FORM TP 2016100

TEST CODE **01238020**

MAY/JUNE 2016

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION

PHYSICS

Paper 02 – General Proficiency

2 hours 30 minutes

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This paper consists of TWO sections: A and B.
2. Section A consists of THREE questions. Candidates must attempt ALL questions in this section.
3. Section B consists of THREE questions. Candidates must attempt ALL questions in this section.
4. ALL answers MUST be written in this answer booklet.
5. All working MUST be clearly shown.
6. Do NOT write in the margins.
7. You may use a silent, non-programmable calculator, but you should note that the use of an inappropriate number of figures in answers will be penalized.
8. Mathematical tables are provided.
9. 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.**
10. **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.

Copyright © 2015 Caribbean Examinations Council
All rights reserved.

"*"Barcode Area"*"
Sequential Bar Code

SECTION A

Answer ALL questions.

1. The activity of a radioactive sample was measured over a six-hour period. The results are recorded in Table 1.

TABLE 1

Time (*t*) in hours	**Activity *(A)* Disintegrations per second**
0	80.0
1	50.0
2	34.5
3	20.0
4	13.0
5	7.5
6	5.0

(a) Using the grid **on page 5**, plot a graph of Activity (*A*) versus Time (*t*). **(8 marks)**

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

"*"Barcode Area"*"
Sequential Bar Code

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

GO ON TO THE NEXT PAGE

“*”Barcode Area”*”
Sequential Bar Code

(b) (i) From your graph, determine the half-life of the sample.

.....

.....

.....

.....

.....

.....

(5 marks)

(ii) Using your graph, determine a more accurate value of the half-life of the sample.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(6 marks)

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

“*”Barcode Area”*”
Sequential Bar Code

(c) From your graph, and using dotted lines, determine how long it takes for the activity of the sample to be reduced to 10 disintegrations per second, from its original activity level.

.....

.....

.....

.....

(2 marks)

(d) State ONE reason why a line drawn through all the points would not form a perfectly smooth curve.

.....

.....

.....

.....

(1 mark)

(e) All elements including radioactive substances have an 'atomic number' and 'mass number'. Explain what the two terms mean.

Atomic number: .....

.....

Mass number: .....

.....

(2 marks)

(f) In medicine, Iodine–123, $\left({}^{123}_{53}\mathrm{I}\right)$ is used to check a patient's thyroid function. What does '123' represent?

.....

.....

.....

(1 mark)

Total 25 marks

"*"Barcode Area"*"
Sequential Bar Code

DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA

2. (a) Complete the bubbles in Figure 1 by inserting the SI unit which matches EACH of the physical quantities.

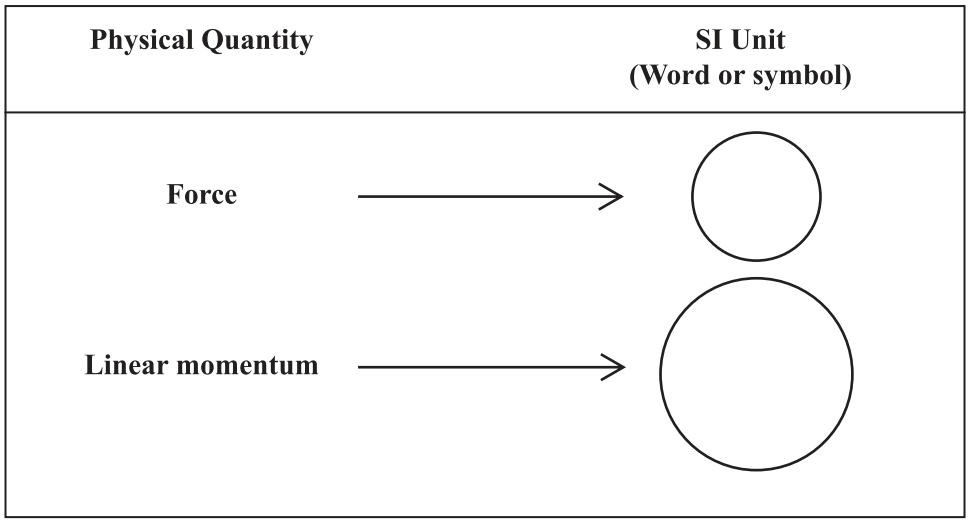


Figure 1

(2 marks)

(b) (i) State Newton's third law of motion.

.....

.....

.....

(3 marks)

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

"*"Barcode Area"*"
Sequential Bar Code

(ii) A Caribbean airplane on its way from the Piarco International Airport to the Grantley Adams International Airport flies horizontally in mid-flight.

