



Rewarding Learning

General Certificate of Secondary Education
2023

Centre Number

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Candidate Number

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Physics

Unit 3: Practical Skills

Booklet A

Higher Tier



GPY33

[GPY33]

TIME

2 hours.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

Write your answers in the spaces provided in this question paper.

Answer **all** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is **30**.

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

Follow all health and safety instructions.

You may use a ruler and calculator if required.

The apparatus and materials required to complete the task(s) are provided.

FOR TEACHER USE ONLY

In Experiment 2, it is assumed that the candidate was given help to complete the circuit. If this is **not** the case please tick the box below.

No help was given

Examiner's use only	Marks
Experiment 1	
Experiment 2	

Total Marks	
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Experiment 1 Motion down a ramp

Introduction

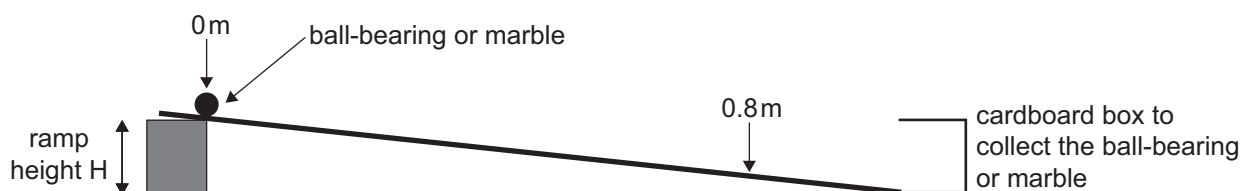
In this experiment you will investigate how the motion of a ball-bearing or marble down a ramp is affected by the ramp height.

Aims

The aim of the experiment is to measure the time it takes a ball-bearing or marble to travel from rest, a measured distance down the ramp. You will repeat this process for a number of different ramp heights from 1 cm to 5 cm.

You will calculate the **average velocity** and use this to calculate the **final velocity** of the ball-bearing or marble after it has moved a distance of 0.8 m down the ramp.

Apparatus



The apparatus shown in the diagram above has been set up for you. The ramp has two lines marked on it which are **0.8 m apart**. A wooden block has been placed under the ramp.

Procedure

During (a)(i) to (iii) you may work on your own or as part of a group of two or three.

- (a) (i) A wooden block marked 1 cm has been placed under the ramp as shown in the diagram.
 Release the ball-bearing or marble from rest at the position on the ramp marked 0 m, and record the time it takes the ball-bearing or marble to reach the 0.8 m mark.
 Record this time to **one decimal place** in Table 1.
 Repeat this process twice more so that you have three values of the time.
 Record all these values to **one decimal place** in Table 1.
 Add appropriate headings with units to columns 1, 2 and 3 of Table 1. [2]
- (ii) Remove the block marked 1 cm and replace it with the one marked 2 cm.
 Release the ball-bearing or marble from rest at the position on the ramp marked 0 m, and record the time it takes the ball-bearing or marble to reach the 0.8 m mark.
 Record this time to **one decimal place** in Table 1.
 Repeat this process twice more so that you have three values of the time.
 Record all these values to **one decimal place** in Table 1. [1]
- (iii) Repeat the process for ramp heights of 3 cm, 4 cm and 5 cm.
 Record your values in Table 1 to **one decimal place**. [2]

Examiner Only	
Marks	Remark

Table 1

	Column 1	Column 2	Column 3
Ramp height/cm			
1			
2			
3			
4			
5			

← Insert heading

When you have taken all your measurements or when your teacher tells you that 30 minutes are up you must stop using the apparatus.

To complete the remainder of this assessment you must work alone. Your teacher will direct you to a place in the room to do this.

Table 2

	Column 4	Column 5	Column 6
Ramp height/ cm	Average time/s	Average velocity/ m/s	Final velocity/ m/s
1			
2			
3			
4			
5			

(iii) Using the relationship below, calculate the **final velocity v** for the ball-bearing as it reaches the 0.8 m mark for each ramp height.

$$\text{Final velocity } v = 2 \times \text{average velocity}$$

Record your final velocity values to **two decimal places** in column 6 of Table 2.

[1]

You may use the space below for final velocity calculations.

Examiner Only	
Marks	Remark

(iii) Which one of the equations below best describes the relationship between the **final velocity v** and the **ramp height H**? In the equations k is a constant.

$$v = kH$$

$$v = k\sqrt{H}$$

$$v = \frac{k}{H}$$

Circle the correct equation and explain your choice.

