

UNIVERSITY OF SWAZILAND

Faculty of Health Sciences

(BSC) IN ENVIRONMENTAL HEALTH

SECOND SEMESTER FINAL EXAMINATION PAPER MAY 2010

TITLE OF PAPER : ENVIRONMENTAL CHEMISTRY11

COURSE CODE : EHS 414

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

Question one is a multiple choice. Answer by writing the letter to the correct answer besides the number of the question e.g. 26. C.

1. A hydrocarbon from conifer trees that is 9000 times as reactive is
 - (a) Pinene
 - (b) β -pinene
 - (c) α -pinene
 - (d) γ -pinene
2. The fate of H_2S that does get into the atmosphere is that it is
 - (a) Converted to H_2O
 - (b) Converted to SO_2
 - (c) Converted to H_2SO_4
 - (d) Converted to NH_3
3. Broad-spectrum pesticides may increase the number of pest species through
 - (a) development of genetic resistance
 - (b) killing of predators of the pest species
 - (c) killing of parasites that may have kept the population of pest low.
 - (d) All of the above
4. Atmospheric aerosols are
 - (a) solid or liquid particles smaller than $100\mu\text{m}$
 - (b) solid or liquid smaller than $1000\mu\text{m}$
 - (c) liquid or gas particles smaller than $100\mu\text{m}$
 - (d) liquid, solid or gas particles
5. Today, major classes of insecticides include all the following except
 - (a) Botanicals
 - (b) Organophosphates
 - (c) Bromated hydrocarbons
 - (d) Carbamates
6. A reactive species that is especially important at night is
 - (a) Hydrogen
 - (b) Hydroxyl
 - (c) Nitrate radical
 - (d) Hydroperoxy radical
7. An organohalide that is a known human carcinogen is
 - (a) Vinyl chloride
 - (b) PCBs
 - (c) PBBs
 - (d) Perspex

8. Compounds with an oxygen atom bridging between two carbons are
- (a) Oxides
 - (b) Organic acids
 - (c) Aldehydes
 - (d) Ethers
9. The toxic metal of greatest concern in the urban atmosphere is
- (a) Mercury
 - (b) Cadmium
 - (c) Lead
 - (d) Uranium
10. Two specific gaseous fluorine-containing air pollutants are
- (a) Fluorine gas and hydrogen fluoride
 - (b) Fluorine and hydrogen sulfide
 - (c) Fluorine and hydrogen chloride
 - (d) Fluorine and water vapor.
11. In diverse ecosystems, populations of species are least likely to be kept under control by
- (a) Pesticide
 - (b) Parasites
 - (c) Disease organisms
 - (d) Predators
12. Which of the following would be used to kill rats and mites
- (a) Herbicides
 - (b) Rodenticides
 - (c) Insecticides
 - (d) Fungicides
13. Aldrin, dieldrin, endrin, lindane, DDT, and mirex are examples of
- (a) Pyrethroids
 - (b) Chlorinated hydrocarbons
 - (c) Carbamates
 - (d) Organophosphates
14. Farm workers in developing countries are especially vulnerable to pesticide poisoning for all of the following reasons except
- (a) Few warnings
 - (b) Little use of protective equipment
 - (c) A gene pool particularly susceptible to pesticides
 - (d) Predominantly hand-application of pesticides

15. Insect control by sterilization involves irradiating
- (a) Eggs
 - (b) Males
 - (c) Females
 - (d) Larvae
16. A pheromone is
- (a) A new form of chemical insecticide waiting approval by authorities
 - (b) A strong herbicide
 - (c) A species-specific chemical sex attractant
 - (d) A bloodstream chemical that controls an organism's growth and development.
17. All of the following are volatile organic compounds (VOCs) except
- (a) methane
 - (b) chlorofluorocarbon
 - (c) carbon monoxide
 - (d) benzene
18. All of the following are photochemical oxidants except
- (a) dioxin
 - (b) hydrogen peroxide
 - (c) peroxyacyl nitrates (PANs)
 - (d) benzene
19. Much of the sulfur and nitrogen that enter the atmosphere end up converted to
- (a) Sulfonic acid and nitric acid
 - (b) Sulfuric acid and nitric acid
 - (c) Sulfates and nitrates radicals
 - (d) Sulfuric acid and nitrous acid
20. The least reactive common hydrocarbon is
- (a) Butane
 - (b) Propane
 - (c) Ethane
 - (d) Methane
21. Ozone adversely affects rubber by
- (a) Aging
 - (b) Cracking and aging
 - (c) Charring
 - (d) Darkening

22. The three major classes of pollutant hydrocarbons are
- Alkanes, alkenes and alkynes
 - Alkanes, alkenes, and cyclic hydrocarbons
 - Alkanes, alkenes, and aromatic compounds
 - Alkanes, alkenes, and halogenated hydrocarbons
23. Soap is manufactured through the process of
- Esterification
 - Saponification
 - Oxidation
 - Alkylation
24. Soaps have two poles. These are
- Hydrophobic and hydrophilic
 - Hydrophobic and organic
 - Cationic and ionic
 - Neutral and charged
25. Marine aerosols and incineration of organic polymer wastes produces
- Al and Cl
 - Na and Cl
 - K and Cl
 - Br and Cl

TOTAL 25 MARKS

QUESTION TWO

Enumerate the sources and explain the biochemical effects of the following:

- Carbon monoxide (5 marks)
- Nitrogen dioxide (5 marks)
- Sulphur dioxide (5 marks)
- Hydrogen sulfide (5 marks)
- Hydrogen fluoride (5 marks)

TOTAL 25 MARKS

QUESTION THREE

- What chemical property(s) of chlorofluorocarbons (CFCs) made them particularly well adapted to their widespread use in the past, and why was this same property a major reason behind their being banned? (5 marks)
- Name an alternative to CFCs and give four example (5 marks)

3. It has been mentioned in this course that, much of the NO_x and SO_x entering the atmosphere are converted to HNO_3 and H_2SO_4 respectively. Explain with the aid of balanced chemical equations how SO_x can lead to the formation of acid rain and how this can be controlled. What are the consequences of acid rain? (15 marks)

TOTAL 25 MARKS

QUESTION FOUR

Draw the structural formulae of the following anthropogenic environmental pollutants and name the sources of each and name two health effects of each.

- Polychlorinated biphenyl (5 marks);
- The epoxide ethylene oxide (5 marks);
- Dichlorodiphenyltrichloroethane (5 marks);
- Tetrachlorodibenzo-p-dioxin (5 marks); and
- Benzene (5 marks)

TOTAL 25 MARKS

QUESTION FIVE

Lead could be characterized as one of the most widely used and broadly distributed toxic substance known. It may be found in organic or inorganic form in the environment.

- Name two inorganic and two organic forms of lead in the environment (4 marks);
- Describe its toxic effects (8 marks);
- Based on its wide use, explain how one can get exposed to lead (8 marks); and
- As a prospective health worker, propose how you can help protect children from lead poisoning (5 marks).

TOTAL 25 MARKS

GOOD LUCK!!!!!!