UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

2780809571

PHYSICS **5054/32**

Paper 3 Practical Test **May/June 2013**

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 a pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, 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	
2	
3	
4	
Total	

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

DC (NF/JG) 73873

UNIVERSITY *of* CAMBRIDGE International Examinations

Section A

For Examiner's Use

Answer **all** questions in this section.

1 *In this experiment, you will make measurements on some glass slides in order to determine the density of the glass.*

You have been provided with

- a stack of glass slides,
- a single glass slide,
- a 30 cm ruler,
- a card which gives information about the **single** slide.

You also have access to a top-pan balance.

Do not remove any slides from the stack.

(a) Fig. 1.1 shows the stack of slides. Determine accurate values for the length l, the width w and the height h of the stack of slides.

Fig. 1.1

l = ...

w = ...

h = ...
[2]

(b) **(i)** Measure the mass M of the stack of slides.

M = ...

(ii) Calculate the density ρ of the stack of slides using the formula

$$\rho = \frac{M}{lwh}.$$

ρ = ...
[1]

For Examiner's Use

(c) The thickness *t* and the mass *m* of the single slide are written on the card.

(i) Write down the values of *t* and *m* that are on the card.

t = ...

m = ...

(ii) Estimate the number of slides in the stack by two methods.

1. ....

....

2. ....

....
[1]

(iii) Comment on the values obtained in **(ii)**. Explain your answer.

....

....

....[1]

[Total: 5]

2 *In this experiment, you will investigate the reflection of light by a plane mirror.*

You have been provided with
- a plane mirror in a holder,
- an illuminated slit,
- a protractor.

(a) Fig. 2.2 is on page 5 of your question paper. On Fig. 2.2,

(i) draw a normal to the line XY at the point M and below the line XY,

(ii) draw a line from M at an angle of 40° to the normal, towards the bottom left-hand side of the page. Label this line L.

[1]

(b) (i) Place the front surface of the mirror along the line XY with the reflective surface facing the bottom of the page. Position the light source and slit so that a ray of light passes along the line L towards M.

(ii) Mark two points on the reflected ray. Choose the points so that the reflected ray can be drawn as accurately as possible. Label the points P_1 and P_2.

[1]

(c) (i) Remove the mirror. Draw a line through P_1 and P_2 that extends above XY. Label this line R_1.

(ii) On Fig. 2.2, draw a line through M at an angle of 20° to the line XY, as shown in Fig. 2.1. Place the front of the mirror along this new line with the reflective surface facing the bottom of the page. Again position the light source and slit so that a ray of light passes along line L towards M.

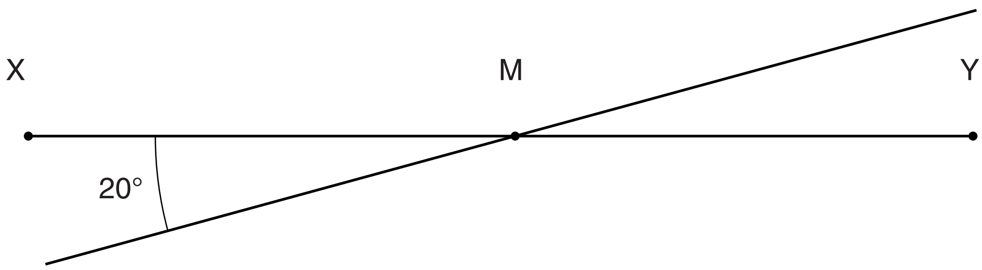

Fig. 2.1

(iii) On Fig. 2.2, mark two points on the ray reflected from the mirror in its new position. Label these points P_3 and P_4.

(iv) Draw a line through P_3 and P_4 that meets the line R_1. Label this line R_2.

(v) Measure the angle θ between the lines R_1 and R_2.

θ = ...

[3]

[Total: 5]

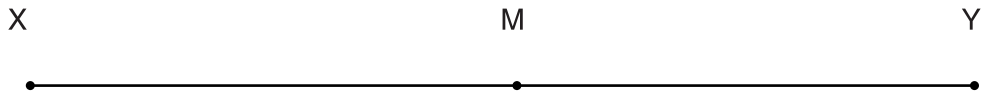

Fig. 2.2

3 *In this experiment, you will investigate the charging of a capacitor.*

For Examiner's Use

You have been provided with a circuit consisting of

- a power supply,
- a resistor,
- a capacitor,
- a switch,
- a voltmeter.

You have also been provided with a stopwatch.

Do not disconnect any components in the circuit, or adjust the power supply.

(a) In the space below, draw a circuit diagram of the circuit.

[2]

(b) (i) Close the switch to discharge the capacitor. Record the reading V_0 on the voltmeter.

V_0 = ...

(ii) Calculate $\frac{V_0}{2}$.

