

UNIVERSITY OF SWAZILAND

Faculty of Health Sciences

(BSC) IN ENVIRONMENTAL HEALTH

FIRST SEMESTER FINAL EXAMINATION PAPER 2007

TITLE OF PAPER: **ENVIRONMENTAL CHEMISTRY 1**

COURSE CODE : **EHS 413**

DURATION : **TWO HOURS**

MARKS : **100**

INSTRUCTIONS : **ANSWER ONLY FOUR QUESTIONS.**

: **EACH QUESTION CARRY 25 MARKS.**

: **QUESTIONS ONE AND TWO ARE COMPULSARY.**

: **NO QUESTION PAPER SHOULD BE BROUGHT INTO NOR
OUT OF 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.

155

QUESTION ONE

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

2. Soil is a complex mixture of
 - a. Mineral nutrients.
 - b. Eroded rock
 - c. air and water
 - d. All the above

3. The zones that compose a mature soil are known as
 - a. Strata.
 - b. Profiles.
 - c. Horizons.
 - d. Laminae.

4. The soil surface litter horizon is described by the letter
 - a. A.
 - b. B.
 - c. C.
 - d. O.

5. The --- horizon of a soil contains no organic material and is composed of parent material
 - a. A.
 - b. B.
 - c. C.
 - d. O.

6. Topsoil contains all of the following *except*
 - a. plant roots
 - b. humus
 - c. freshly fallen leaves
 - d. some inorganic minerals

7. As it is weathered, ----- gives the C – horizon
 - a. Parent material.
 - b. Leaching.
 - c. Subsoil
 - d. Bedrock.

8. The dissolving of material from the upper layers of the soil and its movement to lower horizons is called
- percolation
 - Leaching
 - Eluviation
 - Illuviation
9. Red and yellow colours in a soil horizon usually indicate a
- High percentage of sand.
 - High percentage of lime and gypsum.
 - Lack of iron oxide.
 - Low organic matter content.
10. You send up a weather balloon that monitors temperature changes in the atmosphere. Initially, the temperature drops as the balloon rises. Suddenly, there is a reversal and the temperature starts to rise. This boundary would be the
- Tropopause
 - Stratopause
 - Minipause
 - Mesopause
11. The troposphere differs from the stratosphere in that it has
- 1,000 times less oxygen by volume.
 - 1,000 times more ozone by volume.
 - 1,000 times less ozone by volume.
 - 1,000 times more nitrogen.
12. Photochemical smog is formed when primary pollutants interact with
- Sunlight.
 - Water vapor.
 - Sulfur dioxide.
 - Oxygen.
13. Photochemical smog generally requires the presence of the following *except*
- Nitrogen oxides
 - Sunlight.
 - Volatile organic compounds
 - Carbondioxide
14. You are enjoying a sunny day in Matsapha. 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.
 - Carbondioxide.

15. Which of the following strategies would help protect the atmosphere?
- Use a city-by-city rather than regional approach to air quality control.
 - Shift from renewable to more efficient nonrenewable energy resources.
 - Integrate air pollution, water pollution, energy, land-use, and population regulation policies.
 - Exclude social costs of air pollution from strategies.
16. Which of the following is not a property of water?
- Liquid water changes temperature very quickly.
 - Water is an important solvent.
 - Water expands when it freezes.
 - Water can filter UV light.
17. Increased greenhouse gases originate from all the below except.
- Burning fossil fuels.
 - Use of CFCs.
 - Deforestation.
 - Emission of too much nitrogen oxides.
18. Inorganic nitrogen-containing ions are converted into organic molecules through
- Assimilation.
 - Nitrification.
 - Nitrogen fixation.
 - Denitrification.
19. Ammonium ions are converted to nitrite ions and nitrate ions through the process of
- Nitrification.
 - Nitrogen fixation.
 - Denitrification.
 - Assimilation.
20. Humans add sulfur to the atmosphere by all the following *except*,
- Refining petroleum
 - Smelting sulfur compounds or metallic minerals
 - Burning sulfur-containing coal and oil
 - Burning natural gas
21. You look up at the sky and observe a giant thunderhead. You predict the arrival of
- Warm front.
 - Cold front.
 - Hurricane.
 - Typhoon.
22. During an El Nino-Southern Oscillation (ENSO),
- Prevailing easterly winds weaken.

- b. Surface water along the South and North American coasts becomes cooler.
 - c. Upwellings of cold, nutrient-rich water are suppressed.
 - d. Upwellings of warm, nutrient-poor water are suppressed.
23. A soil sample that is alkaline, dark, and rich in humus probably came from a
- a. Coniferous forest.
 - b. Deciduous forest.
 - c. Tropical forest
 - d. Grassland soil.
24. Soil texture most directly determines
- a. Porosity.
 - b. pH
 - c. Colour.
 - d. Nutrient content.
25. Which of the following types of soils has the least pore space?
- a. Silt.
 - b. Loam.
 - c. Sand.
 - d. Clay.

Total 25 Marks.

QUESTION TWO

1. Briefly describe the structure of water (2 marks)
2. Describe the heat capacity of water and elaborate on the importance of this property of water? (4 mark)
3. Explain the role played by acid-base reactions on dissolved species in water. (5 marks)
4. Discuss the causes of hardness in water. (2 mark)
5. List the types of hardness in water and for each elaborate on the chemical species that cause it? (4 marks)
6. Explain the ways of removal of hardness in water? (4 marks)
7. What are the disadvantages of hard water (4 marks).

Total 25 Marks.

QUESTION THREE

1. Describe soil CEC and how it contributes to soil fertility (6 marks).
 - a. What four factors determine CEC? (4 marks).
 - b. Describe the role of organic matter in the soil. (5 marks).
2. Describe the problems of
 - a. Salinization (5 marks) and
 - b. Waterlogging (5 marks) of soils and how they can each be controlled.

Total 25 Marks

QUESTION FOUR

1. Briefly explain the technological remediation of soil using the insitumobilization of the contaminants (10 marks).
2. Describe a healthy soil. In so doing, be sure to refer to soil texture, porosity, and acidity (15 marks).

Total 25 Marks.

QUESTION FIVE

With the aid of a labeled diagram and balanced chemical equations, discuss the chemistry of an aquatic ecosystem.

Total 25 Marks.

GOOD LUCK!!!!!!