Name: **Register Number:** **Class:**

南僑中學

NAN CHIAU HIGH SCHOOL
PRELIMINARY EXAMINATION 2022
SECONDARY FOUR EXPRESS

PHYSICS **6091/03**

Paper 3 Practical **5 Aug 2022, Friday**

Students answer on the Question Paper. **1 hour 50 minutes**

READ THESE INSTRUCTIONS FIRST

Write your name, register number and class on all the work you hand in.
Circle the practical shift and laboratory where appropriate, in the boxes.
Write your answers in the spaces provided on the Question Paper.

For the two questions in Section A and one question in Section B, you will be allowed to work with the apparatus for a maximum of 55 minutes before handover.
You are expected to record all your observations as soon as these observations are made.

The use of an approved scientific calculator is expected, where appropriate.
You may lose marks if you do not show your working or if you do not use appropriate decimal places, significant figures or units for numerical answers.

The number of marks is given in brackets [ ] at the end of each question or part question.
Take g to be 10 N/kg.

For Examiner's Use	
1	/10
2	/10
3	/20
Total	/40

This paper consists of **10** printed pages including the cover page.

1 You are to determine the specific heat capacity of oil.
You are provided with

- a thermometer,
- a resistance heater
- a d.c. power supply,
- an ammeter,
- a voltmeter,
- a switch,
- a beaker with oil,
- a stopwatch.

(a) On **Fig. 1.1**, complete the circuit diagram to connect the heater correctly to the power supply, the ammeter and the voltmeter. [2]

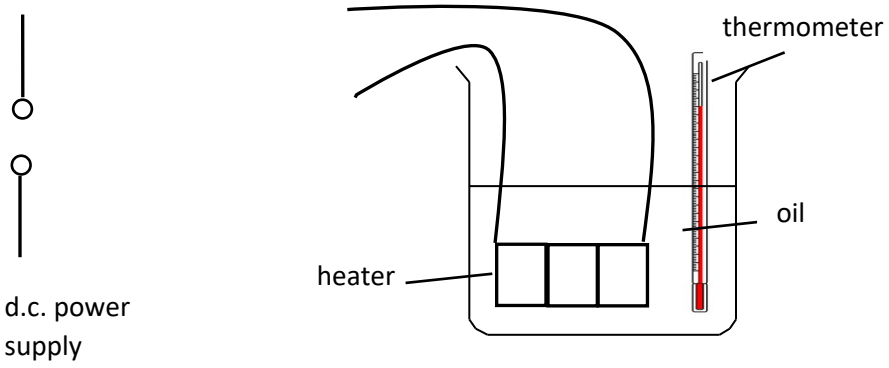

Fig. 1.1

(b) Initially the oil is at room temperature. Record the room temperature θ_i.

θ_i = ...

(c) Close the switch of the circuit and start the stopwatch at the same instant. Record the current, I and the potential difference of heater, V. [2]

I = ...

V = ...

(d) Open the switch after 5 minutes. Record the *highest* temperature reached *after the switch is opened*.

θ_f = ...

(e) Calculate the electrical energy E used to heat up the oil. [2]

E = ...

(f) The specific heat capacity *c* of the oil is given by

$c = IVt/m\Delta\theta$

where *t* is the time taken when the heater is switched on, m is 0.035 kg.

Calculate the specific heat capacity c of the oil. Give the appropriate unit.

c = ... [2]

(g) The value of c calculated is different from its true value.
Suggest two reasons why this is so. [2]

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2. .....

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2. In this experiment, you will determine the focal length of a converging lens.

You are provided with

- a converging lens,
- a cross-wire object,
- a lens holder,
- a light source,
- a screen,
- a metre rule,
- a set square.

(a) Set up the apparatus as shown in **Fig. 2.1**.

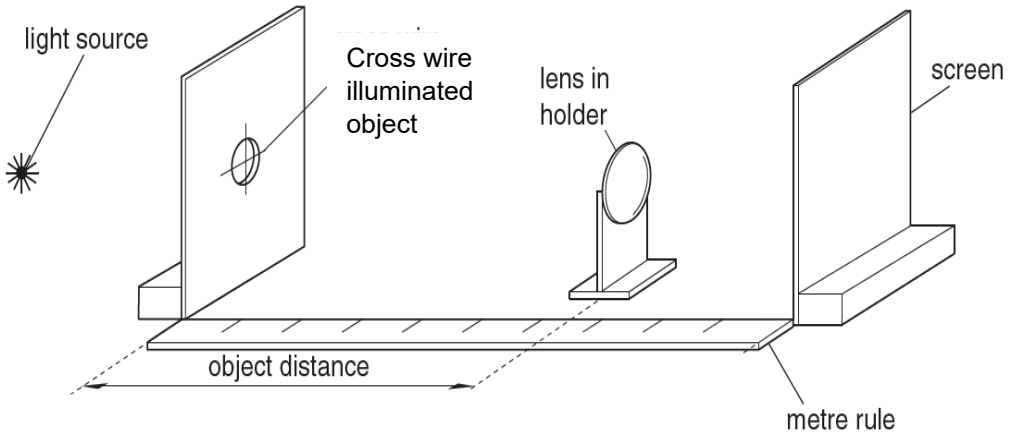

Fig. 2.1

Place the lens in between the cross wire illuminated object and the screen as shown in Fig. 2.1. Move the screen and lens until a sharp image of the object is formed on the screen.

