



CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE®
EXAMINATION

HUMAN AND SOCIAL BIOLOGY

SPECIMEN PAPER

Paper 032 – General Proficiency

Alternative to School-Based Assessment

1 hour 15 minutes

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This paper consists of a case study and TWELVE questions. Answer ALL questions.
2. Write your answers in the spaces provided in this booklet.
3. Do NOT write in the margins.
4. You are advised to take some time to read through the paper and plan your answers.
5. 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.**
6. **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.

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01253032/SPEC 2019

Barcode Area
Sequential Bar Code

INSTRUCTIONS: The following case study contains information for a research project.
Read the case and answer the questions that follow each section.

CASE STUDY

Background

The town of Castries, located at the base of a mountain range, is usually supplied with water from a well. The well has run dry and an alternative water source is needed. The government is considering five rivers that run through the mountain range as potential sources of potable water. Each river differs primarily on land usage patterns as follows:

- The Chan Chich River flows through an area where there are many pig farms.
- The Black Bay River flows through an untouched forest, that is, it has not been disturbed in any way.
- The Caroni River flows through two other towns before reaching Castries.
- The Douce River flows through a deforested region where logging occurs.
- The Demerara River flows through agricultural land.

You are employed by the Government of Castries to investigate the quality of water in these rivers and to make a recommendation as to which river should be used to supply the town's water.

1. Write a suitable statement of the problem.

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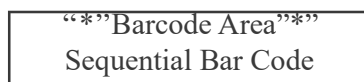
(2 marks)

2. State the objective of the investigation.

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(2 marks)

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5. State ONE limitation of the method of data collection used.

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(1 mark)

Presentation of Data

The results of the tests carried out on the water from each river are presented in Table 1.

TABLE 1: RESULTS OF TESTS OF WATER FROM RIVERS

Contaminant	River				
	Chan Chich	Black Bay	Caroni	Douce	Demerara
Nitrates (mg/L)	1.34	0.94	1.15	1.06	1.21
Phosphates (mg/L)	0.63	0.18	0.4	0.24	1.4
Total sedimentation suspension (mg/L)	19.36	7.3	15.55	31	24
<i>E. coli</i> colonies (per 100 mLs)	900	130	560	120	300

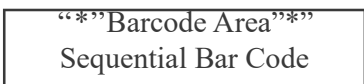
6. Using the grid provided on page 7, plot a bar graph of the data for *E. coli* colonies (per 100 mLs) presented in Table 1. (4 marks)

7. Suggest ONE other way in which the data could be presented.

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(1 mark)

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Analysis and Interpretation of Data

The acceptable levels of phosphates in potable water should NOT exceed 14 mg/L.

The acceptable levels of nitrates in potable water should NOT exceed 50 mg/L.

The acceptable levels of suspended sediments in potable water should NOT exceed 10 mg/L.

Table 2 categorizes the quality of river water by the number of colonies of *E. coli* bacteria per 100 mL.

TABLE 2: QUALITY OF RIVER WATER BASED ON NUMBER OF *E. COLI* COLONIES

Category	Number of Colonies of <i>E. coli</i> bacteria per 100 mL
Excellent	0–49
Good	50–99
Fair	100–199
Intermediate	200–299
Poor	> = 300

8. Using the information in Table 1 and Table 2, complete Table 3 by using a tick (✓) to indicate where the levels of contaminants in EACH river meet acceptable levels.

TABLE 3: RIVER PROFILES OF ACCEPTABLE LEVELS OF CONTAMINANTS

Contaminant	Chan Chich River	Black Bay River	Caroni River	Douce River	Demerara River
Nitrates					
Phosphates					
Total suspended sediments					
<i>E. coli</i> bacteria					

(5 marks)

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9. (a) (i) Identify the river which has the HIGHEST level of *E. coli* bacteria present in the water and suggest ONE likely reason for this occurrence.

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(2 marks)

(ii) Identify the river which has the HIGHEST amount of suspended sediments present in the water and suggest ONE likely reason for this occurrence.

