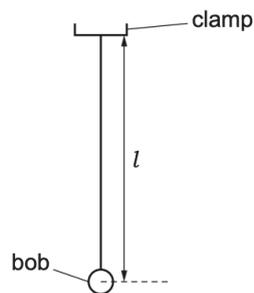


Fig. 1.1

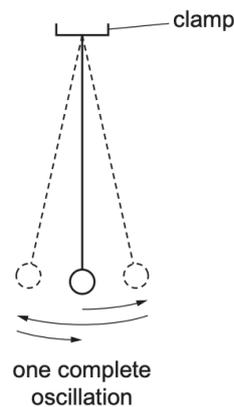


Fig. 1.2

A pendulum has been set up for you as shown in Fig. 1.1.

- (a) (i) Measure the distance l between the bottom of the clamp supporting the pendulum and the centre of the pendulum bob.

$l = \dots\dots\dots$ cm [5]

- (ii) Explain briefly how you measured to the centre of the pendulum bob as accurately as possible.
.....
..... [5]

- (b) Adjust the length of the pendulum until the distance $l = 50.0\text{cm}$.

Displace the bob slightly and release it so that it swings. Fig. 1.2 shows one complete oscillation of the pendulum.

Measure, and record in Table 1.1, the time t for 20 complete oscillations.

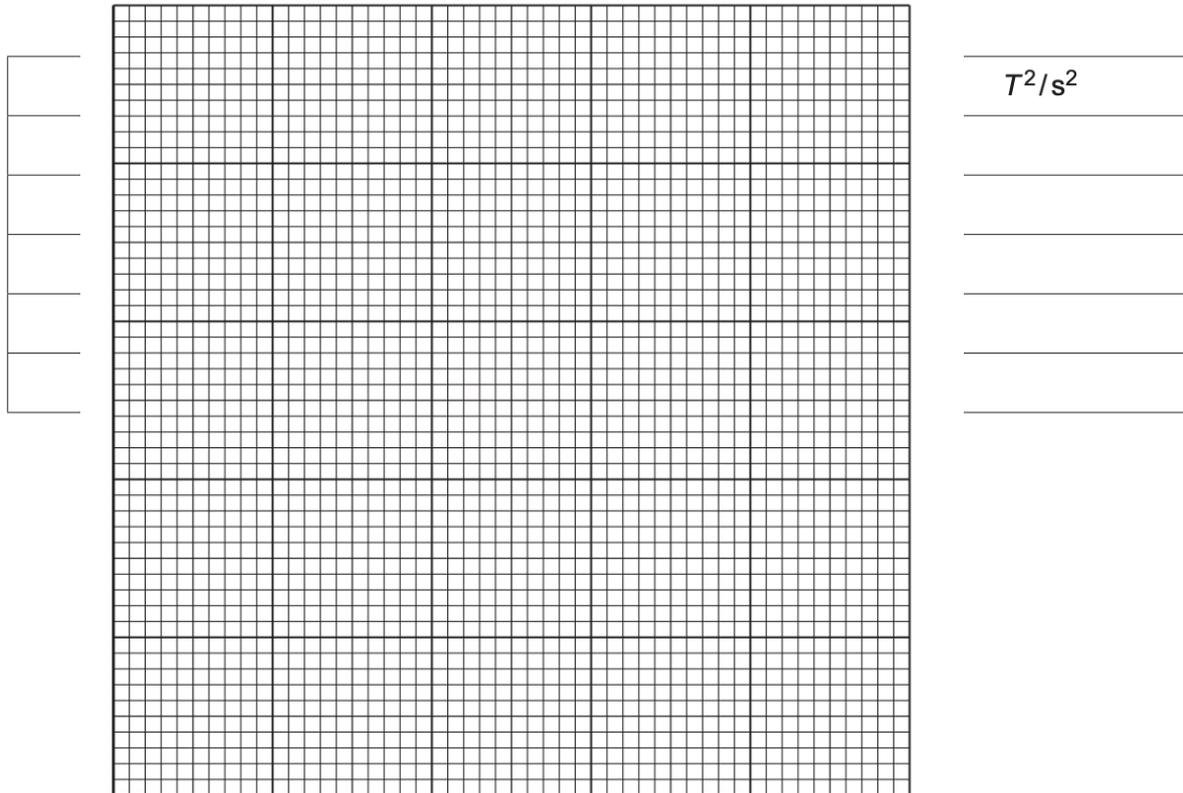
Calculate, and record in Table 1.1, the period T of the pendulum. The period is the time for one complete oscillation.

Calculate, and record in Table 1.1, the value of T^2 .

Repeat the procedure using l values of 60.0cm, 70.0cm, 80.0cm and 90.0cm.

[18]

- (c) Plot a graph of T^2 / s^2 (y-axis) against l/cm (x-axis). Start the T^2 axis at a convenient value close to the minimum value of T^2 .



[18]

- (d) Explain briefly why timing 20 oscillations gives a more accurate result for the period T than timing 1 oscillation.

