ST JOSEPH'S INSTITUTION
END-OF-YEAR EXAMINATION 2020
(YEAR 3)

CANDIDATE NAME								
CLASS						INDEX NUMBER		

Physics
Paper 3 Practical

6091/03

14 September 2020
1 hour 15 minutes

Additional Materials: graph paper, trace paper

READ THESE INSTRUCTIONS FIRST

Write your name, class and index number at the top of this page and all the work you hand in.
Write in dark blue or black pen.
You may use a soft pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.

Answer **all** questions in the Question Booklet.

You are expected to record all your observations as soon as they are made.

The use of an approved scientific calculator is expected, where appropriate.

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.

Shift
Laboratory

For Examiner's Use	
1	
2	
Total	**/ 30**

This document consists of **6** printed pages including this cover page

Section A

1 In this experiment, you will investigate the speed of a glass ball rolling down an inclined track.

You are provided with

- a support
- two metre rules
- a glass ball
- a stopwatch
- Blu-Tack
- a piece of cloth to act as a stop

The apparatus has been set up as shown in Fig. 1.1

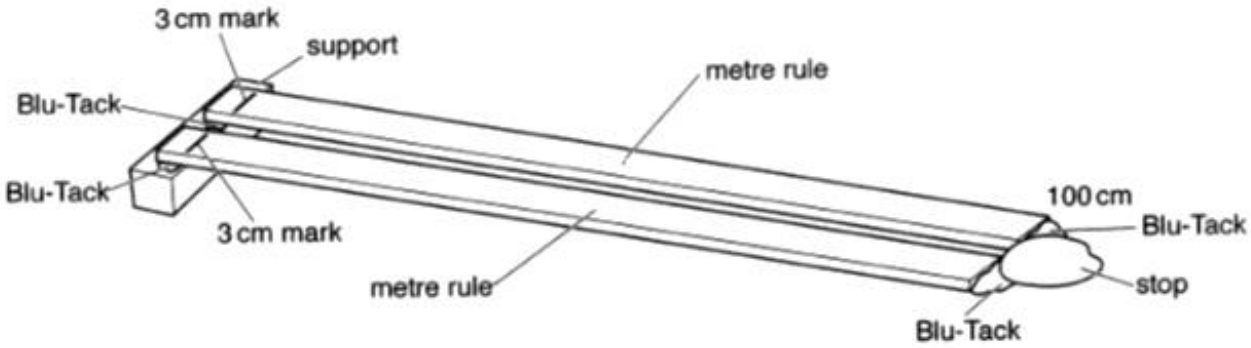

Fig. 1.1

The metre rules are placed on the support at the 3 cm mark and 5 mm apart. Fig. 1.2 shows a side view of the set up.

Fig. 1.2

(a) Place the centre of the glass ball at the 1 cm mark on the metre rules. Release the ball and start the stopwatch.

Stop the stopwatch when the ball hits the stop at the end of the track. The reading on the stopwatch is t_0.

(i) Record your value for t_0.

t_0 = ... [1]

(ii) Replace the ball at the 1 cm mark.
Reset the stopwatch to zero.
Release the ball and start the stopwatch.
Stop the stopwatch when the ball passes the 51.0 cm mark on the track.
The reading on the stopwatch is t_1.

Record your value for t_1.

t_1 = ... [1]

(b) The average speed of the ball is calculated using the formula shown.

$$\text{average speed} = \frac{\text{distance travelled}}{\text{time taken}}$$

(i) In **(a)(i)** the ball travels 99.0 cm.

Calculate the average speed v_0 of the ball for this distance.

v_0 = ... [2]

(ii) In **(a)(ii)** the ball travels 50.0 cm.

Calculate the average speed v_1 of the ball for this distance.

v_1 = ... [2]

(c) Calculate the acceleration a of the ball along the track using the equation shown.

$$a = 2\left(\frac{V_0 - V_1}{t_0 - t_1}\right)$$

a = ... [2]

[Total: 8]

Section B

2 In this experiment, you will investigate the effect of placing a mirror at different distances from a glass block and the displacement of the emergent ray from the original position of the incident ray.

