

FORM TP 2022267



TEST CODE **02165020**

MAY/JUNE 2022

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN ADVANCED PROFICIENCY EXAMINATION®

GREEN ENGINEERING

UNIT 1 – Paper 02

2 hours 30 minutes

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This paper consists of SIX questions. Answer ALL questions.
2. Write your answers in the spaces provided in this booklet.
3. Do NOT write in the margins.
4. 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.**
5. **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 © 2022 Caribbean Examinations Council
All rights reserved.



SECTION A

MODULE 1 – CONCEPTS AND ISSUES

Answer ALL questions from this section.

1. (a) (i) Define the term ‘natural resource’.

.....
.....
.....

[2 marks]

- (ii) Describe how TWO non-renewable natural resources can be utilized in the Caribbean.

Non-renewable resource 1

.....
.....
.....
.....
.....
.....
.....

Non-renewable resource 2

.....
.....
.....
.....
.....
.....
.....

[6 marks]

GO ON TO THE NEXT PAGE



DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

- (b) (i) Describe ONE problem associated with the use of non-renewable natural resources.

.....

.....

.....

.....

[2 marks]

- (ii) Discuss TWO measures that reduce negative impacts from the use of non-renewable natural resources in the Caribbean.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

[6 marks]



- (c) In a water catchment area containing approximately 3500 gallons of water, 25% of the water contained phosphorous and 35% of the water contained nitrates.

How many gallons of the water are free of nitrates?

.....

.....

.....

.....

.....

.....

.....

.....

.....

[4 marks]

Total 20 marks

DO NOT WRITE IN THIS AREA



DO NOT WRITE IN THIS AREA

2. (a) Define the term 'risk' as used in the occupational, health and safety environment.

.....
.....
.....

[2 marks]

- (b) *"Identification and controlling of risks are the major techniques used to manage risks."*

Outline ONE way in which the root cause of risks can be identified in the manufacturing sector and ONE way in which the risks can be controlled.

Identification

.....
.....
.....

Controlling

.....
.....
.....

[4 marks]

GO ON TO THE NEXT PAGE



- (c) Farmer A has been involved in poultry farming for more than twenty years. However, after reading the news, he has become aware that animal farming can cause health risks to the community.

Suggest TWO actions that Farmer A can take to minimize health risks to his staff and the community.

.....

.....

.....

.....

.....

.....

.....

.....

.....

[4 marks]

- (d) Proper techniques and body mechanics can reduce the risk of injuries when lifting materials. Identify FOUR techniques which should be used when lifting materials.

.....

.....

.....

.....

.....

.....

.....

.....

.....

[4 marks]

DO NOT WRITE IN THIS AREA

GO ON TO THE NEXT PAGE



- (e) Back injuries, hernias and strains are three major types of injury caused by the improper lifting of materials.

State ONE common cause for **each** category of injuries stated above and identify ONE measure that could be used to minimize **each** type of injury.

Cause of back injuries

.....
.....
.....

Measure to minimize back injuries

.....
.....
.....

Cause of hernias

.....
.....
.....

Measure to minimize hernias

.....
.....
.....

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

GO ON TO THE NEXT PAGE



Cause of strains

.....
.....
.....

Measure to minimize strains

.....
.....
.....

[6 marks]

Total 20 marks

DO NOT WRITE IN THIS AREA



SECTION B

MODULE 2 – THEORETICAL FRAMEWORK OF GREEN ENGINEERING

Answer ALL questions from this section.

3. (a) Figure 1 shows the life cycle of aluminium cans.

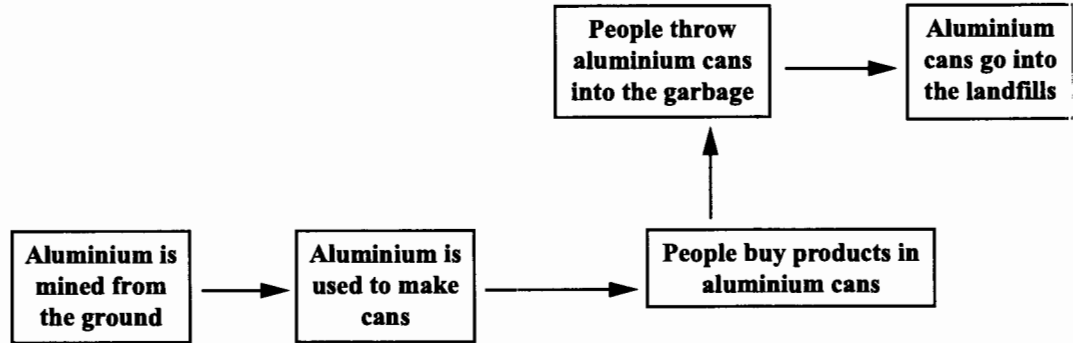


Figure 1. Life cycle of aluminium cans

- (i) Outline TWO benefits of recycling aluminium.

.....

.....

.....

.....

.....

.....

.....

.....

[4 marks]

DO NOT WRITE IN THIS AREA



- (ii) Discuss how THREE impacts resulting from the life cycle of aluminium could be reduced using Green Engineering principles.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

[6 marks]

- (iii) Explain THREE ways in which the environment may benefit if the number of landfill sites in a country is minimized.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

[6 marks]

GO ON TO THE NEXT PAGE



DO NOT WRITE IN THIS AREA

(b) Suggest TWO ways in which a yard/garage sale to sell old toys, is good for the environment.

