Cambridge
O Level

Cambridge International Examinations
Cambridge Ordinary Level

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER			

9644592130

PHYSICS **5054/32**

Paper 3 Practical Test **October/November 2016**

2 hours

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
For each of the questions in Section A, you will be allowed to work with the apparatus for a maximum of 20 minutes. For the question in Section B, you will be allowed to work with the apparatus for a maximum of 1 hour.

You are expected to record all your observations as soon as these observations are made.
An account of the method of carrying out the experiments is **not** required.

Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

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.

For Examiner's Use	
1	
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3	
4	
Total	

This document consists of **11** printed pages and **1** blank page.

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Answer **all** the questions in this section.

Section A

1 *In this experiment, you will determine a value for the focal length of a lens.*

You are provided with

- a converging lens,
- a small piece of Blu-Tack,
- a 30 cm ruler,
- two set squares.

(a) The Supervisor has provided you with either a lens A, that has two curved surfaces, or a lens B, that has one flat and one curved surface. Both lenses are shown in Fig. 1.1.

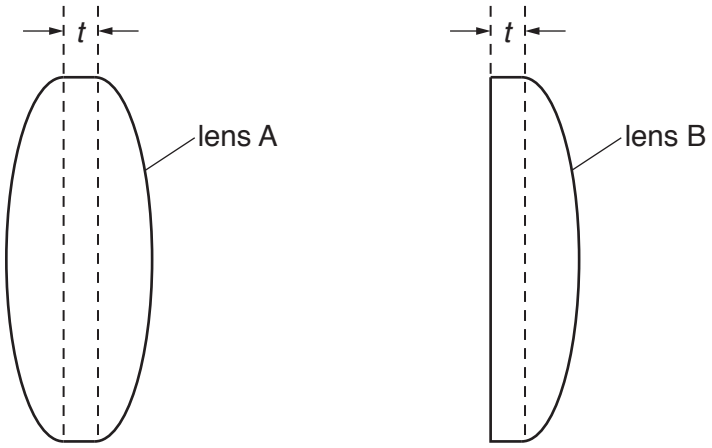


Fig. 1.1

Measure the thickness t of the lens at its edge. For some lenses t is very small. Give your answer to the nearest 0.5 mm.

t = ...[1]

(b) Place the lens on the ruler with a diameter of the lens along the edge of the ruler, as shown in Fig. 1.2.

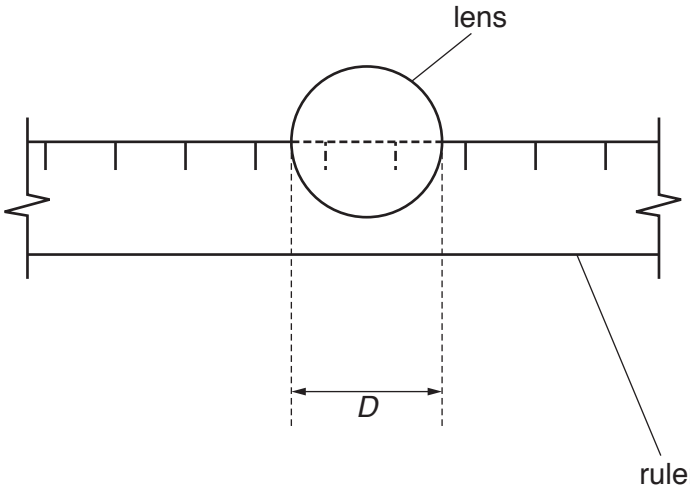


Fig. 1.2 (not to scale)

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(i) Take measurements to determine an average value for the diameter D of the lens.

$D =$ .....[1]

(ii) Describe, with the aid of a diagram in the space below, how you made sure that an accurate value was obtained for D.

.....

.....

.....[1]

(c) Using a **small** piece of Blu-Tack, stand the lens vertically on the ruler as shown in Fig. 1.3.