[1]

Examiner Only	
Marks	Remark

For the remainder of Experiment 2 you must work alone.

Analysis

(b) The resistance R of the wire is calculated using the equation below.

$$R = \frac{V}{I}$$

Calculate the resistance of the wire for each set of the voltage and current measurements.

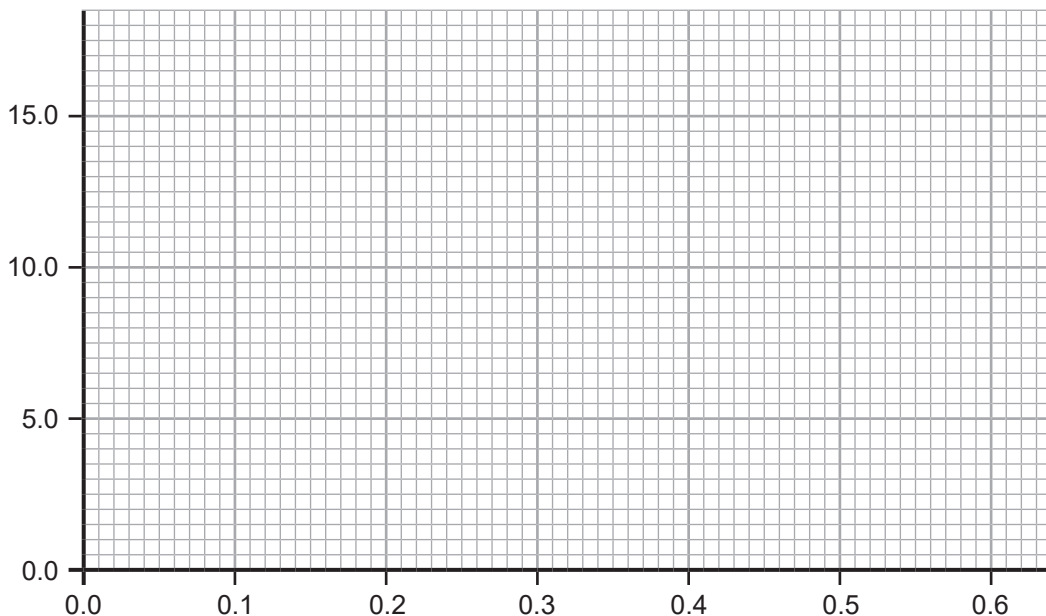
Record your values of resistance to **one decimal place** in column 3 of the table on the previous page. [3]

Add a heading and unit to column 3. [1]

Examiner Only	
Marks	Remark

Interpretation of your data

- (c) (i) On the axes below, draw the graph of how the resistance (y-axis) and current (x-axis) are related.
Label each axis with the quantity and its unit.
Plot the points using \odot or \times .



[4]

- (ii) The resistance of the coil of wire should remain the same throughout the experiment because the temperature of the coil of wire was kept constant.
To show this, draw the straight line of best fit through the points you have plotted.

[1]

THIS IS THE END OF THE QUESTION PAPER

Examiner Only	
Marks	Remark

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**General Certificate of Secondary Education
2023**

Physics

Unit 3A: Practical Skills

Booklet A

Higher Tier

[GPY33]

APPARATUS AND MATERIALS LIST AND CONFIDENTIAL INSTRUCTIONS

To be accessed by Head of Department only

It is the responsibility of the centre to ensure that appropriate risk assessments are carried out for all practical skills assessments.

Experiment 1 Motion down a ramp

Experiment 1 Equipment and Confidential Instructions

Apparatus and Materials List

Rigid ramp at least 1.0 m long with a groove that the ball-bearing will roll down, e.g. a wooden lath with a groove cut into it would be suitable.

One ball bearing of a size that will allow it to run smoothly down the ramp.

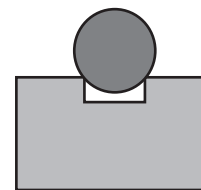
Stop clock or stopwatch that reads to one decimal place.

5 wooden blocks of heights 1 cm, 2 cm, 3 cm, 4 cm and 5 cm.

The heights should be marked on the blocks.