$\frac{V_0}{2}$ = ...
[1]

For Examiner's Use

(c) Open the switch and start the stopwatch. Stop the stopwatch when the reading on the voltmeter is $\frac{V_0}{2}$. Close the switch.

Determine the **average** time *t* taken for the reading on the voltmeter to fall to $\frac{V_0}{2}$.

t = ... [2]

[Total: 5]

For Examiner's Use

Section B

4 *In this experiment, you will investigate the equilibrium of a mass suspended by two springs.*

You have been provided with

- a rod to which two springs are attached,
- a stand, boss and clamp to hold the rod,
- a spring identical to the other springs,
- a 100 g mass hanger and five 100 g slotted masses,
- a 30 cm ruler.

(a) Fig. 4.1 shows the single spring.

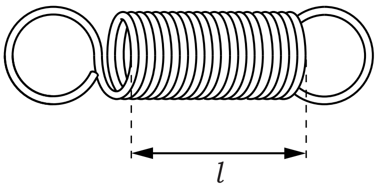

Fig. 4.1

Measure the length l of the unstretched coil of the spring, as shown in Fig. 4.1.

l = ... [1]

(b) The two-spring system has been set up as shown in Fig. 4.2.

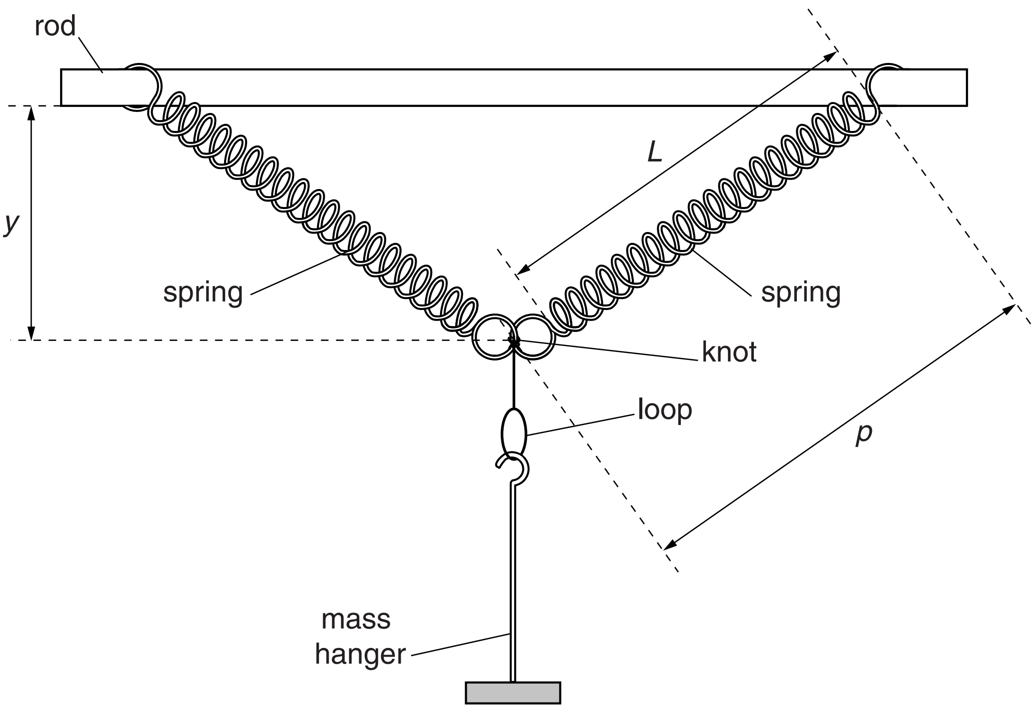

Fig. 4.2

For Examiner's Use

Three distances y, p and L are shown on Fig. 4.2.

Measure

(i) the vertical distance y from the knot to the bottom of the rod,

y = ...

(ii) the distance p from the knot to the point where the right-hand spring touches the bottom of the rod,

p = ...

(iii) the stretched length L of the coil of the right-hand spring.

L = ...
[2]

(c) Determine

(i) the extension x of the spring, using the formula

$$x = L - l$$

x = ...

(ii) the vertical force F produced by the right-hand spring, using the formula

$$F = \frac{kxy}{p}$$

where k = 0.25 N/cm, and x, y and p are measured in cm.

F = ...
[2]

For Examiner's Use

(d) Repeat **(b)** and **(c)** for a range of slotted masses added to the mass hanger. Record in a table the total mass *M* suspended from the two-spring system and values for *y*, *p*, *L*, *x* and *F*. Also include your results from **(b)** and **(c)**.

[4]

(e) Using the grid opposite, plot a graph of *F* / N against *M* / g. Draw a straight line of best fit through your points. [4]

(f) Determine the gradient of your line.

gradient = ... [2]

For Examiner's Use

[Total: 15]

BLANK PAGE