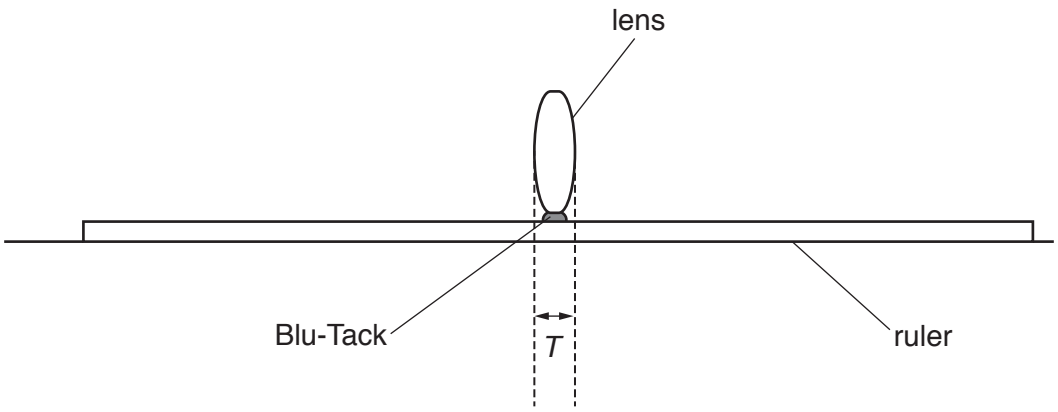


Fig. 1.3

(i) On Fig. 1.3 draw a diagram to show how to determine the thickness T of your lens at its centre using two set squares.

(ii) Determine T.

$T =$ .....
[1]

(d) Calculate the focal length f of the lens using

$$f = \frac{D^2}{4.2\,(T - t)}.$$

$f =$ .....[1]

2 *In this experiment, you will investigate the rotational motion of a spring.*

You are provided with

- a spring,
- a 150 mm plastic ruler,
- two pieces of Blu-Tack to hold the spring and ruler together,
- two small blocks of wood,
- a stand, boss and clamp to hold the blocks of wood,
- a separate piece of Blu-Tack,
- an optical pin in a cork,
- a stopwatch.

(a) The Supervisor has set up the apparatus as shown in Fig. 2.1.

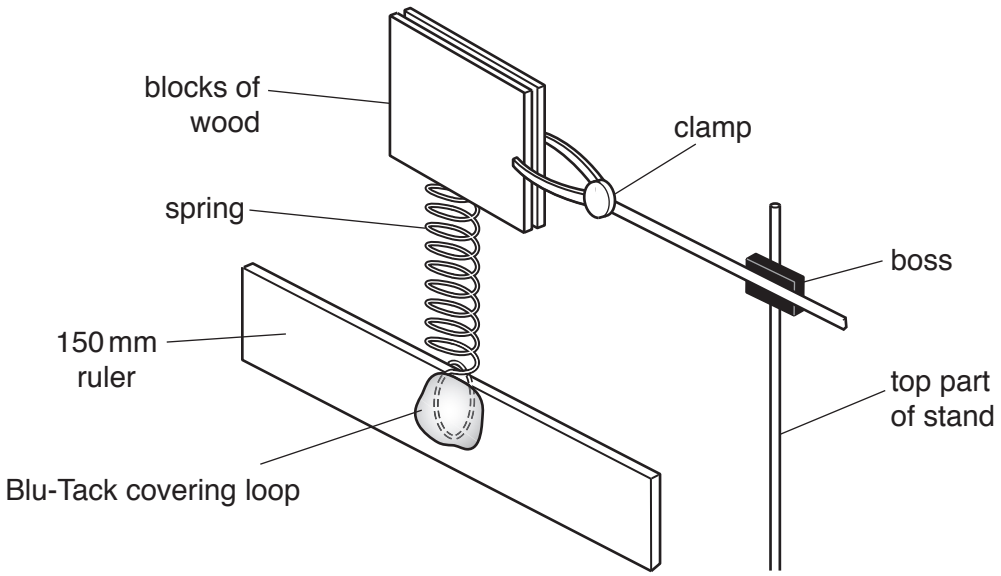


Fig. 2.1

Ensure that the ruler is approximately horizontal. Carefully rotate the ruler in a horizontal plane through an angle of approximately 90° as shown in Fig. 2.2, which is a view from above the apparatus.

