CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION

17 JANUARY 2020 (p.m.)

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FILL IN ALL THE INFORMATION REQUESTED CLEARLY IN CAPITAL LETTERS.

TEST CODE | 0 | 1 | 2 | 3 | 8 | 0 | 3 | 2 |

SUBJECT PHYSICS – Paper 032

305

PROFICIENCY GENERAL

REGISTRATION NUMBER | | | | | | | | | | |

SCHOOL/CENTRE NUMBER					

NAME OF SCHOOL/CENTRE

A001

CANDIDATE'S FULL NAME (FIRST, MIDDLE, LAST)

DATE OF BIRTH | D | D | M | M | Y | Y | Y | Y |

SIGNATURE _____

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FORM TP 2020026

TEST CODE 01238032

JANUARY 2020

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION

PHYSICS

Paper 032 – General Proficiency

Alternative To School-Based Assessment

2 hours 10 minutes

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This paper consists of THREE questions. Answer ALL questions.
2. Write your answers in the spaces provided in this booklet.
3. Do NOT write in the margins.
4. Where appropriate, ALL WORKING MUST BE SHOWN in this booklet.
5. You may use a silent, non-programmable calculator to answer questions, but you should note that the use of an inappropriate number of figures in answers will be penalized.
6. If you need to rewrite any answer and there is not enough space to do so on the original page, you must use the extra lined page(s) provided at the back of this booklet. **Remember to draw a line through your original answer.**
7. **If you use the extra page(s) you MUST write the question number clearly in the box provided at the top of the extra page(s) and, where relevant, include the question part beside the answer.**

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

NOTHING HAS BEEN OMITTED.

GO ON TO THE NEXT PAGE

Answer ALL questions.

1. You are required to determine the focal length, f, of a converging lens by investigating how the image distance, v, varies with the object distance, u. Use the apparatus listed below.

APPARATUS AND MATERIALS

- 12 V light bulb source
- Converging lens
- Lens holder
- Metre rule
- Screen
- Object

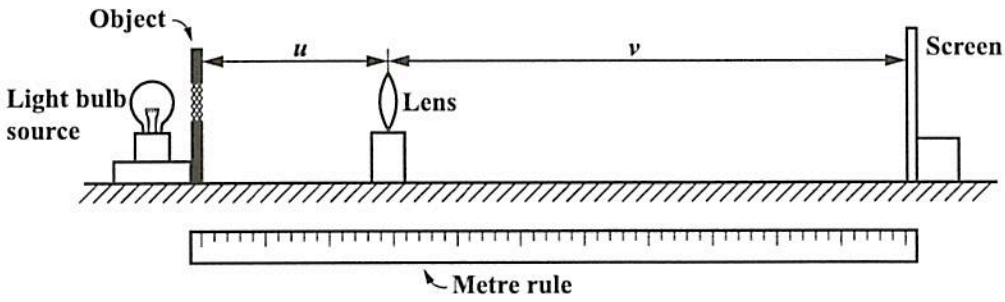

Figure 1. Set up of apparatus

PROCEDURE

1. Set up the apparatus as shown in Figure 1.

2. Place the converging lens so that its centre is 20.0 cm from the illuminated object, that is, $u = 20.0$ cm.

3. Start the screen close to the lens, then move it away from the lens until a sharply focused image of the object is seen on the screen.

4. Measure the image distance, v (cm), from the centre of the lens to the screen, to 1 decimal place.

5. Record the value of v in Table 1 **on page 6**.

6. Repeat Steps 2 to 5, using the remaining values of u from Table 1 to determine the corresponding values of v.

GO ON TO THE NEXT PAGE

(a) Complete Table 1.

TABLE 1: IMAGE DISTANCE AND OBJECT DISTANCE

Object Distance *u*/cm	**Image Distance *v*/cm**
20.0	
21.5	
24.0	
30.0	
40.0	
50.0	
60.0	

(4 marks)

(b) Using the grid provided **on page 7,** plot a graph of image distance, *v*/cm, against object distance, *u*/cm. Draw the best smooth curve through the points. **(7 marks)**

(c) (i) Mark on your graph the points (0.0, 0.0) and (60.0, 60.0). Draw the straight line to join the points. **(2 marks)**

(ii) Read off the x value of the point where the straight line cuts the curve. Record this value as S. **(1 mark)**

S = ... cm.

