



UNIVERSITY OF ESWATINI
Faculty of Health Sciences
Department of Environmental Health Science

DEGREE IN ENVIRONMENTAL HEALTH SCIENCE

MAIN EXAMINATION PAPER DECEMBER 2019

TITLE OF PAPER	:	ENVIRONMENTAL CHEMISTRY
COURSE CODE	:	EHS201
DURATION	:	2 HOURS
MARKS	:	100
INSTRUCTIONS	:	READ THE QUESTIONS & INSTRUCTIONS CAREFULLY
	:	ANSWER QUESTION <u>ONE AND ANYOTHER THREE</u> QUESTIONS
	:	EACH QUESTION <u>CARRIES 25</u> MARKS.
	:	WRITE NEATLY & CLEARLY
	:	NO PAPER SHOULD BE BROUGHT INTO THE EXAMINATION ROOM.
	:	BEGIN EACH QUESTION ON A SEPARATE SHEET OF PAPER.

DO NOT OPEN THIS QUESTION PAPER UNTIL PERMISSION IS GRANTED BY THE INVIGILATOR.

QUESTION ONE

- a. In a tabular form, list the first three different spheres of the atmosphere and describe each sphere highlighting the changes in temperatures, chemical species, air movement, density, altitude, and pressure as one move from one sphere to the next starting from the Earth’s surface. [24 marks]

	1 st sphere	2 nd Sphere	3 rd Sphere
Name of sphere			
Temperature			
Chemical species			
Air movement			
Density			
Altitude			
Pressure			
Lapse rate			

- b. Write the value of the moist adiabatic lapse rate. [1 mark]

TOTAL 25 MARKS

QUESTION TWO

With the aid of balanced chemical equations, state and describe the aquatic chemistry of a reservoir. TOTAL 25 MARKS

QUESTION THREE

- a. Define soil and list its constituents [10 marks]
b. Explain the process of soil formation detailing the physical weathering processes that are involved. [15 marks]

TOTAL 25 MARKS

QUESTION FOUR

- a. Explain why atomic ions such as O⁺ and N⁺ predominate in the upper regions of the ionosphere whereas molecular ions such as O₂⁺ and NO⁺ predominate in the lower regions. [5 marks]
b. Explain what the following two reactions show about oxidation – reduction phenomena in water

i. $2\text{H}_2\text{O} + 2\text{e}^- \leftrightarrow \text{H}_{2(\text{g})} + 2\text{OH}^-$. [5 marks]
ii. $2\text{H}_2\text{O} \leftrightarrow \text{O}_{2(\text{g})} + 4\text{H}^+ + 4\text{e}^-$. [5 marks]
iii. How are they linked to pH in water? [5 marks]

- c. Explain what organic matter is and list four important aspects of organic matter in the soil. [5 marks]

TOTAL 25 MARKS

QUESTION FIVE

1. What does the acronym CEC stand for? [1 mark]
2. Define the CEC. [1 marks]
3. List five factors that determine CEC in soils [5 marks]
4. Define soil texture. [1 mark]
5. Phosphorus in soils can be available only under optimal pH conditions. Discuss this statement. [6 marks]

2. Draw the triatomic molecule of water and explain the origin of water's surface tension. How is this surface tension useful to the human life and other organisms living in water? 11 marks.

TOTAL 25 MARKS

END OF EXAMINATION