

UNIVERSITY OF SWAZILAND
Faculty of Health Sciences

BSC IN ENVIRONMENTAL HEALTH SCIENCE

SECOND SEMESTER FINAL EXAMINATION PAPER MAY 2012

TITLE OF PAPER : ENVIRONMENTAL CHEMISTRY

COURSE CODE: EHM104

DURATION : TWO HOURS

MARKS : 100

INSTRUCTIONS :

- : ANSWER ONLY FOUR QUESTIONS
- : EACH QUESTION CARRIES 25 MARKS
- : QUESTIONS ONE, TWO AND THREE ARE COMPULSORY
- : NO QUESTION 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. One of the sources of carbon monoxide is tobacco smoking. Which one of the following suggestions would least likely to reduce the health risks of smoking?
 - A. Legalize the sale of tobacco products to all age groups
 - B. Ban cigarette vending machines
 - C. Eliminate federal subsidies to tobacco farmers and companies
 - D. Ban cigarette advertising
2. Which of the following elements constitutes the highest percentage of mass in Earth's crust?
 - A. Oxygen
 - B. Aluminium
 - C. Carbon
 - D. Potassium
3. All of the following gases have been implicated in contributing to the increase in global temperatures via the greenhouse effect except
 - A. O_2
 - B. CH_4
 - C. N_2O
 - D. CO_2
4. The most abundant gas in the Earth's atmosphere is
 - A. Oxygen
 - B. Nitrogen
 - C. Water vapor
 - D. Carbon dioxide
5. All of the following substances are derived from petroleum except
 - A. Asphalt
 - B. Dichlorodiphenyltetrachloroethane
 - C. Cellulose
 - D. Polystyrene

6. Which of the following substances is released by chlorofluorocarbons and catalyzes a chain reaction that breaks down ozone in the upper atmosphere?
- A. Carbon monoxide
 - B. Carbon dioxide
 - C. Chlorine
 - D. Sulfur dioxide
7. 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
8. The main environmental effects of ozone depletion could include all of the following except
- A. Lower food crop production
 - B. Decreased concentration of CO₂ in the atmosphere
 - C. Disruption of food chains
 - D. Increased incidence of skin cancer
9. 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
10. Elements that cycle in the environment and that also has a gaseous phase at some point in their cycle include which of the following?
- A. Carbon
 - B. Sulfur
 - C. Carbon and phosphorus
 - D. Carbon and sulfur

11. 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
12. In models of global warming, the most important factor contributing to an increase in sea level is
- A. Thermal expansion of the oceans
 - B. Increased precipitation
 - C. Decreased evaporation
 - D. Growth of the polar ice caps
13. Which of the following best explains why Dichlorodiphenyltetrachloroethane has been found in human breast milk?
- A. Chemicals used in one region of earth can circulate in the biosphere and affect organisms in a distant region
 - B. The large number of penguins in Antarctica has resulted in a depletion of their preferred foods
 - C. Chemicals like DDT are volatile and eventually make their way to the ozone layer
 - D. Because penguins incubate their eggs on land, the eggs are exposed to DDT
14. Approximately what percentage of the water on earth is freshwater?
- A. 75%
 - B. 25%
 - C. 0.25%
 - D. 0.025%

