



PAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

FACULTY OF HEALTH, NATURAL RESOURCES AND APPLIED SCIENCES

DEPARTMENT OF NATURAL AND APPLIED SCIENCES

QUALIFICATION: BACHELOR OF SCIENCE HONOURS	
QUALIFICATION CODE: 08BOSH	LEVEL: 8
COURSE NAME: ENVIRONMENTAL POLLUTION, MONITORING AND REMEDIATION	COURSE CODE: EPM821S
SESSION: NOVEMBER 2022	PAPER: THEORY
DURATION: 3 HOURS	MARKS: 100

FIRST OPPORTUNITY EXAMINATION QUESTION PAPER	
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MODERATOR:	DR JAMES ABAH

INSTRUCTIONS
<ol style="list-style-type: none">1. Answer ALL the questions in the answer book provided.2. Write and number your answers clearly.3. All written works MUST be done in blue or black ink.

PERMISSIBLE MATERIALS

None

ATTACHMENT

None

THIS QUESTION PAPER CONSISTS OF 4 PAGES (Including this front page)

Question 1

[20]

- 1.1 Explain how an earthquake can cause an overtopping on a Tailings Storage Facility. (4)
- 1.2 Differentiate between
 - (a) Irritant and toxic properties of substances (4)
 - (b) Low grade ore stockpile and tailings (4)
- 1.3 (a) What are the key factors that control the health effects of hazardous wastes? (3)
 - (b) After treatment of waste is completed, an inorganic valueless residue remains that must be disposed of safely. Provide the different options for disposing hazardous waste. (5)

Question 2

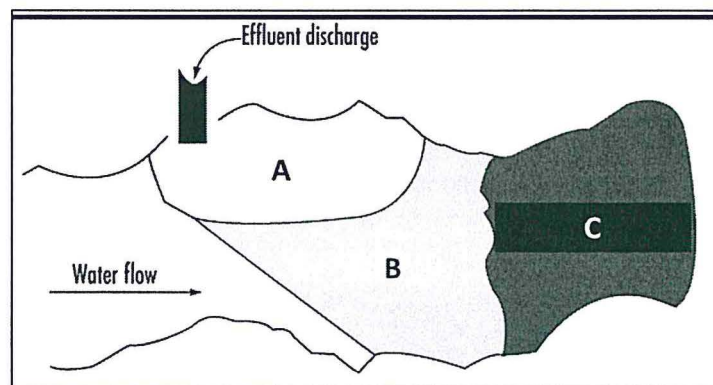
[20]

- 2.1 Explain how pollutants are naturally removed from the atmosphere. (4)
- 2.2 Define Negative Emissions Technologies with respect to climate change and name two technologies that belong to this group. (4)
- 2.3 How important is the information obtained through atmospheric air analytics and monitoring? (4)
- 2.4 Discuss the main parts of rainwater analysis including the measurement methods. (8)

Question 3

[20]

3.1 The figure below shows a model of water pollution discharge mixing zones.



- (a) What are water pollution discharge mixing zones? (2)

(b) Why is this zone not to be considered as a treatment entity of a body of water? (2)

(c) Which one of the sections A, B and C from the above figure represents the actual mixing zone? (1)

3.2 (a) Wastewater treatments are grouped into three main categories namely, primary treatment, secondary treatment and tertiary treatment. What are the respective purposes of these categories of treatment? (3)

(b) Name the main types of secondary wastewater treatment. (4)

(c) Which one of the types of treatment in (b) is the most efficient? Briefly explain its principle and write the generic chemical reactions involved. (8)

Question 4 [20]

4.1 Compare the following characteristics of saline soils and sodic (alkaline) soils:

(a) Location (2)

(b) Clay type (2)

(c) Properties (4)

(d) Texture and effects (2)

4.2 (a) What is the other name given to the “conventional techniques” for the reclamation of Salt-Affected Soils? (2)

(b) Name the main conventional techniques used for the reclamation of salt-affected soils? (4)

(c) What are the problems associated with the use of the techniques in (b)? (4)

Question 5 [20]

5.1 It is recognized that legislation and regulations implemented to tackle environmental pollution problems are largely a command and control approach and they have a heavy reliance on “end-of-pipe” measures. Explain the underlined concepts. (4)

5.2 (a) Complete the following definition of Green Chemistry.

“Green Chemistry is the _____ practice of chemical science and technology within the framework of the practice of _____ in a manner that is safe and

non-polluting and that consumes _____ amounts of materials and energy while producing _____ waste material and which minimizes the use and handling of _____ substances and does not release such substances to the environment". (5)

(b) Name the main classes of toxic substances that need to be avoided in the practice of Green Chemistry. (3)

5.3 Adding energy to the system and reducing the activation energy required by a chemical reaction are the two most commonly used approaches to enhance chemical reactions.

(a) Why is the practice of external heating no longer recommended in industrial processes? (2)

(b) Provide TWO alternatives to external heating that can be used in the perspective of Green Chemistry. (2)

5.4 Differentiate between life cycle assessment (LCA) and product stewardship. (4)

END