(iii) Use the value of S in (c) (ii) to calculate the focal length of the lens, f, given that $f = \frac{S}{2}$.

(2 marks)

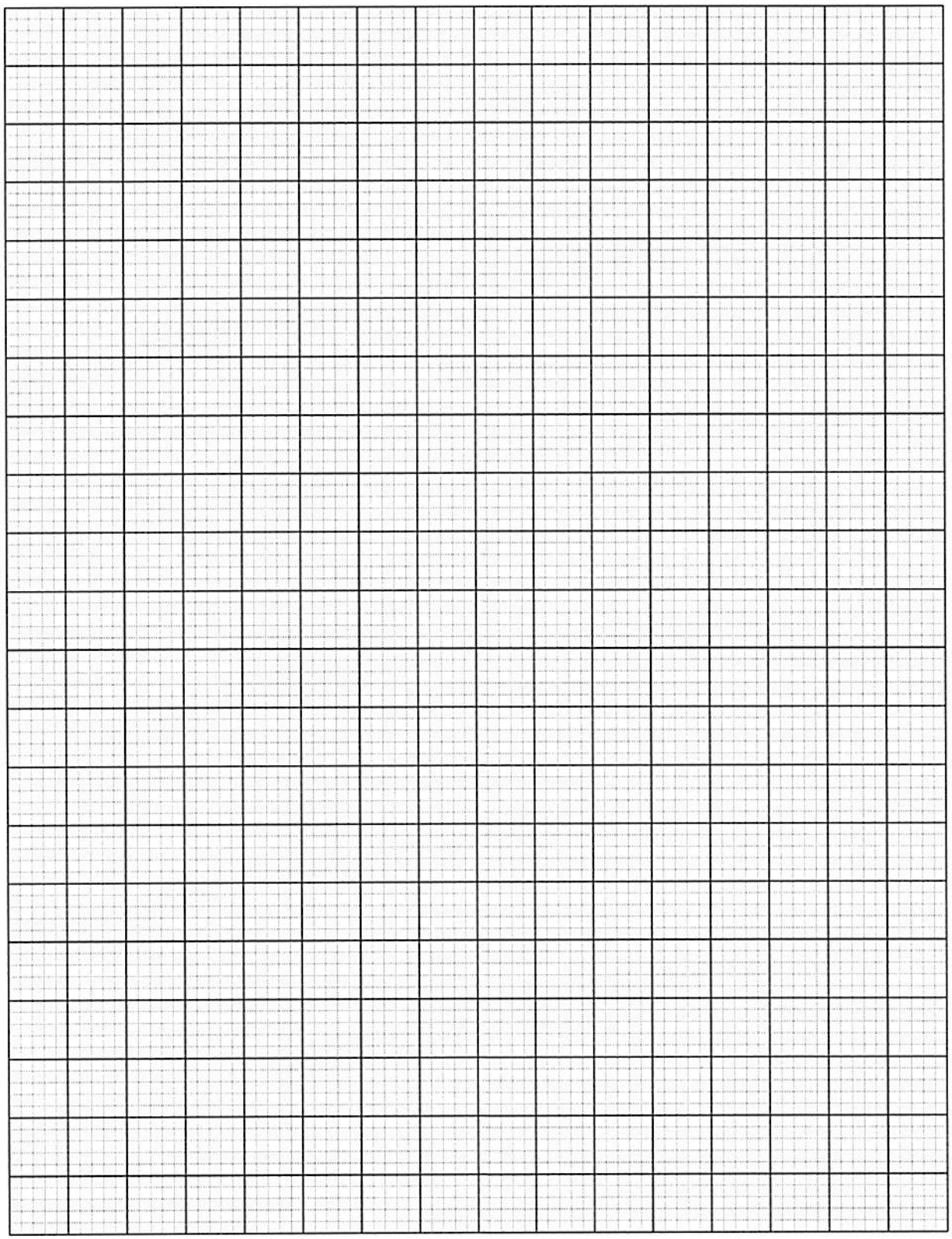

Figure 2. Graph of image distance, *v*/cm, versus object distance, *u*/cm

(d) Identify TWO sources of error which could affect the accuracy of the values obtained for the image distance, v.

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(2 marks)

(e) Choose any corresponding values of object distance, u, and image distance, v, from Table 1 in (a) and use these values to calculate the focal length, f. Use the equation $f = \frac{uv}{u+v}$.