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(2 marks)

(iii) Identify the river which has the HIGHEST level of phosphates and nitrates present in the water and suggest ONE likely reason for this occurrence.

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(2 marks)

(b) In the river with high levels of nitrates and phosphates, eutrophication is likely to occur. Suggest ONE social and ONE economic implication for the town of Castries.

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(2 marks)

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Recommendations

10. Recommend, to the Government of Castries, the river that would be BEST suited to provide potable water to the town and give TWO reasons for your recommendation.

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(3 marks)

11. Suggest ONE **other** river that the Government of Castries could utilize to provide the town with potable water. Justify your recommendation.

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(3 marks)

12. Suggest TWO ways in which the waterways of Castries could be improved.

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(2 marks)

Total 40 marks

END OF TEST

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

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WRITE ON
THIS PAGE**

CANDIDATE'S RECEIPT

INSTRUCTIONS TO CANDIDATE:

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

TEST CODE:

0	1	2	5	3	0	3	2
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SUBJECT: HUMAN AND SOCIAL BIOLOGY – Paper 032

PROFICIENCY: GENERAL

REGISTRATION NUMBER:

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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: _____



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C A R I B B E A N E X A M I N A T I O N S C O U N C I L

C A R I B B E A N S E C O N D A R Y E X A M I N A T I O N C E R T I F I C A T E ®

H U M A N A N D S O C I A L B I O L O G Y

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S P E C I M E N

K E Y A N D M A R K S C H E M E

HUMAN AND SOCIAL BIOLOGY

Key and Mark Scheme

Paper 032

Specific Objectives: E 1, 2, 3, 4, 7, 9, 10

Background

1. Problem Statement

Human activity **(1)** affects the quality of river water **(1)**.

(2 marks)

2. To determine the quality of water **(1) in each of the five rivers in the town of Castries **(1)**.**

(2 marks)

Methodology

3. The data was collected primarily using experimentation.

(1 mark)

4. Steps to test river water for *E.coli*

1. Obtain samples of the water from each of the five rivers **(1)**.
2. Using a sterilised inoculating loop or swab **(1)**, transfer a sample of water from one river to an Agar plate making zigzag streaks across the surface of the Agar **(1)**.
3. Close the lid of the plate as quickly as possible to avoid contamination. **(1)**
4. Secure the lid with adhesive tape. **(1)**
5. Incubate at 25° for 48 hours. **(1)**
6. Observe and count the number of *E.coli* colonies. **(1)**
7. Repeat steps 2 - 6 using samples from the other rivers. **(1)**

1 mark for EACH point given (1 x 8 = 8 marks)