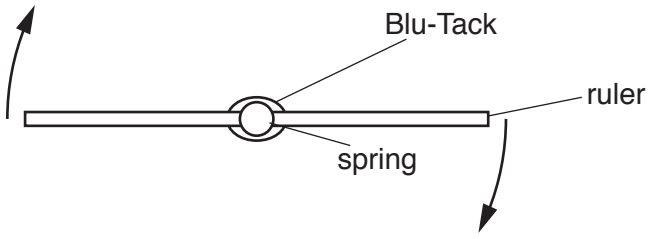


Fig. 2.2

The ruler should be rotated clockwise. Ensure that the spring remains vertical during this operation. Release the ruler.

Describe what happens to the amplitude of the motion during the first 10 oscillations.

.....

.....

.....

.....[1]

(b) One complete oscillation of the ruler occurs when the ruler moves from the extreme clockwise position, rotates and returns to the next extreme clockwise position.

(i) The time for 10 complete oscillations is t_1. Take measurements to determine an accurate value of t_1.

t_1 = ...

(ii) Calculate the time T_1 for one complete oscillation. Give your answer to a suitable number of significant figures.

T_1 = ...
[2]

(c) Attach the separate piece of Blu-Tack to the lower edge of the ruler directly below the spring. Repeat **(b) (i)** and **(b) (ii)** so that new values are obtained for the time t_2 for 10 oscillations and the time T_2 for one complete oscillation.

t_2 = ...

T_2 = ...
[1]

(d) Calculate $\frac{T_2}{T_1}$.

$\frac{T_2}{T_1}$ = ...[1]

3 *In this experiment, you will determine the resistance of a resistor* X.

You are provided with

- a power supply,
- a switch,
- a resistor labelled X,
- a 10 Ω resistor,
- a 22 Ω resistor,
- an ammeter,
- a voltmeter,
- connecting leads.

The Supervisor has set up the incomplete circuit shown in Fig. 3.1.

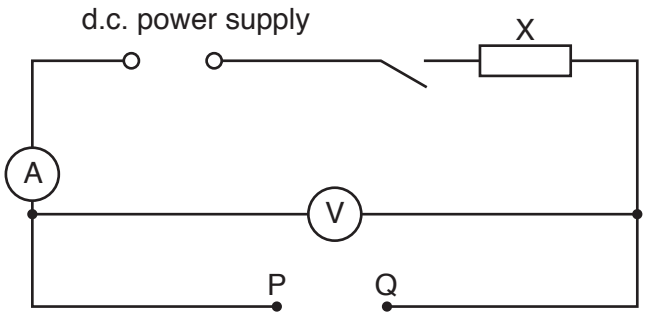


Fig. 3.1

(a) Connect the 10 Ω resistor between terminals P and Q. Close the switch. Record the voltmeter reading V_1, the ammeter reading I_1, and then open the switch.

V_1 = ...

I_1 = ...
[1]

(b) Remove the 10 Ω resistor from the circuit and replace it with the 22 Ω resistor. Close the switch. Record the voltmeter reading V_2, the ammeter reading I_2, and then open the switch.

V_2 = ...

I_2 = ...
[1]

(c) By changing the resistor between P and Q, the current in the circuit changes. State how a change in the current affects the voltmeter reading.

.....

.....

.....[1]

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(d) Calculate the resistance R of X using the equation

$$R = \frac{V_2 - V_1}{I_1 - I_2}.$$

R = ...[2]

Please turn over for Section B.

Section B

4 *In this experiment, you will investigate the equilibrium of a metre rule.*

You are provided with

- a pivot in the form of a thin rod,
- a stand labelled A, with a boss and a clamp to hold the pivot,
- a metre rule with holes at the 10.0 cm and 90.0 cm marks.

The Supervisor has set up these items as shown in Fig. 4.1.

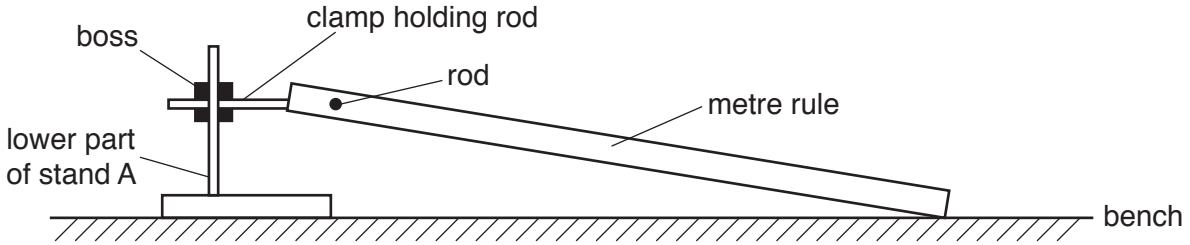


Fig. 4.1

You are also provided with

- a spring,
- a stand, labelled B, with a boss and a clamp to hold the spring,
- an S-hook,
- a loop of string,
- a mass labelled M,
- a 30 cm ruler,
- a set square.