(3 marks)

Total 21 marks

GO ON TO THE NEXT PAGE

2. The apparatus in Figure 3 was used to investigate the relationship between pressure and volume for a fixed mass of gas.

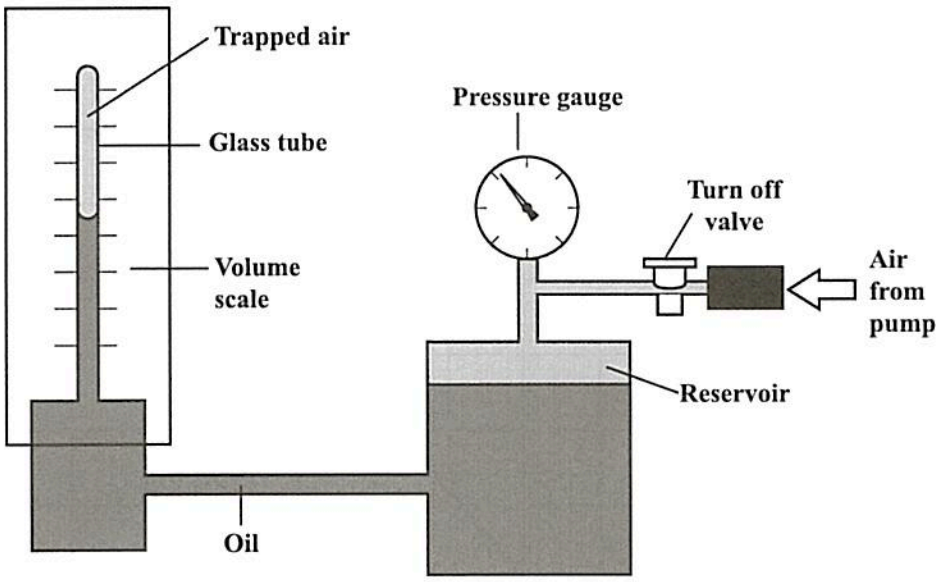

Figure 3. Apparatus to investigate the relationship between pressure and volume for a fixed mass of gas

(a) Outline the procedure used to obtain the results.

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(4 marks)

(b) Figure 4 shows a graph of the results obtained in the experiment.

