CARIBBEAN EXAMINATIONS COUNCIL

SECONDARY EDUCATION CERTIFICATE EXAMINATION

PHYSICS

Paper 02 – General Proficiency

1\frac{1}{2} hours

READ THE FOLLOWING DIRECTIONS CAREFULLY

1. You MUST use this answer booklet when responding to the questions. For each question, write your answer in the space provided and return the answer booklet at the end of the examination.

2. ALL WORKING MUST BE SHOWN in this booklet, since marks will be awarded for correct steps in calculations.

3. Attempt ALL questions.

4. The use of non-programmable calculators is allowed.

5. Mathematical tables are provided.

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

Copyright © 2005 Caribbean Examinations Council ®.
All rights reserved.

01238020/JANUARY/F 2006
Graph paper for Question 1.
1. Three hundred and fifty grams (350 g) of a solid substance, X, is heated in an insulated oven at a steady rate. A record of the variation of temperature as time varies is tabulated below in Table 1.

<table>
<thead>
<tr>
<th>Temperature, $T/\degree C$</th>
<th>20</th>
<th>50</th>
<th>80</th>
<th>80</th>
<th>80</th>
<th>105</th>
<th>147</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time, $t/s$</td>
<td>0</td>
<td>100</td>
<td>200</td>
<td>300</td>
<td>400</td>
<td>550</td>
<td>800</td>
</tr>
</tbody>
</table>

(a) Using the observations from the Table 1, plot a graph of temperature vs time on the graph paper opposite. (Your graph should have THREE straight line sections.)

(b) Determine the slope of the graph during the first 200 s.

(c) Given that the specific heat capacity of substance $X$ is 1720 J kg$^{-1}$ K$^{-1}$. calculate the rate at which heat is supplied to substance $X$.

(d) How much energy is needed to melt substance $X$ completely from its original temperature of 20$^\degree C$?
(e) Explain the behaviour of substance X between $t = 200\ s$ and $t = 800\ s$.


(3 marks)

(f) Sketch the cooling curve of substance X if the oven is turned off at $t = 800\ s$.


(3 marks)

Total 30 marks

2. (a) State the TWO laws of reflection.

(i) 


(1 mark)

(ii) 


(2 marks)
(b) Figure 1 shows a ray of light AB, incident on the surface of a triangular prism.

(i) Draw the path taken by the ray of light AB as it travels through the transparent triangular prism shown in Figure 1.

(ii) Indicate by labelling, the angle of

a) incidence i, on the first boundary

b) refraction r, on the first boundary.

Figure 1

(2 marks)

(c) Light is incident on a glass block of index of refraction of 1.5, at angle of incidence of 45°. Calculate the angle of refraction of the light.
(d) Figure 2 shows a waterproof spotlight, spotted/placed underwater so that the light rays it produces are allowed to strike the water's surface at varying angles of incidence, \( i \).

![Figure 2](image)

(i) Calculate the critical angle in this situation.

(ii) Explain what happens to a ray of light at angle of incidence \( 68^\circ \).

[Refractive index of water = 4/3]

Total 14 marks
3. (a) An electric hand dryer located in the washroom of an airport has the specifications:

240 V a.c.; 50 Hz; 10 A

(i) Fill in the blanks in Table 2 below with the physical quantities associated with the numbers and units given in the specifications.

<table>
<thead>
<tr>
<th>Specifications</th>
<th>Physical Quantities</th>
</tr>
</thead>
<tbody>
<tr>
<td>50 Hz</td>
<td></td>
</tr>
<tr>
<td>10 A</td>
<td></td>
</tr>
<tr>
<td>240 V a.c.</td>
<td></td>
</tr>
</tbody>
</table>

(3 marks)

(ii) What does the abbreviation a.c. stand for?

(1 mark)

(b) The only electrical components in the dryer are a motor driven fan and a heater. Draw a circuit diagram showing how you would connect these components to a 240 V a.c. source so that they can work INDEPENDENTLY.

(4 marks)
(c) When the fan and the heater are both in operation, the dryer draws 10 A from the 240 V mains. The fan is using 2 A.

(i) Calculate the power used by the fan.


(3 marks)

(ii) Determine the resistance of the heater.


(4 marks)

Total 15 marks

4. (a) (i) Define the term 'displacement'.


(2 marks)

(ii) State the SI unit for displacement.


(1 mark)
(b) Hurricane Hurry leaves Point A and travels 12 km due west at 5 km h\(^{-1}\) to point B. At B, Hurry changes course and speed, and travels a further 16 km due north at 3 km h\(^{-1}\) to reach Point C.

(i) Draw in the space below, a vector diagram showing this movement.

(ii) Calculate the displacement of Hurricane Hurry from Point A to Point C.

(iii) Determine the distance Hurricane Hurry travels in moving from Point A to Point C.

(iv) Calculate the average speed of Hurricane Hurry in travelling from Point A to Point C, in km h\(^{-1}\).

(2 marks)

(5 marks)

(1 mark)

(4 marks)

Total 15 marks

GO ON TO THE NEXT PAGE
5.  (a) State ‘Newton’s Third Law of Motion’.


(2 marks)

(b) A large truck which has a mass of 9500 kg is parked on a straight level road.

(i) What is the weight of the truck?


(2 marks)

(ii) What is the reaction force exerted by the road on the truck?


(1 mark)

\( g = 10 \text{ N kg}^{-1} \)
(c) Figure 3 shows the velocity-time graph for a journey completed by the truck mentioned in (b).

![Velocity-time graph]

Figure 3

Calculate the acceleration of the truck during the first 50 seconds.

(3 marks)

(d) State 'Newton's Second Law of Motion'

(i) in words

(ii) in the form of an equation.

(1 mark)
(c) What would be the force necessary to give the truck the acceleration you calculated in (c)?

(2 marks)

(f) (i) Explain how distance travelled is obtained from a velocity-time graph.

(1 mark)

(ii) Determine the total distance covered by the truck.

(2 marks)

Total 16 marks

END OF TEST