With the aid of a diagram, and using Newton's third law of motion, explain how this happens.

.....

.....

.....

.....

.....

.....

(4 marks)

DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA

"*"Barcode Area"*"
Sequential Bar Code

(c) (i) Define the term 'linear momentum'.

.....

.....

(2 marks)

(ii) An 8 kg ball travelling to the east at 10 ms^{-1}, collides with a 2 kg ball travelling to the west with a velocity of 5 ms^{-1}. After the collision, they move together.

Determine the final velocity of the balls. **Assume that there are no resistive forces.**

.....

.....

.....

.....

.....

.....

.....

.....

(4 marks)

Total 15 marks

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

"*"Barcode Area"*"
Sequential Bar Code

DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA

3. (a) State, in words, the quantity EACH symbol represents in the equation $E_H = mc\Delta\theta$. State the SI unit of EACH quantity as well.

E_H: .....

.....

c: .....

.....

$\Delta\theta$: .....

.....

(6 marks)

(b) What does the symbol '*l*' in the equation $E_H = ml$ represent?

.....

.....

(1 mark)

(c) In an experiment to determine the specific latent heat of fusion of ice using a container with negligible heat capacity, a student obtained the following data:

Initial temperature of water = 30 °C
Final temperature of water + melted ice = 20 °C
Initial mass of water = 100 g
Final mass of water plus melted ice = 110 g

(i) Calculate the heat lost by the water.

(3 marks)

"*"Barcode Area"*"
Sequential Bar Code

(ii) Calculate the heat gained by the melted ice.

(2 marks)

(iii) Assuming the heat lost by the water is equal to the heat gained by the ice, calculate the specific latent heat of fusion of ice.

(3 marks)

[Specific heat capacity of water = 4.2 $Jg^{-1}K^{-1}$]

Total 15 marks

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

“*”Barcode Area”*”
Sequential Bar Code

SECTION B

Answer ALL questions.

4. (a) List THREE types of electromagnetic waves in order of increasing wavelength. Identify a use of EACH type of wave.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(6 marks)

DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA

"*"Barcode Area"*"
Sequential Bar Code

(b) Humans can 'see' electromagnetic radiation only between the wavelengths of about 4×10^{-7} m and 7×10^{-7} m. This is called the visible part of the spectrum.

A rattlesnake can detect e.m. radiation of frequency 3.5×10^{14} Hz and a honeybee can detect e.m. radiation of 1×10^{15} Hz.

Calculate the wavelengths corresponding to EACH frequency.

(5 marks)

(c) Thunder is heard 2.3 seconds after a flash of lightning is seen. If the lightening strike is 750 m away, calculate the speed for this event.

(4 marks)

[Speed of light, $c = 3 \times 10^8$ ms^{-1}]

Total 15 marks

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

"*"Barcode Area"*"
Sequential Bar Code

DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA

5. (a) (i) How does the electric current in a metal differ from that in an electrolyte? Compare EACH with 'conventional current'.

.....

.....

.....

.....

.....

.....

.....

.....

(4 marks)

(ii) State which of these two media (metal and electrolyte) has similar current flow to that in a semiconductor. Give a reason for your answer.

.....

.....

.....

.....

(2 marks)

"*"Barcode Area"*"
Sequential Bar Code

(b) The makers of a popular cellphone have upgraded its battery capacity from 4320 C to 9000 C.

(i) If the standard charger can deliver a current of 0.6A, how much more time will it take to charge the new battery than the old battery?

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(7 marks)

(ii) In order to maintain a competitive edge, the cellphone maker needs to keep the same charging time for the new model the same as the old model. What must be the current rating on a new charger to accomplish this?

.....

.....

.....

.....

(2 marks)

Total 15 marks

GO ON TO THE NEXT PAGE

"*"Barcode Area"*"
Sequential Bar Code

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

6. (a) A student was given a sample of candle wax in a test tube located in a water bath. She was asked to demonstrate that temperature remains constant during a phase change.

Describe the procedure she should use.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(6 marks)

DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA DO NOT WRITE IN THIS AREA

“*”Barcode Area”*”
Sequential Bar Code

(b) In Dominica, hydroelectricity is used to supply energy on a large scale.

(i) Describe how electricity is generated using the process of hydroelectricity.

.....

.....

.....

.....

.....

.....

(3 marks)

(ii) Discuss the rationale for the application of hydroelectricity as a viable alternative energy source in Dominica.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(6 marks)

Total 15 marks

END OF TEST

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

"*"Barcode Area"*"
Sequential Bar Code

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA