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

DEGREE IN ENVIRONMENTAL HEALTH SCIENCE

MAIN EXAMINATION PAPER DECEMBER 2018

TITLE OF PAPER	:	ENVIRONMENTAL CHEMISTRY
COURSE CODE	:	EHS201
DURATION	:	2 HOURS
MARKS	:	100
INSTRUCTIONS	:	READ THE QUESTIONS & INSTRUCTIONS CAREFULLY
	:	ANSWER **QUESTION ONE AND ANY 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. Polar molecules attract one another by ------- leading to a
   A. Dipolar interaction between the +ve region of one molecule and the –ve region of another.
   B. Tri-polar interaction between the +ve region of one molecule and the –ve region of another.
   C. Mono-polar interaction between the +ve region of one molecule and the –ve region of another.
   D. Tetra-polar interaction between the +ve region of one molecule and the –ve region of another.
2. Ice that form at 0^0C, has about --- greater volume and a lower density than water.
   A. 40%
   B. 30%
   C. 20%
   D. 10%
3. Soil structure controls the size and amount of ---- associated with the aggregates.
   A. Pores.
   B. Clay minerals.
   C. Soil moisture.
   D. Organic matter.
4. Ozone which contributes to the formation of smog is found in the
   A.Mesosphere.
   B.Troposphere.
   C.Thermosphere.
   D.Stratosphere.
5. Human health problems closely associated with ozone depletion include all of the following except;
   A. Skin cancer.
   B. Eye cataracts.
   C. Increased incidence of heart disease.
   D. Suppression of the immune response.
6. All of the following are volatile organic compounds (VOCs) except
   A. Methane.
   B. Chlorofluorocarbon.
   C. Carbon monoxide.
   D. Benzene.
7. All of the following describe soils that are vulnerable to acid deposition except;-
   A. Thin.
   B. Low in buffering ions.
   C. Acidic.
   D. High in hydroxyl (OH^-) ions.
8. Water is a
   A. Diatomic molecule.
   B. Triatomic molecule.
   C. Monatomic molecule.
   D. Tetratomic molecule.

9. The water molecule has a V shape structure with a bond angle of
   A. 103^0
   B. 102^0
   C. 104^0
   D. 105^0
10. Below a temperature of --- degrees, the density of water starts to decrease.
   A. 0^0C
   B. 4^0C
   C. 100^0C
   D. 3^0C
11. The major biological source of dissolved oxygen in the water bodies is
   A. Decomposition of organic sediments in the water floor.
   B. Metabolic processes of organisms.
   C. Oxidation of sulfur by bacteria.
   D. Photosynthesis.
12. The main environmental effects of ozone depletion could include all of the following except
   A. Lower food crop production.
   B. Decreased concentration of CO_2 in the atmosphere.
   C. Disruption of food chains.
   D. Increased incidence of skin cancer.
13. The primary cause of earth's seasons is the
   A. Constant tilt of earth's rotational axis with respect to the plane of its orbit around the sun.
   B. Changing distance of earth from the sun at different times of the year.
   C. Periodic wobbling of earth on its axis of rotation.
   D. Periodic changes in solar energy output.
14. Although ozone in the stratosphere has been decreasing in recent years, ozone near the earth's surface is on the increase. This ozone near the surface is undesirable because it
   A. Absorbs ultraviolet light.
   B. Has a different chemical structure than stratospheric ozone.
   C. Is a strong oxidant and a respiratory irritant.
   D. Reacts with hydrocarbons to form chlorofluorocarbons.
15. Thermal inversion is a 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.
16. Gray-air smog comes from suspended particles of
   A. Carbon dioxide.
   B. Ammonium salts.
   C. Carbonic acid.
   D. Soot.

17. soil texture with moderate physical and chemical properties include
    A. Clay and silt.
    B. Sand and loam.
    C. Clay and loam.
    D. Silt and clay.
18. Which of the soils would most likely become waterlogged?
    A. Silt.
    B. Loam.
    C. Clay.
    D. Sand.
19. Sand has ----- permeability and ----- porosity
    A. High ..... High.
    B. High ..... Low.
    C. Low ..... high.
    D. Low ..... Low.
20. Physical properties of clay include good
    A. Nutrient-holding capacity.
    B. Water infiltration.
    C. Low porosity.
    D. Aeration.
21. Salt buildup on the soil
    A. Increases crop growth.
    B. Increases yield.
    C. Eventually kills weeds.
    D. Eventually makes the land unproductive.
22. People have often settled on floodplains because of the following reasons except;
    A. The soil is fertile.
    B. The flat surfaces are ideal for flooding.
    C. The surfaces are ideal for buildings and settlements.
    D. They want access to water for irrigation and transportation.
23. Which choice completes the sentence incorrectly? Cloud seeding
    A. Is most useful in very dry areas.
    B. Could change regional rainfall patterns.
    C. Could introduce large amounts of cloud-seeding chemicals into natural ecosystems.
    D. Is impeded by legal disputes.
24. To help protect the ozone layer, individuals should do all of the following <u>except</u>
    A. Avoid purchasing products that contain CFCs.
    B. Buy halon fire extinguishers.
    C. Pressure legislators to ban all uses of CFCs, halons, and methyl bromide.
    D. Buy new refrigerators that use vacuum insulation and helium as a coolant.
25. Which of the following statements is <u>false</u>?
    A. The formation of the ozone layer enabled life on land to evolve.
    B. CFCs are odorless and stable.
    C. CFCs are nonflammable, nontoxic, and noncorrosive.
    D. Fluorine atoms are most responsible for the breakdown of ozone to molecular oxygen.

QUESTION TWO

A. Draw and label a soil profile and describe the composition of the top three layers of the profile. 13 marks.
B. With the aid of balanced chemical equation(s), describe the process of soil formation through oxidation. 12 marks.

Total 25 marks

QUESTION THREE

A. The atmosphere is one of the important life support systems of the Earth. However, in our endeavor to improve our quality of life, we are believed to be deteriorating its role in supporting life. Describe how we are destroying the atmosphere through our daily activities. 6 marks.
B. List three major and two minor constituents of the atmosphere. 5 marks.
C. Name and describe the importance of the first two layers of the atmosphere (from the earth surface) in supporting life on earth. 14 marks.

Total 25 marks

QUESTION FOUR

A. Briefly describe how civilization and water are related. 11 marks.
B. Compare the amounts of
    I. Salt water and fresh water. 2 marks
    II. Frozen water and water available for human consumption. 2 marks.
C. In details describe how the use of water resources in Swaziland is affecting the chemistry of natural water. 10 marks.

TOTAL 25 MARKS

QUESTION FIVE

A. Chemistry plays a central role in the life and health of all organisms. From an Environmental Health perspective, defend this statement. 13 marks.
B. Why is there concern regarding the use and misuse of chemicals as far as the environment is concerned? 12 marks.

TOTAL 25 MARKS