(a) Measure the unstretched length *y* of the coiled part of the spring as shown in Fig. 4.2.

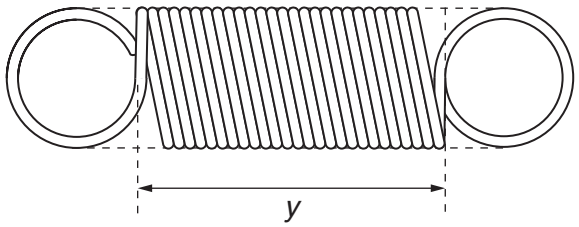


Fig. 4.2

y = ...[1]

(b) Set up the apparatus as shown in Fig. 4.3.

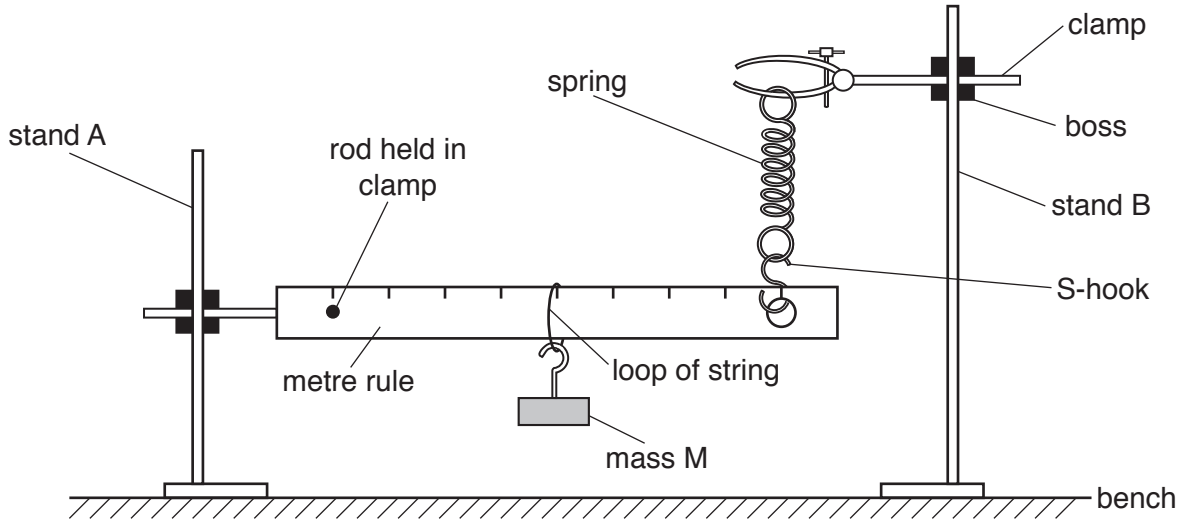


Fig. 4.3

Use the loop of string to suspend the mass M from the rule at the 50.0 cm mark. Pass the S-hook through the hole at the 90.0 cm mark. Use stand B to suspend the spring so that it supports the S-hook. Adjust the height of the boss on stand B so that the metre rule is horizontal.

(i) Record the distance x between the position of the pivot and the position of the loop of string.

x = ...

(ii) Measure the new length L of the coiled part of the spring. Hence determine the extension e of the spring using $e = L - y$.

L = ...

e = ...

(iii) Explain how you ensured that the metre rule was horizontal. You may draw on Fig. 4.3.

.....

.....

.....

.....

.....

[3]

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[Turn over

(c) By altering the position of the loop of string on the metre rule, repeat **(b) (i)** and **(b) (ii)** for a range of values of x. In each case the height of the boss on stand B should be adjusted to make the metre rule horizontal. Record your results for x, L and e in the table of Fig. 4.4. Include headings in your table and your results from **(b) (i)** and **(b) (ii)**.

