

National University of Lesotho

Faculty of Agriculture

Department of Soil Science

Final Examination

SSR 210 /212 – Physical Geology and Geomorphology of Lesotho

December 2017

100 Marks

Time: 3 Hours

Instructions

Section 1: Answer All Questions

Section 2: Answer Any Three Questions

Section 1: Answer All Questions

Question 1

a) Identify the following phenomena in relation to geology (2 marks each)

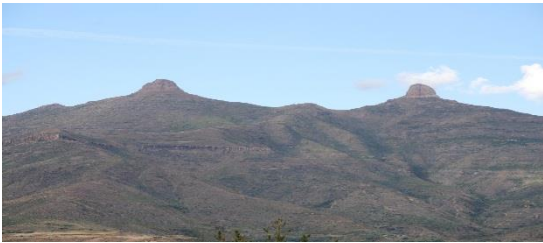
i) _____



ii) _____



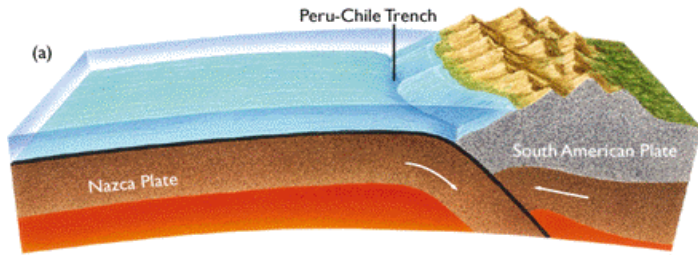
iii) _____



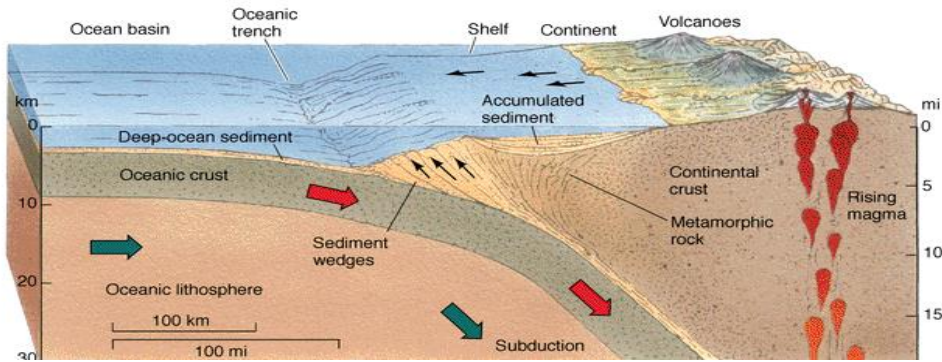
iv) _____



v) _____



b) Make a brief discussion of the phenomenon taking place in the illustration and highlight major processes (10 marks)



Question 2

Discuss the following concepts (5 marks each)

- Hot spots in volcanism
- Mantle dynamics
- Plate relative motions
- Structure systems

Section 2: Answer any three (3) Questions

Question 3

Briefly discuss the role of water in mass movement of unconsolidated materials (20 marks)

Question 4

Compare and contrast the Bowen's Reaction Principle and hypothesis (20 marks)

Question 5

The idealized rock cycle assumes a linear process. Make a brief illustrated description of the process across different rock families. (20 marks)

Question 6

- a) List the five (5) major sedimentary strata in the Karoo basin sedimentary history in Lesotho (10 marks)
- b) Compare and contrast the first and second phases of the Lesotho volcanic episodes (10 marks)

Question 7

a) Identify the following concepts (2 marks each)

- i) Land surface which is homogeneous in terms of morphology & genesis with uniform underlying geology, definite set of soils and particular processes of accelerated erosion, mass wasting & sedimentation
- ii) Exhumed surface of sandstone layers formerly covered with basalt with deep largely loamy to sandy sandstone residuum cover the plateau depressions. Characterized by hill tops, steeper surfaces & plateau rims have stony soils or form bare rock surfaces; Springs & seepage lines exist at the basalt-sandstone contact and accelerated erosion is wide spread & usually takes form of rock stripping
- iii) Natural planar erosion or accumulation surfaces occurring on basalt strata forming major part of the foothills with soil cover ranging from bare to extensive accumulations. It is characterized by the sedimentary strata in which i) The lower forms widespread areas on broad & long interfluvies with slide undulation but generally sloping towards the valley axes and ii) The upper parts are covered with dark reddish brown sandy loam to a depth of 2 m. Sheet erosion is the dominant erosion process
- iv) High accumulation terrace consists of red coloured alluvial deposits to a maximum of 45 m; The original surfaces are intact in some places but only denudational humps are left at other places covered with recent terrace deposits; Terrace is little influenced by accelerated erosion with severely eroded edges & short steep gullies retreating head ward.

- v) Curved out in the alluvial deposits of the middle accumulation terrace; Mostly formed by the lateral swing of the meandering rivers & appear to be local features; The terrace surfaces are little affected by accelerated erosion; Rills formed on geomorphological units above the terrace & discontinue when they reach the terraces producing thin, fanlike deposits on the terrace surface; Dongas rarely occur in the terrace and their growth does not proliferate into badlands as in the case of the accumulation glacia.
- b) Briefly summarize the sedimentary episodes of the Clarens formation (10 marks)