



**NAMIBIA UNIVERSITY  
OF SCIENCE AND TECHNOLOGY**

**FACULTY OF HEALTH AND APPLIED SCIENCES**

**DEPARTMENT OF NATURAL AND APPLIED SCIENCES**

<b>QUALIFICATION:</b> BACHELOR OF SCIENCE HONOURS	
<b>QUALIFICATION CODE:</b> 08BOSH	<b>LEVEL:</b> 8
<b>COURSE CODE:</b> EPM821S	<b>COURSE NAME:</b> ENVIRONMENTAL POLLUTION, MONITORING AND REMEDIATION
<b>SESSION:</b> JANUARY 2019	<b>PAPER:</b> THEORY
<b>DURATION:</b> 3 HOURS	<b>MARKS:</b> 100

<b>SUPPLEMENTARY/SECOND OPPORTUNITY EXAMINATION QUESTION PAPER</b>	
<b>EXAMINER(S)</b>	DR JULIEN LUSILAO
<b>MODERATOR:</b>	DR JAMES ABAH

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

**PERMISSIBLE MATERIALS**

None

**ATTACHMENT**

None

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

**Question 1** **[15]**

- 1.1 List the four activities identified as priorities for the improvement of Environmental Impact Assessment (EIA) systems. (4)
- 1.2 A common approach during EIA screening is to classify projects into different types of impact category. Briefly discuss these categories. (3)
- 1.3 Explain the following concepts
- (a) Mitigation (2)
  - (b) EIA statement (2)
  - (c) Post-project analysis (2)
- 1.4 Give the phases of the process of impact management. (2)

**Question 2** **[20]**

- 2.1 Explain the following causes of tailings dams' failure:
- (a) Seepage (3)
  - (b) Structural Failure (2)
- 2.2 List the safety properties and safety effect associated with hazardous waste. (4)
- 2.3 What are the factors that control the extent of hazardous wastes health effects? (3)
- 2.4 Explain with appropriate example the process of single replacement (displacement) in the chemical treatment of hazardous waste. (3)
- 2.5 Define the following:
- (a) Phytoremediation (1)
  - (b) Phytoextraction (or phytoaccumulation) (1)
  - (c) Rhizofiltration (1)
  - (d) Phytostabilisation (1)
  - (e) Phytodegradation (or phytotransformation) (1)

**Question 3** **[25]**

- 3.1 Why is carbon dioxide considered as pollutant when it is not toxic to humans, Plants or other organisms? (2)
- 3.2 Explain the concept of "the good, the bad, and the ugly" with respect to ozone. (3)
- 3.3 It has been reported that temperature stabilization at or below 2°C above pre-industrial temperatures should be the goal of climate change policy. Discuss what

could be the consequences of trespassing this threshold value. (4)

3.4 What are the most significant forms of reactive nitrogen and their sources? (6)

3.5 What are the criteria that a sampling system must fulfil for air quality analysis? (5)

3.6 List five instrumental trends in the monitoring and analytics of atmospheric air. (5)

**Question 4** [20]

4.1 Differentiate between the following

(a) Bioaccumulation and Biomagnification (2)

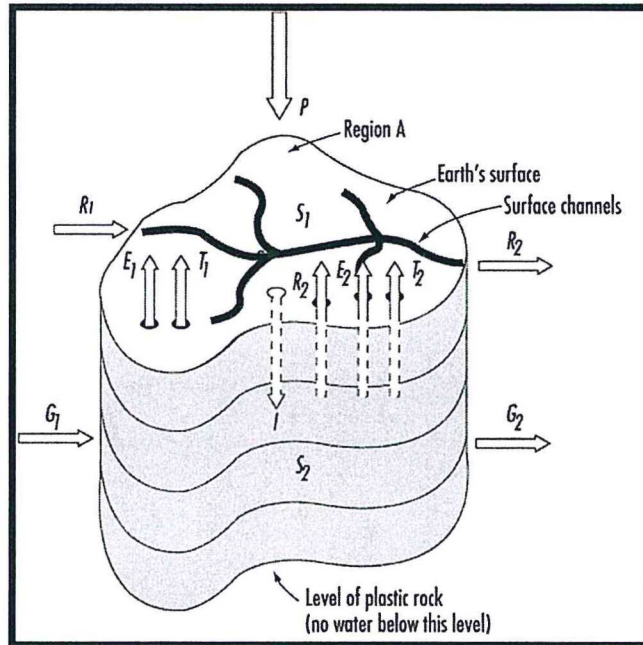
(b) BOD and COD (2)

(c) TDS and TSS (2)

4.2 How important is the concept of residence time in water pollution studies?

Support your answer with an example. (3)

4.3 The diagram below represents a regional hydrologic cycle.



(a) Identify the terms represented by E, G, I, P, R, S and T. (3.5)

(b) Write and briefly explain the equation that describes the disposition of the various waters shown in (a). (1.5)

4.4 Why is it useful to prepare a “study plan” which describes in detail the objectives and possible limitations of a monitoring programme? (2)

4.5 How is the information obtained from water monitoring programmes useful in rational decision-making processes? (4)

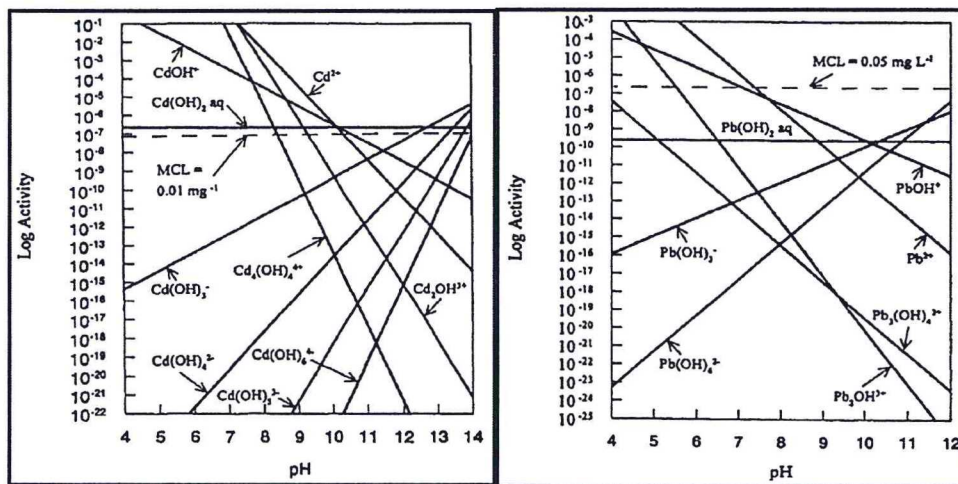
**Question 5** [20]

5.1 Explain how the specific ion effect does impact on plant growth in salt-affected soils. (5)

5.2 What are the factors that determine how much brine can be disposed of in a field (assuming the brine does not contain boron)? (3)

5.3 Briefly explain how the reclamation of salt-affected soils is done. (2)

5.4 Briefly explain the principle of metal-hydroxide precipitation used in acid drainage (AD) remediation. Based on this principle, use the species stability diagrams below to predict which specie between  $\text{Cd}^{2+}$  and  $\text{Pb}^{2+}$  will be removed from an AD water as metal hydroxide precipitate. Explain your choice.



(5)

5.5 Why is the use of ammonia so popular in neutralizing acidity and what are the problems often encountered in the use of this technique? (5)

END