



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

DEGREE IN ENVIRONMENTAL HEALTH SCIENCE

FINAL EXAMINATION PAPER DECEMBER 2016

TITLE OF PAPER : ENVIRONMENTAL CHEMISTRY

COURSE CODE : EHS 201

DURATION : 2 HOURS

MARKS : 100

INSTRUCTIONS :

- : READ THE QUESTIONS & INSTRUCTIONS CAREFULLY
- : ANSWER **ANY FOUR** QUESTIONS
- : QUESTION **ONE** IS COMPULSORY
- : 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

Instruction: This is a multiple choice question carrying 25 marks. Write the question number on your answer script and write the letter of the correct answer next to it. Wrongly numbered questions and or unclear letters of the answer will be given a zero mark.

1. The correct sequence of layers of the atmosphere from the innermost to outermost is
 - (a) mesosphere-stratosphere-thermosphere-troposphere
 - (b) troposphere-stratosphere-mesosphere-thermosphere
 - (c) stratosphere-thermosphere-troposphere-mesosphere
 - (d) thermosphere-stratosphere-mesosphere-troposphere
2. Stratospheric ozone
 - (a) screens out ultraviolet radiation
 - (b) allowed the evolution of life on land
 - (c) prevents ozone formation in the troposphere
 - (d) all of these answers.
3. Human health depends on having
 - (a) low amounts of ozone in the stratosphere
 - (b) enough ozone in the stratosphere and little ozone in the troposphere
 - (c) high amounts of ozone in the troposphere and low amounts in the stratosphere
 - (d) high amounts of ozone in the troposphere and stratosphere.
4. Humans can disrupt earth's gaseous biogeochemical cycles through
 - (a) addition of carbon dioxide from combustion
 - (b) mining limestone
 - (c) emitting waste heat from air conditioners
 - (d) using mister systems to water crops

5. Ozone which contributes to the formation of smog is found in the
 - (a) troposphere
 - (b) mesosphere
 - (c) thermosphere
 - (d) stratosphere
6. All of the following describe soils that are vulnerable to acid deposition, **except**
 - (a) Thin soils
 - (b) Soils low in buffering ions
 - (c) Soils high in hydroxyl (OH⁻) ions
 - (d) Acidic soils
7. The major greenhouse gases include all of the following, **except**
 - (a) chlorofluorocarbons (CFCs)
 - (b) carbon dioxide and water vapour
 - (c) sulphur dioxide
 - (d) ozone and nitrous oxide.
8. Increased greenhouse gases originate from all of the following, **except**
 - (a) burning fossil fuels
 - (b) use of solar energy
 - (c) deforestation
 - (d) land fill emissions.
9. The threat to global warming can be addressed by all of the following, **except**
 - (a) using energy more efficiently
 - (b) halting deforestation
 - (c) slowing population growth
 - (d) Burning coal.
10. Nitrogen and sulfur oxides are examples of
 - (a) Respiratory disease causing inorganic pollutants
 - (b) oxygen-demanding waste pollutants
 - (c) organic plant nutrients
 - (d) Inorganic plant nutrients.

11. Each of the following is one of the major classes of outdoor pollutants, **except**
- (a) Carbon oxides
 - (b) Smog
 - (c) Nitrogen oxides
 - (d) Sulfur oxides
12. A thermal inversion is the result of
- (a) Precipitation
 - (b) Cold air drainage
 - (c) A lid of warm air on top of cooler, stagnant air
 - (d) A cold blanket of air that prevents warm air from rising
13. Which of the following areas would be least likely to have a temperature inversion?
- (a) An area near the coast
 - (b) An area in a flat land
 - (c) A valley surrounded by mountains
 - (d) The leeward side of a mountain range
14. Acid deposition is properly defined as the ----- deposition of ----- pollutants onto Earth's surface
- (a) Wet Secondary
 - (b) Dry secondary
 - (c) Wet and dry primary
 - (d) Wet and dry secondary
15. Acid deposition is best classified as a
- (a) Local problem
 - (b) District problem
 - (c) Regional problem
 - (d) National problem
16. Of the following strategies to reduce acid deposition, the least effective is ...
- (a) Removing sulfur from coal before it is burnt
 - (b) Reducing energy use
 - (c) Switching to natural gas
 - (d) Adding lime to neutralize the acids
17. Sources of carbon monoxide in the air include all of the following, **except**
- (a) Cigarette smoking
 - (b) Anaerobic respiration
 - (c) Motor vehicles
 - (d) Faulty heating systems

18. In this course we have learnt that, acid deposition can do all the following, **except**
- (a) Increase the mobility of toxic metals
 - (b) Kill many species of fish
 - (c) Damage statues, buildings, and car finishes
 - (d) Damage glass
19. The two predominant greenhouse gases in the troposphere are
- (a) Carbon dioxide and ozone
 - (b) Carbon dioxide and water vapor
 - (c) Nitrogen and water vapor
 - (d) Nitrous oxide and sulfur dioxide
20. Which of the following statements about the greenhouse effect is **false**?
- (a) The amount of heat trapped in the troposphere depends on concentrations of greenhouse gases
 - (b) The greenhouse effect is a new theory that explains the warming of the atmosphere
 - (c) Heat trapped by greenhouse gases keeps the planet warm enough for life
 - (d) The two predominant greenhouse gases are water vapor and carbon dioxide
21. All of the following greenhouse gases have increased in recent decades, **except**
- (a) Carbon dioxide
 - (b) Methane
 - (c) Water vapor
 - (d) Nitrous oxide
22. If the world climate changes due to global warming, we would expect more of all of the following, **except**
- (a) Droughts
 - (b) Hurricanes
 - (c) Prolonged heat waves
 - (d) Moderate weather conditions
23. A decrease in the ozone layer will cause an increase in all of the following, **except**
- (a) Skin cancers
 - (b) Yields of food crops
 - (c) Eye cataracts
 - (d) Suppression of the immune system

QUESTION THREE

- A. List eight unique properties of water and describe the importance of each of the properties you listed to life. (16 marks).
- B. Water is both a blessing and a curse to humanity. Discuss this statement under the following themes:
- Blessing (5 marks)
 - Curse (4 marks)

TOTAL 25 MARKS**QUESTION FOUR**

- A. List the **six chemical** and the **six physical** weathering processes (12 marks)
- B. What are the full names of the following chemical compounds? (7 marks)
- $(2\text{Fe}_2\text{O}_3 \cdot 3\text{H}_2\text{O})$
 - $(\text{CaSO}_4 \cdot 2\text{H}_2\text{O})$
 - $(\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2 \cdot 2\text{H}_2\text{O})$
 - $(\text{K}_2 \cdot \text{Al}_2\text{O}_3 \cdot 6\text{SiO}_2)$
 - (Fe_2O_3)
 - $(\text{CaMg}(\text{CO}_3)_2)$
 - (MgFeSiO_4)
- C. Describe the importance of organic matter in soil. (6 marks)

TOTAL 25 MARKS**QUESTION FIVE**

- A. What is the difference between a saturated and an unsaturated organic compound? (2 marks)
- B. Draw the structural formula for each of the following organic compounds (5 marks)
- 2-methylbutane
 - 2,5-dimethylhexane
 - 1,2-dichlorobenzene
 - 1,1-dichloroethylene
 - 3-ethyl-2-methylpentane

- C. Name three types of xylenes and draw their molecular structures. (9 marks)
- D. Describe the health effects of polychlorinated biphenyls (PCBs). (9 marks)

TOTAL 25 MARKS