



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

DEGREE IN ENVIRONMENTAL HEALTH SCIENCE

**RE-SIT EXAMINATION PAPER JANUARY 2019**

TITLE OF PAPER : ENVIRONMENTAL CHEMISTRY

COURSE CODE : EHS201

DURATION : 2 HOURS

MARKS : 100

INSTRUCTIONS :

- READ THE QUESTIONS & INSTRUCTIONS CAREFULLY
- ANSWER **ANY FOUR** QUESTIONS
- EACH QUESTION **CARRIES 25** 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 <sup>st</sup> sphere	2 <sup>nd</sup> Sphere	3 <sup>rd</sup> 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. 25 marks.

TOTAL 25 MARKS

### QUESTION THREE

- a. Define soil and list its constituents (10 marks).  
b. Explain the process of soil formation detailing the chemical 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  $O_2^+$  and  $NO^+$  predominate in the lower regions. 5 marks.  
b. Explain what the following two reactions show about oxidation – reduction phenomena in water



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 pE 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. Discuss the sources, chemical reactions and environmental effects of the following substances in the atmosphere. Propose one way of controlling each of them.

b. Nitrogen oxides 7 marks.

c. Sulfur oxides 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?

12 marks.

**TOTAL 25 MARKS**