.....

.....

.....

.....

.....

.....

.....

.....

.....

[4 marks]

Total 20 marks

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA



4. Most of the materials recovered from landfills can be categorized into four main categories — polymeric, ceramics, composite and metallic.

(a) Select THREE of the listed categories. For EACH selected category, identify ONE material that may be recovered during the design and manufacturing of products.

.....
.....
.....
.....

[3 marks]

(b) Identify ONE **main** waste recovery technique. Describe an example of the technique identified.

.....
.....
.....
.....
.....
.....

[3 marks]

(c) (i) Explain the concept ‘industrial ecology (IE)’ in relation to natural ecosystems.

.....
.....
.....
.....
.....
.....
.....
.....
.....

[4 marks]

GO ON TO THE NEXT PAGE



DO NOT WRITE IN THIS AREA

(ii) Identify FOUR barriers associated with the implementation of IE principles.

.....

.....

.....

.....

.....

.....

.....

.....

.....

[4 marks]

(iii) Discuss measures that can be taken to overcome TWO of the barriers identified in (c) (ii).

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

[6 marks]

Total 20 marks

GO ON TO THE NEXT PAGE



DO NOT WRITE IN THIS AREA

SECTION C

MODULE 3 – GREEN ENGINEERING IN PRACTICE

Answer ALL questions from this section.

Answer the following questions using Case Study 3 titled “Sandals La Toc” from the syllabus.

5. (a) Identify **THREE key** actions that have been taken to address the sustainability issues associated with electrical energy efficiency.

.....

.....

.....

.....

.....

.....

[3 marks]

DO NOT WRITE IN THIS AREA



- (b) Imagine that you are the environmental manager at Sandals La Toc and that in order to receive the funds needed to purchase LED bulbs, you had to convince the financial controller that LED bulbs would create significant savings over incandescent bulbs.

Table 1 presents information on the incandescent bulbs currently used at Sandals La Toc that must be replaced with LED bulbs.

TABLE 1: INFORMATION ON INCANDESCENT VERSUS LED BULBS

Features of Bulbs	Incandescent Bulbs Currently Used at Sandals La Toc	Proposed LED Replacement Bulbs
Wattage	60	6
Cost per bulb US\$	US \$1.50	US \$10.00
Life of bulb (hrs)	1500	30 000
Price of electricity per hour — 0.30 cents per kWh		

Use the information given in Table 1 to complete the following table by calculating the values for EACH of the components listed.

Description of Calculation	Incandescent Values	LED Values
Energy savings per bulb (W)		
Price of electricity per hour		
Electricity cost used over 30 000 hours		

[6 marks]

GO ON TO THE NEXT PAGE



- (c) List THREE water conservation methods, NOT mentioned in the case study, that could potentially be adopted by Sandals La Toc.

.....

.....

.....

.....

[3 marks]

- (d) Outline TWO ways in which the energy efficiency and water conservation practices at Sandals La Toc impact future generations.

.....

.....

.....

.....

.....

.....

.....

.....

[4 marks]

DO NOT WRITE IN THIS AREA



- (e) Suggest TWO ways in which Information and Communication Technologies could be used at Sandals La Toc to further contribute to achieving sustainability.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

[4 marks]

Total 20 marks

DO NOT WRITE IN THIS AREA



6. *"The principles of Green Engineering can be used to guide businesses in the design and production of products that minimize negative impacts on natural resources."*

The extract provided is from Case Study 2 titled "Demerara Distillers Limited" of the syllabus. Answer the following questions using this case study.

- (a) Identify ONE way in which Demerara Distillers Limited has addressed energy efficiencies/inefficiencies in the production process.

.....
.....
.....
.....

[2 marks]

- (b) Explain how the Green Engineering principles 'Inherent rather than circumstantial' and 'Prevention instead of treatment' are demonstrated by the Demerara Distillers Limited case study.

Inherent rather than circumstantial

.....
.....
.....
.....
.....
.....

Prevention instead of treatment

.....
.....
.....
.....
.....
.....

[4 marks]

GO ON TO THE NEXT PAGE



DO NOT WRITE IN THIS AREA

- (c) You have been tasked with auditing the energy use of Demerara Distillers Limited. Outline TWO additional actions which Demerara Distillers Limited can take to demonstrate further corporate responsibility in the way that it manages its energy supply and use. Justify your response.

.....

.....

.....

.....

.....

.....

.....

.....

[4 marks]

- (d) Outline ONE way in which the energy decisions taken by Demerara Distillers Limited affects its carbon footprint.

.....

.....

.....

.....

.....

.....

[2 marks]

GO ON TO THE NEXT PAGE



- (e) Recommend ONE standard/piece of legislation/code of practice that could guide the organization in the case study as it engages in delivering products to the market. Justify your response.

.....

.....

.....

.....

[2 marks]

- (f) Suggest THREE benefits that a business could receive by attaining standards set by an international organization such as Green Globe, which accredits businesses that are successfully implementing Green Engineering practices.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

[6 marks]

Total 20 marks

END OF TEST

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



DO NOT WRITE IN THIS AREA