 ...[4]

TASK 2 (Written): Measuring Density of a Solid

1. A student is determining the density of wood by two methods. He is using the wooden rod shown in Fig. 1.1.

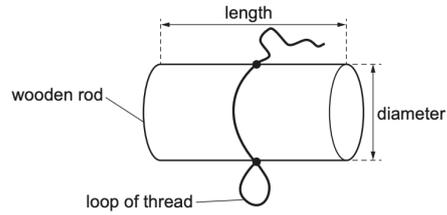


Fig. 1.1

Method 1

The dimensions of the wooden rod are shown full size in Fig. 1.2.



Fig. 1.2

- (a) Measure the length l and the diameter d of the wooden rod in Fig. 1.2.

$l = \dots\dots\dots$ cm
 $d = \dots\dots\dots$ cm
[9]

- (ii) Suggest an accurate method for measuring the diameter of the wooden rod in this experiment. List any additional apparatus that might be required and briefly describe how you would determine the diameter.

You may draw a diagram if it helps to explain your answer.

.....
.....
..... [9]

(b) The student uses a balance to measure the mass m of the wooden rod as shown in Fig. 1.3.

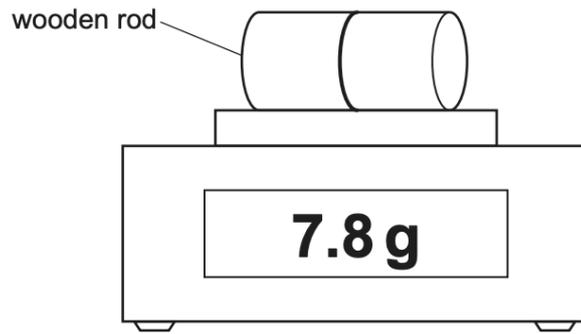


Fig. 1.3

Record the mass m of the rod.

$$m = \dots\dots\dots\text{g}$$

Calculate a value ρ_1 for the density of the wooden rod. Use your values from (a)(i) and (b) and the equation $\rho_1 = \frac{4m}{\pi d^2 l}$. Include a suitable unit.

$$\rho_1 = \dots\dots\dots [8]$$

Method 2

(c) The student pours water into a measuring cylinder as shown in Fig. 1.4. He then floats the wooden rod in the water as shown in Fig. 1.5.

Record the reading V_1 of the water level in the measuring cylinder as shown in Fig. 1.4.

$$V_1 = \dots\dots\dots\text{cm}^3$$

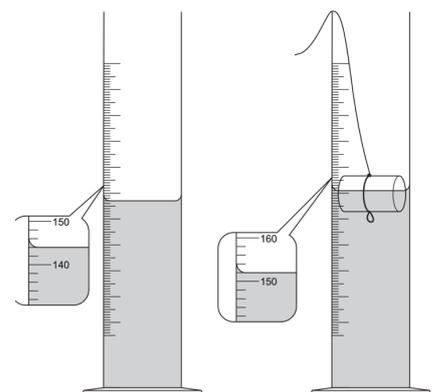


Fig. 1.4

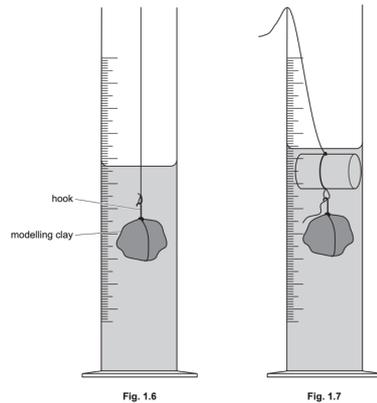
Fig. 1.5

Record the new reading V_2 of the water level in the measuring cylinder with the rod floating in the water as shown in Fig. 1.5.

$$V_2 = \dots\dots\dots\text{cm}^3 [5]$$

(d) The student removes the rod and lowers a piece of modelling clay into the water as shown in Fig. 1.6.

He then hooks the rod to the modelling clay and lowers them into the water as shown in Fig. 1.7.



He records the new reading V_3 of the water level in the measuring cylinder with the modelling clay.

He records the reading V_4 of the water level in the measuring cylinder with the modelling clay and rod.

$$V_3 = \dots\dots\dots 164 \dots\dots\dots \text{cm}^3$$

$$V_4 = \dots\dots\dots 178 \dots\dots\dots \text{cm}^3$$

Calculate another value ρ_2 for the density of the wooden rod. Use the values from (c) and

(d) and the equation $\rho_2 = \frac{(V_2 - V_1)}{(V_4 - V_3)} \times k$ where $k = 1.0\text{g/cm}^3$.

$$\rho_2 = \dots\dots\dots [9]$$

On Fig. 1.8, draw an arrow showing the correct line of sight for reading the volume of water in the measuring cylinder. [5]

(f) Suggest a possible source of inaccuracy in Method 2, even if it was carried out carefully.

.....
 ..[5]

(e)

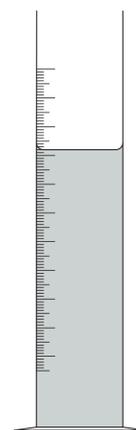


Fig. 1.8