

UNIVERSITY OF SWAZILAND

Faculty of Health Sciences

(BSC) IN ENVIRONMENTAL HEALTH

FIRST SEMESTER FINAL EXAMINATION PAPER DECEMBER 2009

TITLE OF PAPER : ENVIRONMENTAL CHEMISTRY 1

COURSE CODE : EHS 413

DURATION : TWO HOURS

MARKS : 100

INSTRUCTIONS :

- : ANSWER ONLY FOUR QUESTIONS
- : EACH QUESTION CARRIES 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

QUESTION ONE

1. Which of the following is not a constituent of topsoil?
 - a. Plant roots
 - b. Humus
 - c. Freshly fallen leaves
 - d. Inorganic minerals

2. Soil texture mostly directly determines
 - a. Porosity
 - b. pH
 - c. color
 - d. nutrient content

3. The atmospheric layer containing 75% of the mass of Earth's air is the
 - a. Thermosphere
 - b. Mesosphere
 - c. Stratosphere
 - d. Troposphere

4. Most of the Earth's weather occurs in the
 - a. Troposphere
 - b. Thermosphere
 - c. Mesosphere
 - d. Stratosphere

5. The troposphere differs from stratosphere in that it has
 - a. 1,000 times less oxygen by volume
 - b. 1,000 times more ozone by volume
 - c. 1,000 times less ozone by volume
 - d. 1,000 times more nitrogen

6. There is evidence that humans are ----- ozone in the troposphere and ----- ozone in the stratosphere
 - a. Increasing ... increasing
 - b. Increasing ... decreasing
 - c. Decreasing ... decreasing
 - d. Decreasing ... increasing

7. Which of the following is not a photochemical oxidant?
 - a. Dioxin
 - b. Hydrogen peroxide
 - c. Peroxyacyl nitrates (PANs)
 - d. Ozone

8. Which of the following is not a suspended particulate matter in the atmosphere?
- Dust and soot
 - Pesticides
 - Sulfuric acid
 - Chlorofluorocarbons
9. Photochemical smog is formed when primary pollutants interact with
- Nitrogen dioxide
 - Sunlight
 - Sulphur dioxide
 - Oxygen
10. Photochemical smog does not generally require the presence of
- nitrogen oxides
 - sunlight
 - volatile organic compounds
 - carbon dioxide
11. You are enjoying a sunny day at Big Bend near the USA Distillery. 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 monoxide
12. The frequency and severity of smog in an area depends least upon the
- Local climate and topography
 - Fuels used in industry, heating, and transportation
 - Size of ozone hole over the Arctic
 - Density of population
13. Which of the following statements is true?
- Thermal inversion occurs when a layer of cold air prevents warm air from rising
 - Thermal inversions exacerbate pollution problem
 - Thermal inversions last only a few minutes to hours
 - Normally, cool air near earth's surface expands and rises, carrying pollutants higher into the troposphere.
14. Which of the following areas in Swaziland would be least likely to have a temperature inversion?
- An area on top of a mountain
 - An area in the windward side of the mountain
 - An area in the valley surrounded by mountains
 - An area on the leeward side of a mountain

15. Respiratory illnesses in Swaziland are most likely to be caused by
- Formaldehyde
 - Cigarette smoke
 - Particulate matter
 - Asbestos
16. Which of the following processes is most directly involved in soil formation?
- Moving of tectonic plates
 - Earthquakes
 - Weathering
 - Mass wasting
17. The soil layer containing unique colors and often iron, aluminum, humus, and clay leached from higher layers is the
- Parent material
 - Zone of leaching
 - Subsoil
 - Topsoil
18. The dissolving of materials from the upper layers of the soil and its movement to lower horizons is called
- percolation
 - eluviation
 - iluviation
 - leaching
19. Red and yellow colors 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
20. Which of the following is not a particle size used to determine soil texture?
- Silt
 - Loam
 - Clay
 - Sand
21. Alkaline soil can be neutralized or made more acid by adding
- Sulfur
 - Calcium
 - Phosphates
 - Sodium

22. 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
23. Throughout the world, most water is used for
- Irrigation
 - Industrial processes
 - Needs of animals and humans
 - Transportation
24. Which of the following is not a soil physical property?
- Texture,
 - Porosity,
 - Ion exchange,
 - Consistence
25. Which of the following is not one of the major aquatic chemical processes?
- Photosynthesis
 - REDOX
 - Microbial action
 - Sedimentation

TOTAL 25 MARKS

QUESTION TWO

- Describe the process of temperature inversion and explain how this would influence the movement and chemistry of pollutant in a localized area (8 marks)
- Explain the process of ion exchange in soils (10 marks)
- Discuss the concept of the ozone hole (7 marks)

TOTAL 25 MARKS

QUESTION THREE

- List *five* physical and *three* chemical properties of soil (8 marks)
- There are several ways that can contribute to soil degradation. Briefly describe how chemical degradation can contribute to the degradation of soils (12 marks)
- How can these problems of chemical degradation of soil be corrected? (5 marks)

TOTAL 25 MARKS

QUESTION FOUR

- a. What is photochemical reaction (1 mark)?
- b. List seven types of chemical Species involved in photochemistry and give two examples of each (21 marks).
- c. There are several ways in which the excited species in photochemical reactions lose energy. Explain with the aid of a balanced chemical reaction, how, chemiluminescence help these species to lose their energy of excitation (3 marks)

TOTAL 25 MARKS

QUESTION FIVE

- a. Describe the structure of water (4 marks)
- b. Discuss the occurrence and the important role played by chelating agents in water (6 marks)
- c. Explain with aid of balanced equations, how, oxidation-reduction reactions affect the chemistry of dissolved species in water? (10 marks)
- d. Microscopically small single-celled microorganisms, consisting of bacteria, fungi, and algae are of the utmost importance in water for a number of reasons. Discuss these reasons (5 marks).

TOTAL 25 MARKS