

**NATIONAL UNIVERSITY OF LESOTHO  
FACULTY OF AGRICULTURE  
DEPARTMENT OF SOIL SCIENCE AND RESOURCE CONSERVATION**

**SSR 422: SOIL AND ENVIRONMENTAL MANAGEMENT**

**FINAL EXAMINATION PAPER**

**Programmes**

**Programme: BSc. Agriculture (Soil Science)**

**Year 4**

**May 2019**

**100 marks**

**3 Hours**

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**Instructions**

Answer **ALL** questions in Section A and **two (2)** questions in Section B

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**Section A: Answer ALL questions in this section**

**Question 1 [20 marks]**

- a) Describe three (3) types of soil degradation **[12 marks]**
- b) Inappropriate agricultural practices play a major role in causing land degradation. The table below lists some of those agricultural activities. Specify the type of soil degradation that will result from each activity **[5 marks]**

<b>Agricultural Activity</b>	<b>Soil Degradation Type</b>
i) Low and imbalanced fertilization	
ii) Excessive tillage and use of heavy machinery	
iii) Crop residue burning and inadequate organic matter inputs	
iv) Poor irrigation and water management	
v) Pesticide overuse	

- c) Define a soil pollutant **[3 marks]**

**Question 2 [20 marks]**

Discuss the characteristics, sources and effects of persistent organic pollutants.

**Question 3 [20 marks]**

- a) Explain why agricultural pollution from nitrogen sources generally a major ground-water pollutant **[8 marks]**
- b) Once reaching the soil, pollutants can interact with the soil through sorption, briefly explain the difference between physical adsorption and chemical adsorption of pollutants **[12 marks]**

**Section B: Answer any two (2) questions in this section**

**Question 4 [20 marks]**

- a) Describe the phases of soil that influence the fate and transport of pollutants once they are in the soil **[8 marks]**
- b) Why do soils have sorptive properties? **[2 marks]**
- c) Distinguish between two (2) sources of charges in soils **[10 marks]**

**Question 5 [20 marks]**

Describe the following degradation mechanisms **[5 marks each]**

- a) Photo-transformation
- b) Biodegradation
- c) Bioaccumulation
- d) Dissociation

**Question 6 [20 marks]**

- a) Discuss preferential flow as a pollutant transport mechanism **[10 marks]**
- b) State the criteria for bioremediation as a remedial strategy for polluted soil **[5 marks]**
- c) Describe any ONE (1) bioremediation technology **[5 marks]**