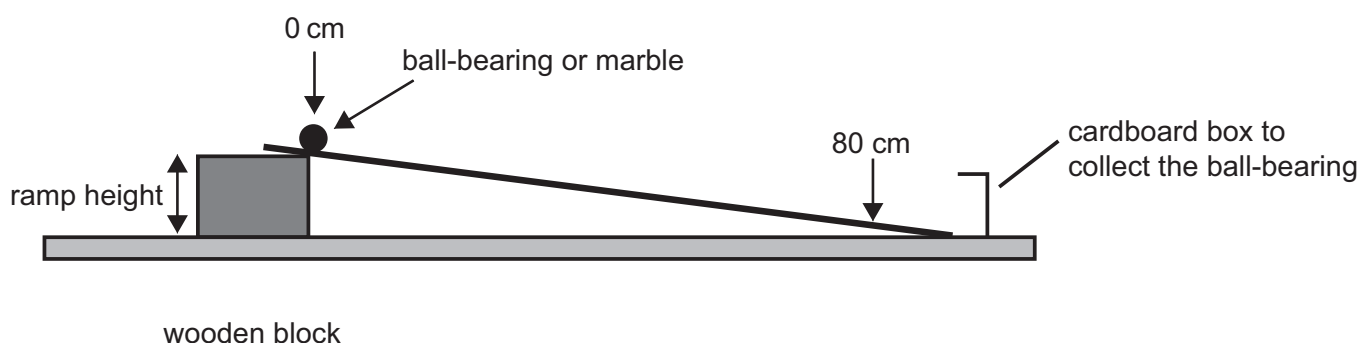
Safety glasses if considered appropriate.

A cardboard box to collect the marble or ball-bearing.



Instructions to the teacher

The apparatus shown below should be set up prior to the student using it. The wooden block of height 1 cm to be placed under the ramp as shown. The other block to be left near the apparatus.



Lines 0.8 m apart should be added to the ramp, label them 0 m and 0.8 m

Supervision of the Practical Skills Assessment

Up to 30 minutes collecting results, with the students working individually or collectively in a group of maximum size three.

Then 30 minutes with all students working individually under full examination conditions with a high level of control to complete the booklet.

Experiment 2 Electrical resistance

Apparatus and Materials List

Switch

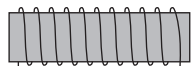
A variable power supply set so that voltages greater than 6V are not possible.

If you plan to use a stepped power supply ensure candidates can obtain 5 values of voltage.

Ammeter (digital capable to measuring 0 – 2A to two decimal places).

Voltmeter (digital capable of measuring 0 – 6V to two decimal places).

100 cm of 28 SWG Nichrome wire (approx. $10\ \Omega$) wound into a coil on a wooden dowel or similar. Use tape to ensure coil does not become loose.



Stackable connecting leads.

Crocodile clips if required.

Safety glasses, if considered appropriate.

Instructions to the teacher

The partial circuit shown below should be set up by the teacher.

Gaps are to be left for the ammeter and voltmeter.

The ammeter and voltmeter should be left close to the circuit.

Ensure the voltage used does not exceed 6V in the case of a power supply.

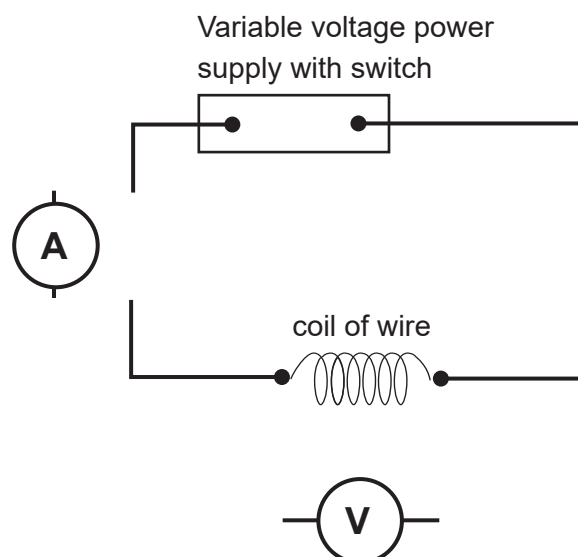
At the start, the output of the power supply should set to 1V and switched off.

At change over return the voltage to 1V and switch off. –

Remove the ammeter and voltmeter.

Place a warning notice beside the circuit stating

Caution: Do not touch the coil of wire it could be very hot.



Supervision of the Practical Skills Assessment

Up to 30 minutes collecting results, with the students working individually or collectively in a group of maximum size three.

Then 30 minutes with all students working individually under full examination conditions with a high level of control to complete the booklet.