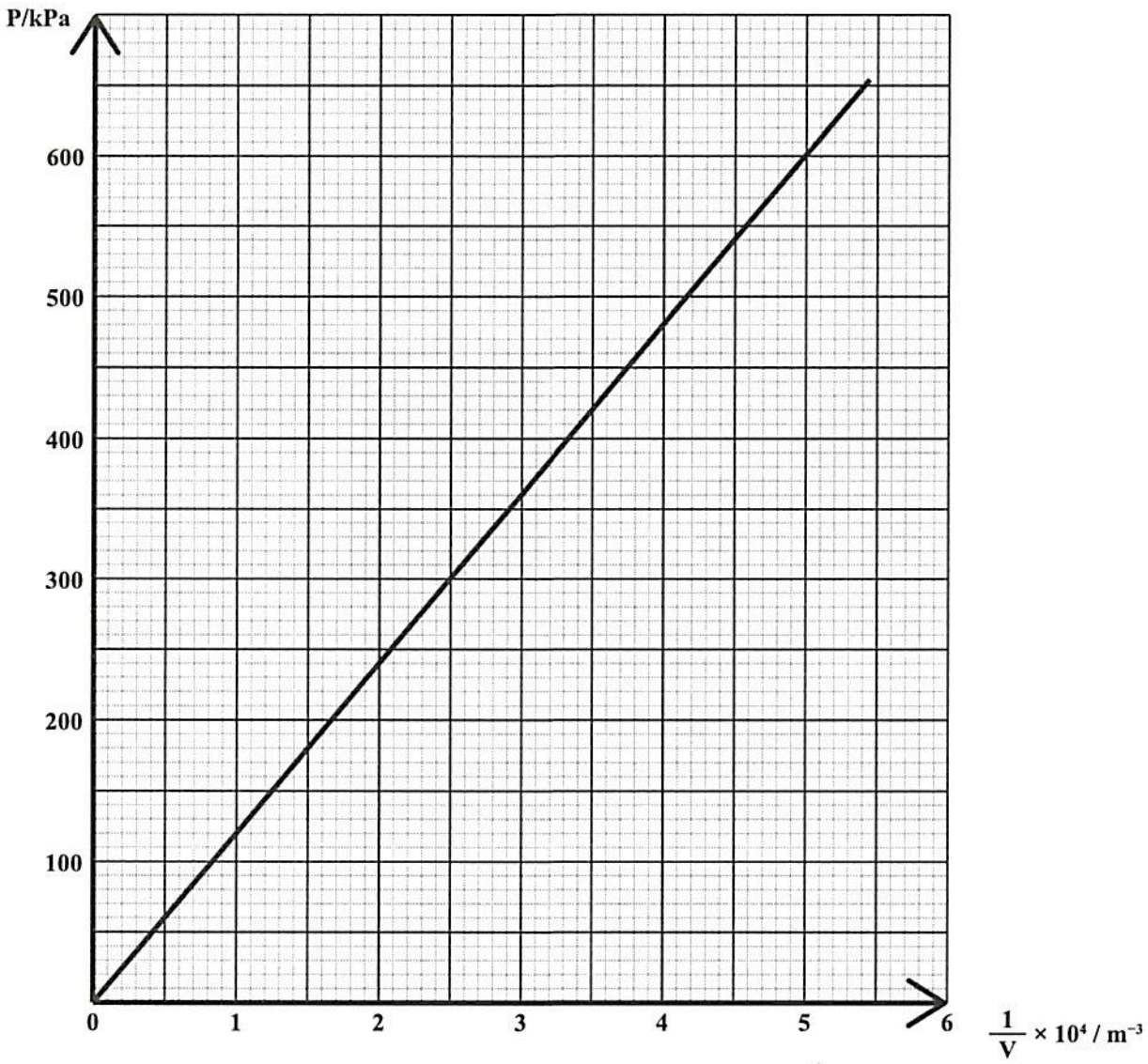

Figure 4. Graph of pressure, P/kPa, versus 1/volume, $\frac{1}{V} \times 10^4 / m^{-3}$

Using the graph **on page 10**, complete Table 2 which shows results obtained in the experiment.

TABLE 2: RESULTS OBTAINED IN EXPERIMENT

Volume (m^3)	Pressure (kPa)	1/Volume (m^{-3})
6.7×10^{-5}		1.5×10^4
5.0×10^{-5}	240	2.0×10^4
4.0×10^{-5}	300	
		3.0×10^4
2.5×10^{-5}	480	4.0×10^4
2.0×10^{-5}		5.0×10^4

(5 marks)

(c) Calculate the slope, *S*, of the graph.

(4 marks)

(d) How do the results verify Boyle's law?

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(2 marks)

(e) State TWO precautions that should be taken in the experiment.

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(2 marks)

Total 17 marks

3. In a class discussion on thermal conductivity, a student hypothesizes that lead is a better conductor of heat than aluminium. Design an experiment using the equipment available in a typical Physics laboratory to test the student's hypothesis.

Your answer should include the following:

(a) Apparatus

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(3 marks)

(b) Method

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(3 marks)

(c) ONE safety precaution which should be taken

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(1 mark)

(d) An explanation of the expected results of the experiment and the conclusion which could be reached to accept or reject the student's hypothesis

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(3 marks)

Total 10 marks

END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

EXTRA SPACE

If you use this extra page, you MUST write the question number clearly in the box provided.

Question No. ☐

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Question No. ☐

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CANDIDATE'S RECEIPT

INSTRUCTIONS TO CANDIDATE:

1. **Fill in all the information requested clearly in capital letters.**

TEST CODE: | 0 | 1 | 2 | 3 | 8 | 0 | 3 | 2 |

SUBJECT: PHYSICS – Paper 032

PROFICIENCY: GENERAL

REGISTRATION NUMBER: | | | | | | | | | | |

FULL NAME: _____

(BLOCK LETTERS)

Signature: _____

Date: _____

2. **Ensure that this slip is detached by the Supervisor or Invigilator and given to you when you hand in this booklet.**

3. **Keep it in a safe place until you have received your results.**

INSTRUCTION TO SUPERVISOR/INVIGILATOR:

Sign the declaration below, detach this slip and hand it to the candidate as his/her receipt for this booklet collected by you.

I hereby acknowledge receipt of the candidate's booklet for the examination stated above.

Signature: _____
Supervisor/Invigilator

Date: _____