FORM TP 2014100

TEST CODE 01238020

MAY/JUNE 2014

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. Do NOT write in the margins.
4. Section B consists of THREE questions. Candidates must attempt ALL questions in this section.
5. All answers MUST be written in this answer booklet.
6. All working MUST be CLEARLY shown.
7. The use of silent, non-programmable calculators is permitted, but candidates 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 re-write any answer and there is not enough space to do so on the original page, you must request extra lined pages from the invigilator. **Remember to draw a line through your original answer and correctly number your new answer in the box provided.**
10. **If you use extra pages you MUST write your registration number and question number clearly in the boxes provided at the top of EVERY extra page.**

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

SECTION A

Answer ALL questions.

You MUST write your answers in this answer booklet.

1. A Form Four class was given a School-Based Assessment activity on the change of phase of a substance while it is cooling. The class presented the results shown in Table 1.

TABLE 1

Temperature, θ/°C	90.0	74.5	70.0	70.0	70.0	70.0	65.0	57.5
Time, t/mins	0.0	5.0	10.0	15.0	20.0	25.0	30.0	35.0
Point on graph	A		B			C		D

(a) Plot, on page 3, a graph of Temperature (θ/°C) versus Time (t/mins). Begin both axes at the origin and insert the letters A, B, C and D on the graph. **(7 marks)**

(b) Using a dotted line on the graph, determine the melting point of the substance that was heated.

(2 marks)

(c) (i) In what state is the substance as it moves between points B and C?

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(1 mark)

(ii) Explain why the temperature was constant between B and C.

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(1 mark)

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(d) (i) State the phase of the substance at C.

(1 mark)

(ii) Describe what is happening to the substance between C and D.

(1 mark)

(e) If 15 g of the substance was cooled from 90.0°C to 57.5°C, calculate the heat, in kilojoules, which was lost in this activity.

[Specific Heat Capacity of Substance = 1763 Jkg^{-1} K^{-1}]
[Specific Latent Heat of Fusion of Substance = 215 000 Jkg^{-1}.] **(8 marks)**

(f) Complete Table 2 to show the symbols and SI units for the physical quantities given.

TABLE 2

Physical Quantity	Symbol	SI Unit
Heat Capacity		
Specific Latent Heat of Vapourisation		

(4 marks)

Total 25 marks

NOTHING HAS BEEN OMITTED.

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2. (a) The unit of energy, the Joule, has two equivalent derived units.

(i) In Figure 1, indicate inside the bubbles, two equivalent derived units for the Joule.

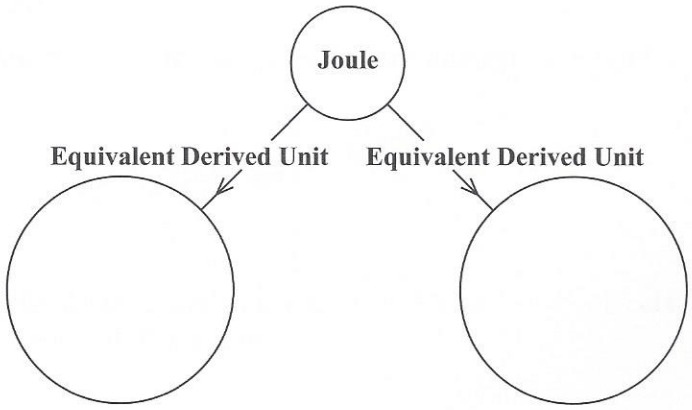

Figure 1.

(2 marks)

(ii) Solar energy is one of the popular alternative sources of energy. State ONE application of solar energy.

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(1 mark)

(iii) State ONE advantage of using solar energy in the Caribbean.

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(1 mark)

(iv) A variety of alternative energy technologies are being used in the Caribbean and globally. Other than solar energy, complete Table 3 to show three other types of alternative energy technologies and their sources.

TABLE 3

Alternative Energy	Source
(1)	
(2)	
(3)	

(3 marks)

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(b)

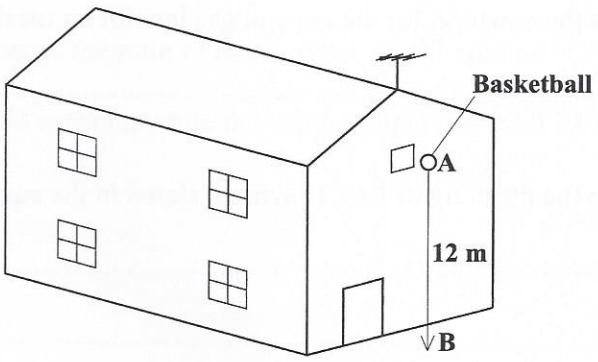

Figure 2.

A basketball of mass 0.44 kg was dropped vertically from rest at A, 12 m from the ground as seen in Figure 2. Calculate the

(i) gravitational potential energy of the ball at the point of release, A.

(3 marks)

(ii) final velocity of the ball on reaching the ground 1.56 seconds later (assume no loss of energy as the ball falls).

(3 marks)

(iii) ball's momentum when it hits the ground.

[Acceleration due to gravity, g, = 9.8 m s^{-2}]

(2 marks)
Total 15 marks

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3. (a) (i) State the equation for the general gas law for an ideal gas.

