

NATIONAL UNIVERSITY OF LESOTHO
BSc. SUPPLEMENTARY EXAMINATIONS
ESC 1311: INTRODUCTION TO THE PHYSICAL ENVIRONMENTAL

AUGUST 2022

MARKS: 100

DURATION: 3 HOURS

This question paper consists of **TWO** pages; please see that you have **BOTH**

Answer **FOUR** questions. Answer at least one question from each section. Use **CLEAR** sketches and diagrams where appropriate.

SECTION A: LITHOSPHERE & BIOSPHERE

Question 1

- a) Define five (5) of the following terms (10)
- i. Extrusive rock
 - ii. Intrusive rock
 - iii. lithification
 - iv. Leaching
 - v. Plate boundary
 - vi. Weathering
 - vii. Ecosystem
 - viii. Autotrophs
 - ix. Heterotrophs
- b) Provide a fully labelled diagram of the internal structure of the earth. Your diagram should show layers based on both the chemical composition and physical properties. (15)
[25]

Question 2

- a) Explain, with the aid of a fully labelled diagram, the components of the ecosystem. (15)
- b) Draw a clearly labelled rock cycle (10)
[25]

SECTION B: ATMOSPHERE & HYDROSPHERE

Question 3

- c) Explain how and why the wet adiabatic lapse differs from the dry adiabatic lapse rate (5)
- d) The normal lapse rate is $6.5\text{ }^{\circ}\text{C}/\text{km}$. If the surface temperature is $24\text{ }^{\circ}\text{C}$, what is the air temperature at 12,000 m above Earth's surface? (4)
- e) As a follow-up to b) above, if an air parcel is rising from the ground following a dry adiabatic lapse rate of $9.8\text{ }^{\circ}\text{C}/\text{km}$, what would be the temperature of the rising air at 12,000m above the Earth's surface? In your answer also indicate whether the air parcel will be stable or unstable at 12,000km. Note that the condensation level is at 4,000 m above the surface. The saturated and dry adiabatic lapse rates are $5.5\text{ }^{\circ}\text{C}/\text{km}$ and $9.8\text{ }^{\circ}\text{C}/\text{km}$. (7)

- f) Draw the structure of the atmosphere with the layers clearly labelled showing in each layer, whether temperature increases or decreases. (9)
[25]

Question 4

- a) Define the following terms (10)
- i. Condensation nuclei
 - ii. Evaporation
 - iii. Infiltration
 - iv. Potential evapotranspiration
 - v. Adiabatic process.
- b) With the aid of a clearly labelled diagram of a water cycle, describe the processes by which water moves between the Earth's surface, subsurface and the atmosphere. (15)
[25]

SECTION C: MAPPING

Question 5

- a) A circle on the ground has an area of 9.065km^2 . The radius of this circle on a map of 1:500000 would be ____cm? (5)
- b) Draw the following polygons:
- i) 1 ha/ 10000m^2 at the scale of 1: 2000 (5)
 - ii) 3 ha / 30000m^2 scale of 1: 3000 (5)
- c) A rectangular field had an area of 64km^2 with one side having a length of 32km. What are the dimensions of this field on a 1:50000 map. (5)
- d) Define the term remote sensing (2)
- e) Outline the importance of converting geographic coordinates to Decimal Degrees in mapping (3)
[25]

Question 6

- a) Mpho's home is located at $27^{\circ}48'09.07''$ **East** and $29^{\circ}52'15.08''$ **South**. What are the **East** and **South** coordinates in Decimal Degrees format? (20)
- b) Draw the earth with the following clearly labelled [you can make the earth flat or round].
- a. Latitudinal lines with 10° intervals (3)
 - b. Longitudinal lines with 10° intervals (3)
 - c. Equator (1)
 - d. Prime meridian (3)
 - e. A point at 40° Latitude, 30° Longitude. (5)
- [25]