

FORM TP 2015193



TEST CODE **02220032**

MAY/JUNE 2015

**CARIBBEAN EXAMINATIONS COUNCIL**

**CARIBBEAN ADVANCED PROFICIENCY EXAMINATION®**

**ENVIRONMENTAL SCIENCE**

**AGRICULTURE, ENERGY AND ENVIRONMENTAL POLLUTION**

**UNIT 2 – Paper 032**

*2 hours*

**26 MAY 2015 (p.m.)**

**READ THE FOLLOWING INSTRUCTIONS CAREFULLY.**

1. This paper consists of THREE questions.
2. Answer ALL questions.
3. Write your answers in the answer booklet provided.
4. Graph paper is provided.
5. You may use a silent, non-programmable, scientific calculator to answer questions.

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Answer ALL questions.

1. (a) Table 1 shows the total production of milk in the Caribbean region from 2000 to 2010. Construct a line graph to illustrate this data. **[8 marks]**

**TABLE 1: TOTAL MILK PRODUCTION IN THE CARIBBEAN, 2000–2010**

Year	Milk production (thousand tonnes)
2000	1525
2002	1620
2004	1340
2006	1365
2008	1610
2010	1640

- (b) (i) List THREE greenhouse gases, **other** than ‘methane’. **[3 marks]**
- (ii) Dairy farming is a significant source of methane, as cattle produce approximately 0.0233 tonnes of methane per tonne of milk produced. How much methane was produced from dairy farming in the Caribbean region in 2010? **[2 marks]**
- (iii) Use the graph to predict the amount of methane that will be produced in 2015. **[4 marks]**
- (c) (i) Given your responses to (b), suggest ONE threat to sustainable agriculture that is likely to occur as a result of dairy farming in the Caribbean AND explain how this threat might impact sustainable agriculture in the Caribbean. **[8 marks]**
- (ii) The improper disposal of animal waste (manure) is one other major environmental problem of livestock farming. Discuss how this may affect surface water resources. **[5 marks]**

**Total 30 marks**

2. (a) (i) Define the terms 'potential energy' and 'kinetic energy'. **[4 marks]**
- (ii) Explain, with the aid of a suitable diagram, how these forms of energy are exploited to produce electricity by hydroelectric power plants. **[8 marks]**
- (b) Table 2 shows the world electricity generation by hydroelectric power plants in 2010. Construct a pie chart to illustrate this data. **[10 marks]**

**TABLE 2: WORLD ELECTRICITY GENERATION BY HYDROELECTRIC POWER PLANTS, 2010**

<b>Region</b>	<b>Electricity Generation (billion KWh)</b>
Africa	105
Asia and Oceania	1090
Central and South America	686
Eurasia	242
Europe	616
Middle East	18
North America	645

*Source: US Energy Information Administration, www.eia.gov,  
(figures rounded to the nearest whole number)*

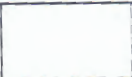
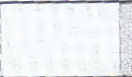




- (c) Explain how using a renewable energy source like hydropower to generate electricity may result in energy conservation AND a reduction in pollution. **[8 marks]**

**Total 30 marks**


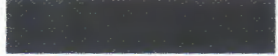



3. A group of students are conducting an experiment to estimate the concentration of ground level ozone in their school using the Schoenbein method. In this method, a paste made of a mixture of water, starch and potassium iodide is spread on paper to make indicator strips. In the presence of ozone, the iodide ions are oxidized to iodine, which turns dark blue on reacting with the starch.

The students placed these strips in a variety of locations around the school and left them for 8 hours. The strips were then collected, and their colour compared to the Schoenbein colour scale below. The numbers on the colour scale correspond to ozone concentrations, as can be seen in Table 3 which gives these correlations for an environment where the relative humidity is 70%. The results of the experiment are seen in Table 4.

**TABLE 3: CORRELATION OF SCHOENBEIN COLOUR SCALE AND NUMBERS WITH GROUND LEVEL OZONE CONCENTRATIONS AT A RELATIVE HUMIDITY OF 70%**

<b>Colour scale</b>						
<b>Schoenbein number</b>	0	1	2	3	4	5
<b>Ozone concentration, ppb</b>	0	15	40	75	100	130

**TABLE 4: RESULTS OF THE EXPERIMENT TO DETERMINE GROUND LEVEL OZONE CONCENTRATIONS USING THE SCHOENBEIN METHOD**

<b>Location</b>	<b>Indicator strip</b>	<b>Ozone concentration, ppb</b>
Form 5 classroom		
Under tree on playing field		
School auditorium		
Middle of playing field		
Control		

- (a) (i) Copy the first and last columns of Table 4 into your answer booklet. Use the data provided in Tables 3 and 4 to estimate the concentration of ground level ozone in the different locations of the school. **[5 marks]**
- (ii) Calculate the average concentration of ozone 'inside' and 'outside' of the school. **[4 marks]**
- (iii) What is the BEST way to store the control? **[2 marks]**
- (iv) What conclusion can be made about the effect of location on the concentration of ozone at the school? **[1 mark]**
- (b) (i) Give THREE reasons why ozone in the atmosphere can be considered good and THREE reasons why it can be considered bad. **[6 marks]**
- (ii) State the name AND use of TWO ozone depleting substances. **[4 marks]**
- (c) (i) Identify TWO receptors for a chemical spilled into the soil. **[2 marks]**
- (ii) Explain how it is possible for a shark to have high levels of mercury in its body. **[6 marks]**

**Total 30 marks**

**END OF TEST**

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