(b) **(i)** Determine the distance u_1 from the object to the lens and the distance v_1 from the image to the lens to obtain a sharp image *smaller* than the object.

u_1 = ...cm

v_1 = ...cm [1]

(ii) Move the lens and screen until another sharp image of the object that is *larger* than the object is formed on the screen. Determine the object distance u_2 and image distance v_2.

u_2 = ...cm

v_2 = ...cm [1]

(c) **Using values from (b)i or (b)ii,** calculate the focal length *f* of the lens, show your workings clearly. [1]

f = (uv)/(u+v)

f = ...cm

(d) State **one** precaution that you should take to obtain an accurate value for the *object distance, u of the* lens. [1]

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(e) A suggested relationship between image distance v and object distance u with f as the focal length is as follows:

1/v = 1/f – 1/u

Using the same apparatus as in **Fig. 2.1** plan an experiment to investigate how the object distance, u affects the image distance, v.

Your plan should include

- the quantities that you should keep constant,
- a detailed description of how you will perform the experiment,
- a suitable table to display your data,
- a sketch of the graph,
- how you would obtain the focal length. [6]

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3 In this experiment, you will investigate an electrical potential divider.
You are provided with

- a metre ruler with wire,
- crocodile clips,
- a d.c. power supply,
- eight resistors (Resistor P & Q and six other different labelled resistors),
- a switch,
- a voltmeter,

Set up the electrical circuit shown in **Fig. 3.1.**

(a) Connect the resistor with the lowest labelled resistance as shown.

(i) Record the length of the resistance wire.

L = ... m

(ii) Record the lowest resistance R of the labelled resistor.

R =..... Ω

(iii) Close the switch. Adjust the position of B on the wire until the voltmeter reading is *as close to zero* as possible.

The distance between A and B is y, as shown in **Fig. 3.1**. Measure and record y.

y = ...m [2]

Open the switch.

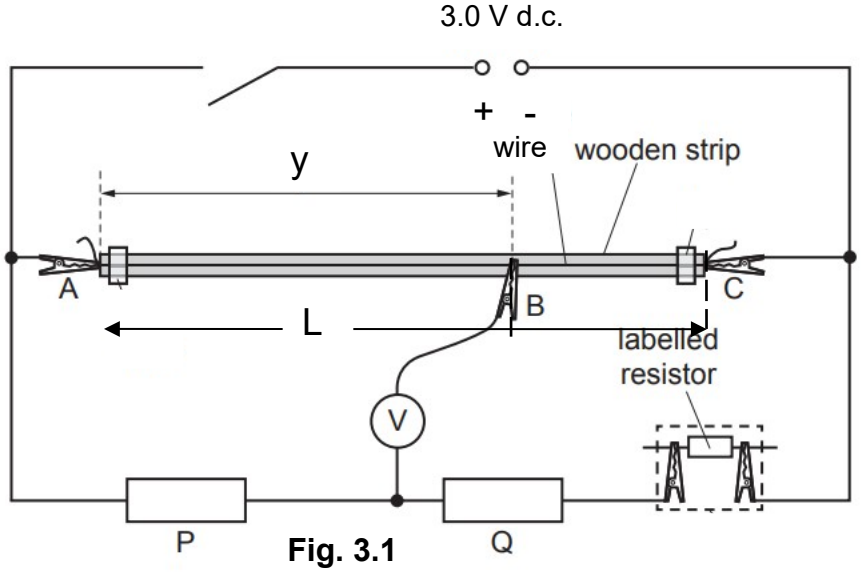

Fig. 3.1

(b) Change the labelled resistor and repeat the steps in **aiii**. Repeat until you have different sets of values of R in ohms and y in metres. Record the various values of R, y and L/y in a table. [4]

(c) **(i)** Using the graph paper on page 9, plot a graph of $\frac{L}{y}$ against R. [5]

(ii) Determine the gradient and y-intercept of this line. [2]

(iii) Based on your graph, state the relationship of $\frac{L}{y}$ against R**.** [1]

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(d) It is suggested that the quantities $\frac{L}{y}$ and R are related by the equation

$\frac{L}{y} = 1 + \frac{Q}{P} + \frac{R}{P}$ where P and Q are constants. Use your answers in (b)(ii) to determine the constants P and Q. [2]

No setting of circuit is required to answer part (e) to (g).

(e) P is changed to a diode. Draw the symbol of the diode in a forward bias mode in the dotted box provided in Fig. 3.2. [1]

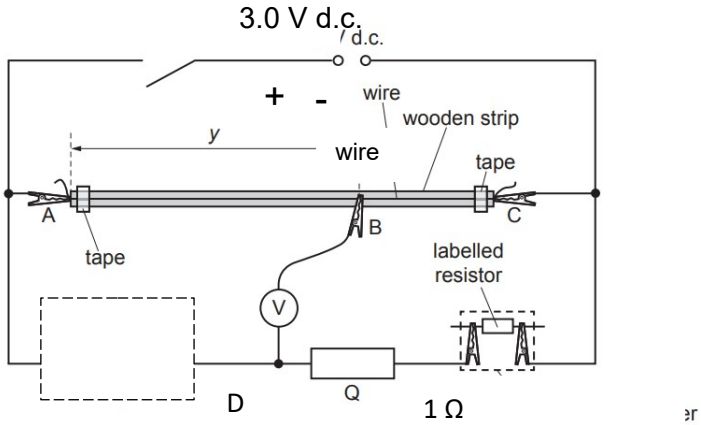

Fig. 3.2

(f) The battery is 3.0 V. The forward bias of the diode is 0.20 V and voltmeter reading is zero in Fig. 3.2. Calculate the length of y. [2]

(g) State a possible source of error in the above setup. [1]

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- End of Paper -