

UNIVERSITY OF SWAZILAND

Faculty of Health Sciences

Department of Environmental Health Science



DEGREE IN ENVIRONMENTAL HEALTH SCIENCE

MAIN EXAMINATION PAPER DECEMBER 2017

TITLE OF PAPER : ENVIRONMENTAL CHEMISTRY

COURSE CODE : EHS201

DURATION : 2 HOURS

MARKS : 100

INSTRUCTIONS : READ THE QUESTIONS & INSTRUCTIONS
CAREFULLY

: ANSWER QUESTIONS ONE AND ANY OTHER THREE
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

1. Give six (6) health impacts of Polychlorinated biphenyls. **(6 marks)**
2. Draw and label the structures of a Para-xylene, Ortho-xylene and Meta-xylene. **(6 marks)**
3. Name three chemical processes taking place in a lake and write their chemical equations. **(6marks)**
4. With the aid of balanced chemical equations, describe the formation of acid rain due to the combustion of coal. **(7 marks)**

TOTAL 25 MARKS

QUESTION TWO

1. It is said that, "when a mass of warm air rises from the earth's surface to higher altitudes, it expands adiabatically and becomes cooler". What do you understand by the terms *adiabatically* and *adiabatic lapse rate* **(4 marks)**
2. Explain why when water condenses from a rising air mass that had sufficient moisture, the cooling effect on the rising air is countered in the atmosphere. **(4 marks)**
3. List the values of the (a) and (b) below and explain why the two values differ. **(3 marks)**
 - a. Moist adiabatic lapse rate
 - b. Dry adiabatic lapse rate
4. It is said that "wind and air currents are strongly involved with air pollution phenomena". Discuss this statement. **(9 marks)**
5. Explain with the aid of drawings how topography influences the impact of air pollutants in a valley **(5 marks)**

TOTAL 25 MARKS

QUESTION THREE

- (a) Chemistry plays a central role in the life and health of all organisms. From the Environmental Health point of view, defend this statement. **(13 marks)**
- (b) There is a big concern about the use and misuse of chemical substances in as far as the environment is concerned. Discuss this statement **(12 marks)**

TOTAL 25 MARKS**QUESTION FOUR**

- (a) What does the abbreviation CEC stand for? **(1 mark)**
- (b) List three factors that determine CEC of soils. **(3 marks)**
- (c) Name the three types of weathering **(3 marks)**
- (d) Describe how biological, chemical and physical weathering contribute to the formation of soil **(12 marks)**
- (e) Describe how surface tension in water comes about and explain how it influences the chemistry of water **(6 marks)**

TOTAL 25 MARKS**QUESTION FIVE**

1. Balance the following chemical equations for the reactions that occur during chemical weathering
- a. Orthoclase + an acid + water to produce kaoline + silicic acid + potassium ions

**(3 marks)**

b. Kaoline +water to produce gibbsite + silicic acid



2. The table below shows elements in order of abundance in the earth's crust – being the approximately 32km – thick layer on the surface of the planet. Draw a table similar to this one on your answer booklet and fill in the oxides of these elements. (7 marks)

Element	Abundance (%)	Oxide	Abundance (%)
O	46.6	X	X
Si	27.2	-----	58.2
Al	8.13	-----	15.2
Fe	5.00	-----	7.2
Ca	3.63	-----	5.1
Na	2.83	-----	3.8
K	2.59	-----	3.1
Mg	2.09	-----	3.5

3. Consider a silt loam soil that has a particle density of 2.65g/mL and a bulk density of 1.50g/mL. Calculate the pore space in the soil. (5 marks)
4. Draw, label and write the contents of the different horizons of a soil profile. (8 marks)

TOTAL 25 MARKS