HUMAN AND SOCIAL BIOLOGY

Key and Mark Scheme

Paper 032

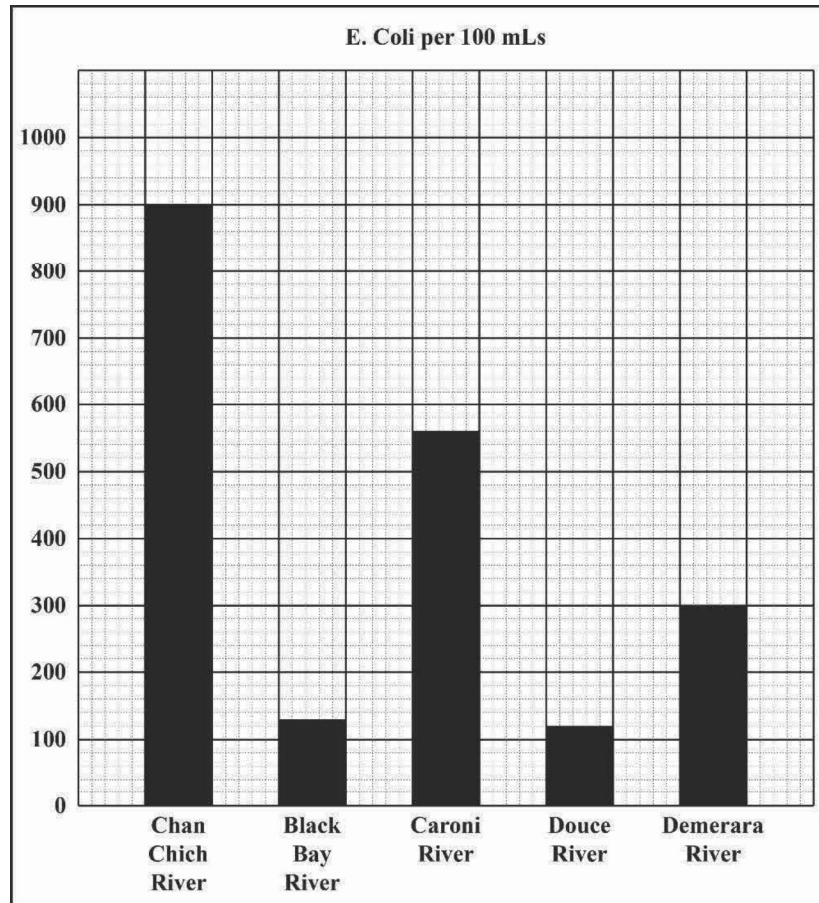
5. Limitation of study

The data collected is dependent on the time of year it was collected, that is, wet vs dry season.

(1 mark)

Presentation of Data

6.



1 mark for each axis correctly labelled, 2 marks

2 marks for all 5 bars plotted accurately

-1 mark for any one bar plotted incorrectly

(4 marks)

7. The data could be presented using a line graph.

(1 mark)

HUMAN AND SOCIAL BIOLOGY

Key and Mark Scheme

Paper 032

Analysis and Interpretation of Data

8. RIVER PROFILES OF ACCEPTABLE LEVELS OF CONTAMINANTS

Contaminant	Chan Chich River	Black Bay River	Caroni River	Douce River	Demerara River
Nitrates	✓	✓	✓	✓	✓
Phosphates	✓	✓	✓	✓	✓
Total Suspended Sediments		✓			
<i>E.coli</i> bacteria		✓		✓	

1 mark for each correct river profile (1 x 5 = 5 marks)

9. (a) (i) The Chan Chich river (1) since it runs through a pig farm farm and large amounts of faecal matter, which contains *E.coli*, is likely to be washed into the river. (1)

1 mark for identifying the river

1 mark for a reason

- (ii) The Douce river (1) since it runs through a deforested area and there will be higher levels of soil erosion and these particles are likely to be washed into the river (1).

1 mark for identifying the river

1 mark for a reason

- (iii) The Demerara river (1) since it runs through agricultural land and fertilisers which contain nitrates and phosphates are likely to be washed into the river (1).

1 mark for identifying the river

1 mark for a reason

HUMAN AND SOCIAL BIOLOGY**Key and Mark Scheme****Paper 032**

(b) Economic Implications:

- Reduction in income from activities such as fishing as the fish die out in significant proportions
- Increase in health care costs as algae produce toxins that make the water unsafe

Social Implications:

- Loss of tourism because recreational activities that usually take place on the river can no longer occur because the water is toxic.
- Loss of local aesthetics as a result of the breakdown of the quality of the environment

**1 mark for a social implication
1 mark for an economic implication
(2 marks)**

Recommendations

10. The Black Bay River **(1)** is best recommended to supply the town of Castries with potable drinking water. This is because this river has the least amount of the four contaminants of the rivers investigated **(1)**. Therefore, it will be less expensive for the government to produce potable water from that river. **(1)**

(3 marks)

11. The Douce River **(1)** because it has 3 out 4 contaminants present at acceptable levels **(1)**. The only contaminant at an unacceptable level (suspended sediments) is relatively easy to be removed **(1)**

(3 marks)

12. Ways in which the waterways of Castries could be improved:

- Move pig farms further away from the river
- Regulate logging activities to reduce deforestation
- In the urban areas, ensure that sewage systems are properly functioning

1 mark for each plausible recommendation(1 x 2 = 2 marks)

Total 40 marks