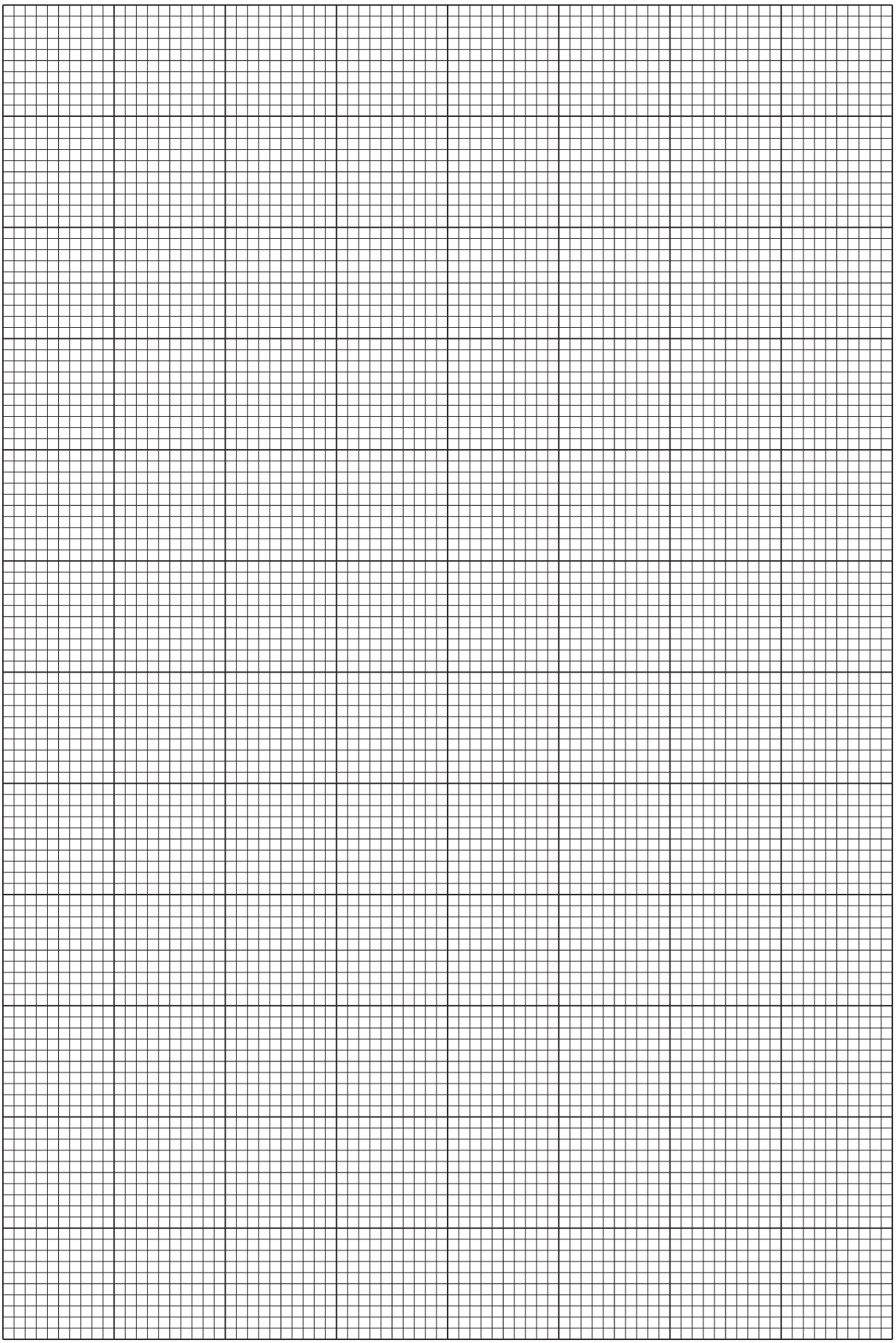
Fig. 4.4 [4]

(d) Using the grid opposite, plot a graph of e/cm (y-axis) against x/cm (x-axis). Draw the straight line of best fit. [4]

(e) Determine the gradient G of your graph. Give your answer to an appropriate number of significant figures.

G = ...[3]

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