15. Which of the following best describes the mechanism of the greenhouse effect in earth's atmosphere?
- A. Ultraviolet radiation from the sun is absorbed by ozone gas in the stratosphere
 - B. Cosmic radiation from deep space is absorbed by gases in the atmosphere
 - C. Gamma radiation from the sun is absorbed at ground level by dust particles in the atmosphere
 - D. Infrared radiation from earth's surface is absorbed by gases in the atmosphere
16. *El Nino*, a periodic warming of ocean surface waters, occurs in which of the following regions?
- A. Tropical East Pacific Ocean
 - B. Gulf of Mexico
 - C. Tropical Indian Ocean
 - D. Temperate West Atlantic Ocean
17. Which of the following procedures would be best for remediating the effects of soil salinization?
- A. Application of broad-spectrum biocides to kill microorganisms
 - B. Application of clay to increase soil water-holding capacity
 - C. Addition of large amounts of water to leach out salts
 - D. Addition of lime to raise soil pH
18. Which of the following chemical substance can cause a decrease in the penis size and the opposite in females?
- A. Dichlorodiphenyltetrachloroethane
 - B. Tetrachlorodibenzo-p-dioxin
 - C. Polybrominatedbiphenyls
 - D. Polychlorinatedbiphenyls
19. All of the following are petrochemical oxidants except
- A. Dioxin
 - B. Hydrogen peroxide
 - C. Peroxyacyl nitrates (PANs)
 - D. Aldehydes such as formaldehyde

20. All of the following are volatile organic compounds (VOCs) except
- A. methane
 - B. chlorofluorocarbon
 - C. carbon monoxide
 - D. benzene
21. All of the following are suspended particles except
- A. dust and soot
 - B. pesticides
 - C. sulfuric acid
 - D. chlorofluorocarbons
22. 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
23. Gray-air smog comes from suspended particles of
- A. carbon dioxide
 - B. ammonium salts
 - C. carbonic acid
 - D. soot
24. Exposure to indoor formaldehyde pollution is likely to cause
- A. ulcers
 - B. Headaches
 - C. Chronic breathing problems
 - D. Dizziness
25. Furniture stuffing, paneling, particle board, and foam insulation may be sources of
- A. Chloroform
 - B. Formaldehyde
 - C. Carbon monoxide
 - D. Asbestos

TOTAL 25 MARKS

QUESTION TWO

For question two, respond by stating the letter of the question, Roman numeral, and your answers E.g. D (i) Vinyl chloride; or E (ii) DDT; etc.

A. Why is it that at very high altitudes, normally reactive species such as atomic oxygen, O, persist for long periods of time? (i)----- . The fact that hydrogen has not been lost to outer space from Earth's atmosphere is due to the existence of (ii)----- . The existence of the ionosphere is due to the action of (iii)----- under conditions of (iv)----- . Air masses move from regions of (v)----- to regions of (vi)----- . An atmospheric condition that is particularly important for air pollution and sometimes affected by topography is that of (vii)----- . (7 marks).

B. The most important unique properties of water that largely determine its environmental chemical behavior are (i) -----, (ii) -----, (iii) -----, (iv) -----, (v) -----, (vi) -----, (vii) -----, (viii) ----- . The ability of solutes in water to neutralize added strong acids is called (ix) ----- and water hardness is due mostly to the presence of (x)----- while for water near neutral pH, the major contributor to alkalinity is (xi) ----- . (11 marks)

C. In as far as plant life and growth is concerned, the most important layer of soil is the (i)----- which consists of (ii)----- (iii)----- and (iv)----- . The most common indicator of soil formation from parent rocks consists of (v)----- . The reaction $\text{MnO}_2 + 4\text{H}^+ + 2\text{e}^- \rightarrow \text{Mn}^{2+} + 2\text{H}_2\text{O}$, indicates that the soil is (vi)----- which one function does organic matter perform in the soil? (vii) -----

TOTAL 25 MARKS

QUESTION THREE

Describe the origin of the earth under the following sub-headings

1. the big bang concept (6 marks)
2. formation of the crust and atmosphere (7 marks)
3. The origin of life and evolution of the atmosphere (12 marks)

TOTAL 25 MARKS

QUESTION FOUR

Discuss DDT under the following sub-themes:

1. origin (5 marks)
2. manufacture and molecular structure (draw) (8 marks)
3. health effects (6 marks)
4. environmental effects (6 marks)

TOTAL 25 MARKS

QUESTION FIVE

Describe the following plastics;

1. thermoplastics (5 marks)
2. thermosetting (5 marks)
3. environmental problems (8 marks)
4. remedy for plastic problems (7 marks)

TOTAL 25 MARKS