



UNIVERSITY OF SWAZILAND
Faculty of Health Science

Department of Environmental Health
Sciences

Final Examination 2007

TITLE OF PAPER : ENVIRONMENTAL CHEMISTRY
COURSE CODE : EHS 401
DURATION : 3 HOURS
MARKS : 100
INSTRUCTIONS : ANSWER ANY FIVE QUESTIONS
: QUESTIONS ONE AND TWO ARE COMPULSORY
: EACH QUESTION CARRIES 20 MARKS
: NO PAPER SHOULD BE BROUGHT INTO NOR OUT
OF THE EXAMINATION ROOM
: BEGIN EACH QUESTION ON A SEPARATE SHEET
OF PAPER

DO NOT OPEN THE QUESTION PAPER UNTIL PERMISSION HAS BEEN
GRANTED BY THE INVIGILATOR.

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QUESTION ONE

- (1) Soil is developed most directly through
 - a. Moving tectonic plates
 - b. Earthquakes
 - c. Weathering
 - d. Mass wasting

- (2) A cross-sectional view of the ----- in a soil is properly termed a -----
 - a. Horizons profile
 - b. Horizons Sample
 - c. Profilesample
 - d. Surface litter Sample

- (3) The soil layer containing unique colors and often iron, aluminium, humus, and clay leached from higher layers is the
 - a. parent material
 - b. zone of leaching
 - c. subsoil
 - d. topsoil

- (4) The dissolving of material from the upper layers of the soil and its movement to lower horizons is called
 - a. percolation
 - b. weathering
 - c. accumulation
 - d. leaching

- (5) Soil texture most directly determines
 - a. porosity
 - b. pH
 - c. color
 - d. nutrient content

- (6) During acid deposition and infiltration, the replacement of some ions attached to mineral particles by hydrogen ions can result in
 - a. Increased crop growth
 - b. Less vulnerability to drought, disease, and pests
 - c. Decreased soil fertility
 - d. Increased tree growth

- (7) The atmosphere is divided into spherical layers based upon the
- density of each layer
 - concentration of ozone in each layer
 - temperature changes from variations in absorption of solar energy
 - concentration of oxygen in each layer
- (8) All the following are volatile organic compounds except
- carbon monoxide
 - chlorofluorocarbon
 - methane
 - benzene
- (9) You are enjoying a sunny day in Mbabane. In the late afternoon, your respiratory tract becomes irritated. Of the following substances, the one least likely to be causing your problem is
- PANS
 - Aldehydes
 - Ozone
 - Carbon dioxide
- (10) Chronic exposure of tree leaves and needles to air pollutants can
- Cause a waxy coating to build up
 - Increase uptake of nutrients
 - Cause leaves or needles to turn bright red and drop off
 - Increase the chances of damage from diseases, pests, drought, and frost
- (11) Human health problems closely associated with ozone depletion include all of the following except
- Skin cancer
 - Eye cataracts
 - Increased incidence of heart disease
 - Suppression of the immune response
- (12) Which of the following is most likely to become biologically magnified in the food chain?
- DDT
 - Parathion
 - Paraquat
 - Malathion
- (13) Water is a molecule
- Diatomic
 - Triatomic
 - Monatomic
 - Tetraatomic

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- (14) Oxidation – Reduction reactions in water are brought about by all of the following except
- Bacterial activity
 - Electron activity
 - Complexation
 - Neutralization
- (15) The following species are responsible for alkalinity in water except
- H₂PO₄ ion and H₂S
 - CO₃ ions and organic acids
 - OH ions and NH₃
 - HCO₃ ions and NH₃
- (16) The following are health effects of Polybrominated biphenyls except
- Atrophy of the thymus and tumor promotion
 - Decrease in antibody production and suppression of the natural immune system
 - Birth defects and gastric disorders
 - Fatigue and loss of memory
- (17) The following are properties of plastics except
- Have a high dielectric constant and a low vapor pressure
 - Easily molded and an excellent electrical insulator
 - Does not corrode and is tough
 - Not affected by weather and durable
- (18) Which of the following gives the correct categories of surfactants
- hydrophilic, anionic, hydrophobic, and cationic
 - cationic, anionic, nonionic, and amphoteric
 - hydrophobic, nonionic, anionic, and amphoteric
 - anionic, cationic, nonionic, and hydrophilic
- (19) Which of the following list of some of the ingredients found in a typical toothpaste formulation is not correct?
- Abrasive, sweetener, fluoride, and perfume
 - Abrasive, fluoride, surfactant, and thickener
 - Surfactant, flavoring, sweetener, and water
 - Thickener, water, surfactant, and flavoring
- (20) A thermal inversion is a result of
- Precipitation
 - Cold front
 - A lid of warm air on top of cooler, stagnant air
 - A lid of cold air on top of warmer air that prevents the warm air from rising

Total 20 marks

QUESTION TWO

- (a) List the different strata of the atmosphere (5 marks)
- (b) Describe the first two strata from the earth's surface and indicate their importance. (10 marks)
- (c) Discuss the concept of temperature inversions with clear reference to the mixing depth (5 marks)

Total 20 marks

QUESTION THREE

Evaluate the human health implications of the following chemical species in the environment

- (a) Lead (5 marks)
- (b) Mercury (5 marks)
- (c) Asbestos (5 marks)
- (d) Nitrogen Oxides (5 marks)

Total 20 marks

QUESTION FOUR

- (a) What are the differences between a surfactant and a detergent? (2 marks)
- (b) Discuss the differences between shampoos and toothpastes (10 marks)
- (c) Differentiate between soft water and hard water (2 marks)
- (d) Describe how permanent hardness of water can be removed (6 marks)

Total 20 marks

QUESTION FIVE

- (a) Draw the structure of DDT (2 marks)
- (b) List four properties and six classes of pesticides (10 marks)
- (c) Discuss the processes by which pesticides can be retained and those that encourage their loss in the soil (8 marks)

Total 20 marks

QUESTION SIX

- (a) Distinguish between dry adiabatic lapse rate and moist adiabatic lapse rate and give the numerical figures of each. (4marks)
- (b) Evaluate the differences including the atmospheric manifestations between a cold front and a warm front. (6 marks)
- (c) Discuss the significance of soil texture in the environmental chemistry of soil. (10 marks)

Total 20 marks

Good Luck !!!