ANSWER

Name: ..... Index No. ..... Class: .....

Bukit Batok Secondary School

PRELIMINARY EXAMINATION 2020

SECONDARY 4 EXPRESS / 5 NORMAL ACADEMIC

SCIENCE (PHYSICS, CHEMISTRY) **5076/05**

Paper 5 **18 August 2020**

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions.

READ THESE INSTRUCTIONS FIRST

Write your name, index number and class in the spaces provided at the top of this page.
Write in dark blue or black pen
You may use an HB pencil for any diagrams, graphs, tables or rough working.
Do not use staples, paper clips, glue or correction fluid.
The use of an approved calculator is expected, where appropriate.

Answer **both** questions.
You are advised to spend 45 minutes on each question. Chemistry practical notes for this paper are printed on page 10.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

APPLYING PAST KNOWLEDGE TO NEW SITUATIONS

For Examiner's Use	
Q1	
Total	

1. You are going to use the apparatus shown in Fig. 1.1 to determine a value for the acceleration of free fall, g.

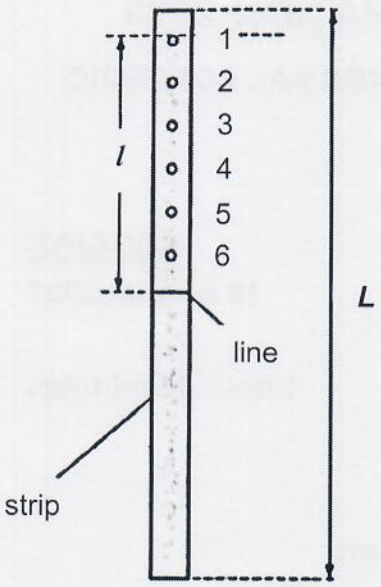


Fig 1.1

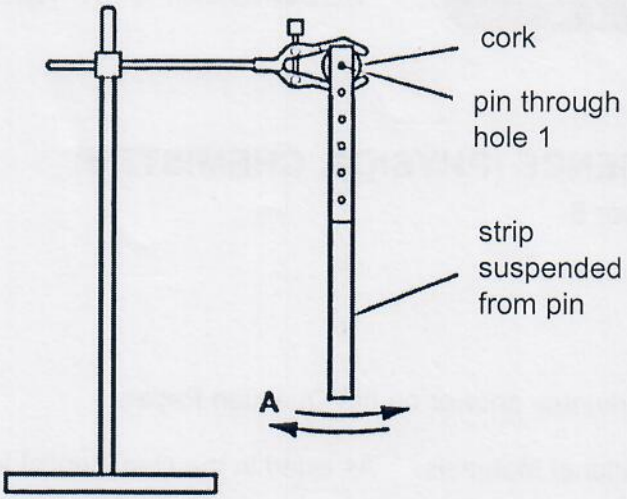


Fig 1.2

(a) (i) Measure the total length of the strip L.

Record L, to the nearest 0.1 cm.

length L = 50.0 [A1] cm [1]

(ii) A line has been drawn on the strip through its centre of mass.

1. Measure the length l, between the centre of mass of your strip and the furthest edge of hole 1, as shown in Fig. 1.1.

   Record this length l, to the nearest 0.1 cm, in Table 1.1.

2. Measure the length l, between the centre of mass of your strip and the furthest edges of holes 2, 3, 4, 5 and 6.

   Record these values of length l, to the nearest 0.1 cm, in Table 1.1.

(b) In this part, you will set up the apparatus as shown in Fig. 1.2. Using each hole in turn, you will measure the time taken ***T***, for the swinging strip to complete ***ten*** full cycles.

Note: You will only record ***one*** value of ***T*** for each length.

(i) 1. Clamp the cork as shown in Fig 1.2 and ensure that the optical pin is horizontal.

2. Place the pin through hole **1**, as shown in Fig. 1.2.

3. Make sure that the strip can swing freely. Move the bottom of the strip about 2 cm from its vertical position into position **A** as shown in Fig. 1.2.

4. Release the strip. When the bottom of the strip returns to position A, start the stopwatch. When the strip returns again to position **A** it has completed cycle number **one**.

5. Continue to count each time the strip returns to position **A**. Stop the stopwatch at the end of cycle number ten. This is the time, ***T***, for **ten** complete cycles of the strip.

6. Read and record the time, ***T***, to the nearest 0.01 s, in Table 1.1.

(ii) Repeat the procedure described in **(b)(i)** using holes **2** to **6**.

In each case, record your value of ***T*** to the nearest 0.01 s, in Table 1.1.

(iii) Complete Table 1 .1 for each row of data by calculating

- T^2, giving your answer to the nearest 0.1 s^2,
- l^2, giving your answer to the nearest whole number,
- T^2l, giving your answer to the nearest whole number.

Table 1.1

hole	length l /cm	Time T /s	T^2 /s^2	l^2 /cm^2	T^2l /s^2cm
1	23.9	11.3	127.7	571	3052
2	19.6	11.2	125.4	384	2459
3	15.3	10.7	114.5	234	1752
4	10.8	11.2	125.4	117	1355
5	6.7	12.3	151.3	45	1014
6	2.3	17.6	309.8	5	712

decreasing trend [A1]

[4]

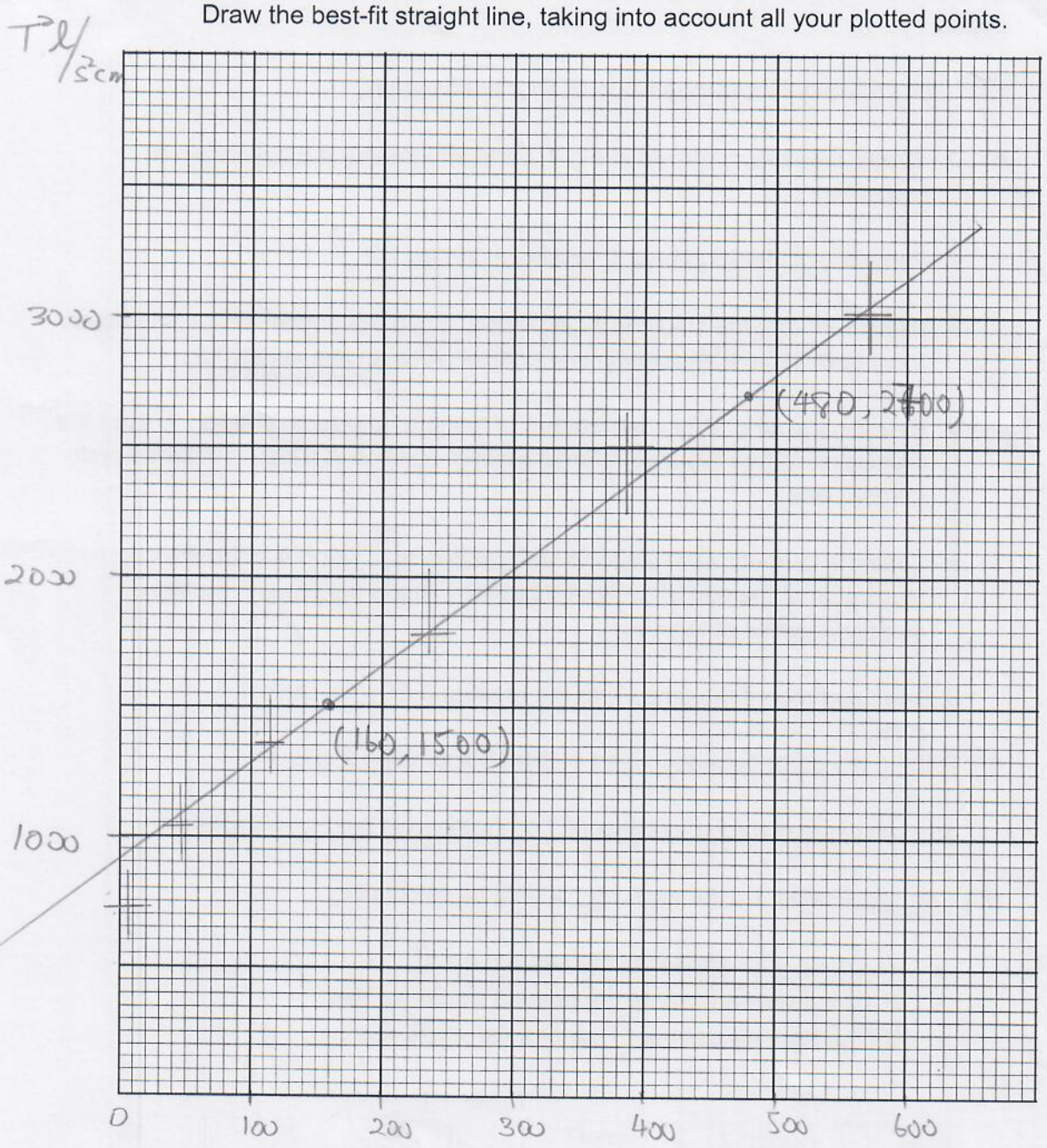
one l within 5% of answer. [A1]

nearest 0.1 [A1]

nearest whole number [A1]

(c) (i) On the grid, plot a graph of T^2l (on the y-axis) against, l^2 (on the x-axis).

Draw the best-fit straight line, taking into account all your plotted points.



[4]

(ii) Determine the gradient of your line, showing clearly on your graph how you did this

$$\text{gradient} = \frac{2700 - 1500}{480 - 160} \quad [m1]$$

$$= 3.75 \quad [A1]$$

gradient = ...mm [2]

(d) Determine a value for the acceleration of free fall, g, using the gradient of your line, and the formula below.

$$g = \frac{4\pi^2}{gradient}$$

[M1] [M1]

$= \frac{4\pi^2}{3.75} = 10.5$

g = 10.5 m/s² [2]

(e) Identify two **different types** of sources of error in this experiment.

For each, suggest an improvement that would reduce the error.

source of error 1 hard to locate start and stop of oscillation. So T is not precise.

improvement Repeat the experiment a few times to take average

source of error 2 hard to determine l because it's hard to ensure ruler is parallel to edge of stick

improvement draw a horizontal line across the holes to the edge

[2]

[Total : 15 Marks]