You have been provided with the following:

- a soft board
- four optical pins
- a rectangular glass block
- a 30 cm ruler
- a protractor
- a sheet of pre-printed trace paper
- a graph paper
- a plain mirror

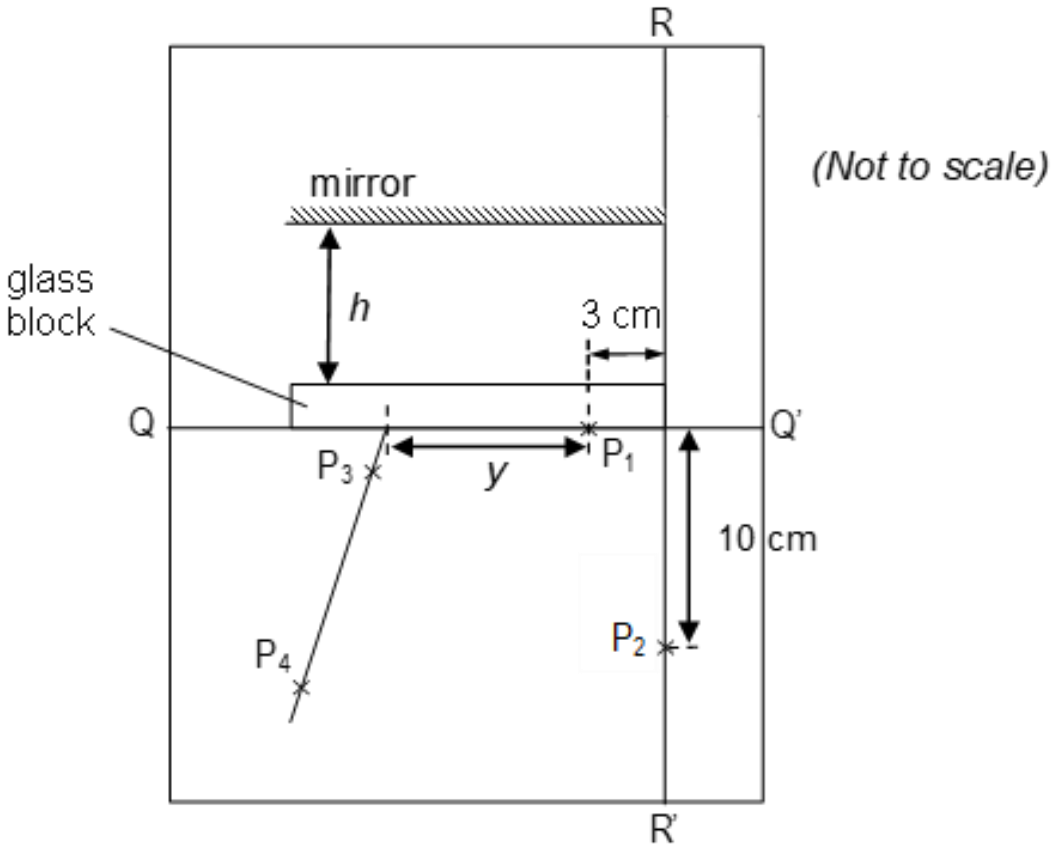

Fig. 2.1

(a) On the trace paper provided, place the rectangular glass block lengthwise on its smallest face and two of its sides on the line **RR'** and **QQ'** as shown in Fig. 2.1.

(b) Trace the outline of the glass block.

(c) Place a pin, P_1, touching the glass block and 3 cm from the line **RR'**.

(d) Place another pin, P_2, along **RR'** and 10 cm from **QQ'**.

(e) The mirror is to be placed parallel to the glass block and perpendicular to **RR'**, as shown in Fig. 2.1.

Draw the mirror line 4 cm away from the glass block and record this distance as *h*.

Record the value of *h*.

h = ……[1]

(f) Describe how you ensure that the mirror is perpendicular to the line **RR'**.

……

……

……[2]

(g) Look through the glass block and place two pins, P_3 and P_4, such that they are in line with the images of P_1 and P_2 in the mirror.

(h) Explain why the optical pins P_3 and P_4 should be placed at least 5.0 cm apart, and state how it affects the accuracy of the reading.

……

……[2]

(i) Remove the glass block.
Draw a line to join the points marked by P_3 and P_4. [1]

(j) Measure and record *y*, the distance between the point at which the line formed by P_3P_4 touches the glass block and the position of P_1.

Record the value of *y*.

y = ……[1]

(k) Repeat steps **(e) to (i)** for **four** additional values of *h*.

(l) Record your values of y and h in the table provided below. [4]

(m) Plot a graph of y against h. [5]

(n) It is assumed that

$$y = kh + c$$

Using your graph, find k and c.

k = ……[2]

c = ……[2]

(o) Identify a source of error and state how it affects the accuracy of the readings.

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……[2]

[Total: 22]

~ END OF PAPER ~