

National University of Lesotho
Faculty of Agriculture
Department of Soil Science and Resource Conservation

SSR 423: Management of Arid and Semi-arid Lands

Final Examination paper

Programmes: BSc. Agriculture (Soil Science) and BSc Agriculture (General)

Year 4

May 2019

100 marks

3 Hours

Instructions

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

Section A (Answer ALL questions in this section)

Question 1 [20 marks]

- a) Based on the characteristics of arid and semi-arid lands, give a brief account on the challenges faced by farmers in these regions. **[15 marks]**
- b) Explain anthropogenic activities that may cause salt accumulation in arid and semi-arid lands. **[5marks]**

Question 2 [20 marks]

- a) Compare and contrast salinity and sodicity in terms of their effects on plants. **[12 marks]**
- b) A certain farmer is interested in buying a piece of land for crop production, he finds that the land has normal soil physical condition, $\text{pH} < 8$, $\text{ESP} < 15\%$, $\text{EC} > 4\text{dS/m}$. What type of salt-affected soils is this and why? **[3 marks]**
- c) Using chemical equations, explain the role of carbon dioxide (CO_2) in alkaline soils **[5 marks]**

Question 3 [20 marks]

- a) State two (2) main factors which largely influence the reclamation of saline soils **[2 marks]**
- b) Given that the root-zone salinity threshold for a particular crop is 0.4dS/m to maintain maximum yields, calculate leaching requirement if the salinity of irrigation water is 0.6dS/m . **[4 marks]**
- c) Calculate the amount of irrigation water needed to meet crop needs and the leaching requirement given that crop water requirement ET_c for the crop in (b) above = 635mm/season **[4 marks]**
- d) Other than gypsum, discuss the effectiveness of two (2) other amendments used in reclaiming sodic soils **[10 marks]**

Section B: (Answer two (2) questions only)

Question 4 [20 marks]

- a) You have discovered that the threshold level of exchangeable sodium percentage for beans is 4%. Find the gypsum requirement (in meq) for reclamation of a sodic soil with an exchangeable sodium percentage of 30% and a CEC of 30 meq/100g soil for successful production of beans **[5 marks]**
- b) Convert your answer in (a) above to grams gypsum/kg soil **[5 marks]**
- c) How much gypsum calculated in (b) above will be needed for a soil with bulk density = 1450kg/m^3 , if the gypsum is mixed to 0.20m depth? Express your answer in Kg/ha **[10 marks]**

Question 5 [20 marks]

Discuss agro-forestry and its role in management of salt affected soils. **[20 marks]**

Questions 6 [20 marks]

Discuss any four (4) socio-economic implications for reclamation and management of salt-affected soils. **[20 marks]**