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(1 mark)

(ii) State the meaning of EACH symbol stated in the equation in (a) (i).

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(4 marks)

(b) (i) A car tyre is pumped to a pressure of 2×10^5 $N\ m^{-2}$ in the morning when the temperature is 23°C. Later in the day, the temperature rises to 34°C. Calculate the new pressure in the tyre. The volume of air is kept constant.

(5 marks)

(ii) Using the kinetic theory of matter, explain why the increase in pressure occured.

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(2 marks)

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(iii) Calculate the ratio of new volume to old volume $\left(\frac{V_2}{V_1}\right)$ for the tyre, if the pressure is held constant while the temperature rises from 23°C to 34°C.

(3 marks)

Total 15 marks

SECTION B

AnswerALL questions.

4. (a) State the laws of refraction. **(6 marks)**

(b) Figure 3 shows the clown fish, Nemo, looking at point B. It sees the fisherman's net appearing as if it were at A.

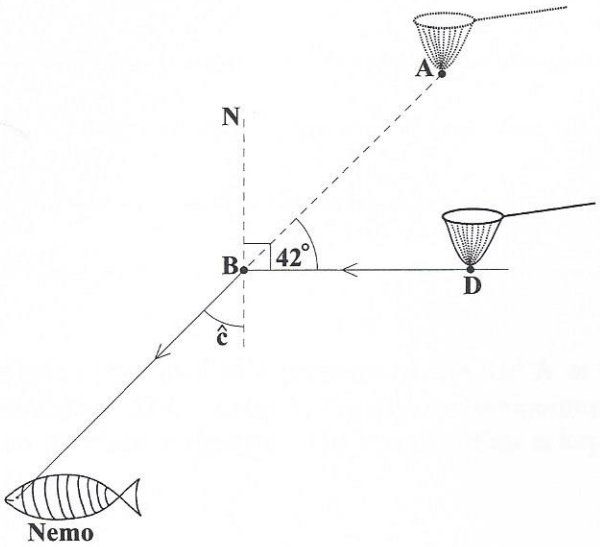

Figure 3.

(i) Calculate angle c, given that angle ABD is 42°. **(3 marks)**

(ii) Given that angle c is the critical angle for the air–water boundary, calculate the refractive index of the water. **(3 marks)**

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(iii)

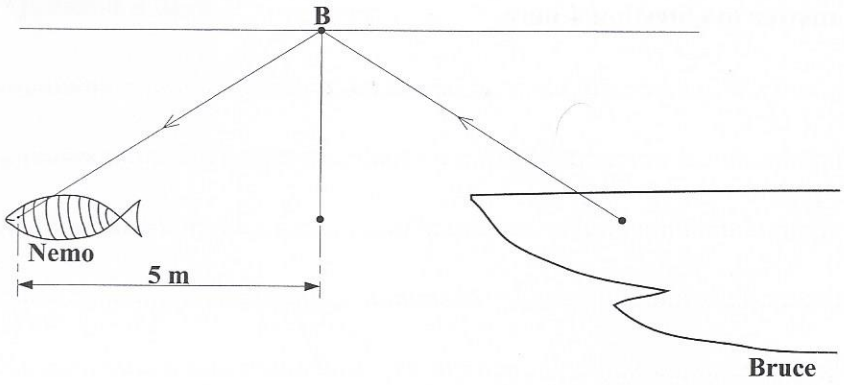

Figure 4.

Nemo swims away and his eye is now a horizontal distance of 5 metres from point B. Looking at point B he no longer sees the net but now sees Bruce, the shark.

If Bruce is at the same depth as Nemo, how far away is Bruce's eye from Nemo's eye. Explain your result. **(3 marks)**

Total 15 marks

Write your answer to Question 4 here.

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5. (a) Climate change is a major issue facing the global community. The average person can make a positive difference by conserving existing energy sources.

Describe THREE ways in which this can be done. State clearly what **form** of energy is conserved in EACH case. **(6 marks)**

(b) Home owner, Rasheed, is going on a two–week vacation. He has decided to leave on a 60W incandescent light bulb for security reasons.

(i) Calculate the total energy in kW h that the bulb will consume during the two–week period. **(4 marks)**

(ii) Given that Rasheed's electricity rate is \$0.26 per kWh, calculate his electricity charges for the bulb for the two weeks. **(1 mark)**

(iii) During the two–week period, 15.5 kWh of energy was lost as heat from the bulb. Determine the efficiency of the bulb. **(4 marks)**

Total 15 marks

Write your answer to Question 5 here.

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6. (a) In 20 days, the activity of a sample of Bismuth decreases to one-sixteenth of its original activity.

(i) Define the term 'half-life'. **(2 marks)**

(ii) Calculate the half-life of Bismuth. **(4 marks)**

(b) Radioisotopes have many useful applications, but overexposure is a health hazard.

State TWO useful applications of radioisotopes and TWO precautions to be taken when handling radioisotopes. **(4 marks)**

(c) During the fission of 1 kg of Uranium –235, 6.7×10^{10} J of energy is released and there is a change in its mass.

Calculate the new mass. **(5 marks)**

Total 15 marks

Write your answer to Question 6 here.

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