UNIVERSITY OF SWAZILAND

Faculty of Health Sciences

(BSC) IN ENVIRONMENTAL HEALTH

SECOND SEMESTER FINAL EXAMINATION PAPER 2009

TITLE OF PAPER	:	ENVIRONMENTAL CHEMISTRY II
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

1. All of the following are volatile organic compounds (VOCs) except
   (a) methane
   (b) chlorofluorocarbon
   (c) carbon monoxide
   (d) benzene

2. All of the following are photochemical oxidants except
   (a) dioxin
   (b) hydrogen peroxide
   (c) peroxyacyl nitrates (PANs)
   (d) benzene

3. Which of the following would be used to kill weeds
   (a) herbicides
   (b) rodenticides
   (c) fungicides
   (d) insecticides

4. 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

5. The pesticide treadmill involves
   (a) use of stronger doses of pesticide
   (b) a switch to new chemicals
   (c) use of more frequent doses of pesticide
   (d) all of the above.

6. atmospheric aerosols are
   (a) solid or liquid particles smaller than 100μm
   (b) solid or liquid smaller than 1000μm
   (c) liquid or gas particles smaller than 100μm
   (d) liquid, solid or gas particles

7. 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

8. Much of the sulfur and nitrogen that enter the atmosphere end up converted to
    (a) Sulfonic acid and nitric acid
    (b) Sulfuricacid and nitric acid
    (c) Sulfates and nitrates radicals
    (d) Sulfuric acid and nitrous acid

9. The harmful effects of smog occur mainly in the four areas of
    (a) Human health, comfort, , effects on the atmosphere, and toxicity to plants
    (b) Human health and comfort, damage to materials, effects on the atmosphere, and toxicity to plants
    (c) Human health, damage to materials, effects on the atmosphere, and toxicity to plants
    (d) Human health and comfort, damage to materials, effects on the atmosphere, and toxicity to animals

10. The least reactive common hydrocarbon is
    (a) Butane
    (b) Propane
    (c) Ethane
    (d) Methane

11. Ozone adversely affects rubber by
    (a) Aging
    (b) Cracking and aging
    (c) Charring
    (d) Darkening

12. The three major classes of pollutant hydrocarbons are
    (a) Alkanes, alkenes and alkynes
    (b) Alkanes, alkenes, and cyclic hydrocarbons
    (c) Alkanes, alkenes, and aromatic compounds
    (d) Alkanes, alkenes, and halogenated hydrocarbons

13. A reactive species that is especially important at night is
    (a) Hydrogen
    (b) Hydroxyl
    (c) Nitrate radical
    (d) Hydroperoxy radical

14. An organohalide that is a known human carcinogen is
    (a) Vinyl chloride
    (b) PCBs
    (c) PBBs
    (d) Perspex

15. A simple inorganic oxidant characteristic of the presence of photochemical smog is
    (a) Ozone
    (b) Hydrogen peroxide
    (c) Carbon dioxide
    (d) Sulfuric acid

16. A hydrocarbon from conifer trees that is 9000 times as reactive is
    (a) Pinene
    (b) β-pinene
    (c) α-pinene
    (d) γ-pinene

17. Alkanes can undergo
    (a) Addition reactions only
    (b) Combustion reactions only
    (c) Addition and substitution reactions
    (d) Combustion and substitution reactions

18. Alkenes can react with ---------- to produce a species in which 3 oxygen atoms are bridged between two carbon atoms
    (a) Aldehydes
    (b) Ozone
    (c) Esters
    (d) Ketones

19. Compounds with an oxygen atom bridging between two carbons are
    (a) Oxides
    (b) Organic acids
    (c) Aldehydes
    (d) Ethers

20. Automobiles are equipped with ---------- to cut down carbon monoxide emissions
    (a) Catalytic converters
    (b) Fluidized beds
    (c) Nitrogen dioxide converters
    (d) Carbon dioxide removers

21. Soap is manufactured through the process of
    (a) Esterification
    (b) Saponification
    (c) Oxidation
    (d) Alkylation

22. Soaps have two poles. These are
    (a) Hydrophobic and hydrophilic
    (b) Hydrophobic and organic
    (c) Cationic and ionic
    (d) Neutral and charged

23. Marine aerosols and incineration of organic polymer wastes produces
    (a) Al and Cl
    (b) Na and Cl
    (c) K and Cl
    (d) Br and Cl

24. The toxic metal of greatest concern in the urban atmosphere is
    (a) Mercury
    (b) Cadmium
    (c) Lead
    (d) Uranium

25. 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.

TOTAL 25 MARKS

QUESTION TWO:

1. Illustrate the sulphur cycle (10 marks)
2. list five damaging effects of acid rain (5 marks)
3. Explain why ammonia is present in unpolluted air and discuss its fate giving balanced chemical equations (10 marks).

TOTAL 25 MARKS

QUESTION THREE:

(a) List five types of pesticides and indicate on each type what it is used to treat. (5 marks)
(b) Describe the consequences of relying heavily on pesticides. (5 marks)
(c) Describe the pesticide treadmill. Be sure to describe biological magnification. (5 marks).
(d) Briefly describe the threat of pesticides to wildlife and human health. (5 marks).
(e) Describe with the aid of balanced chemical equations the effect of CFCs on the chemistry of ozone in the stratosphere. (5 marks)

TOTAL 25 MARKS.

QUESTION FOUR:

(a) Describe the origin and draw the structural formula of the following compounds:
- (i) Methane
- (ii) Ethylene
- (iii) Xylene
- (iv) Benzene
- (v) Acetylene
- (vi) Naphthalene

(2 marks each making 12 marks)

(b) Draw the structural formula of the following halogenated aromatic compounds. (2 marks each making 8 marks)
- (i) polychlorinated biphenyl
- (ii) poly chlorinated dibenzo-p-dioxin (TCDD)
- (iii) DDT
- (iv) Polybrominated biphenyl

(c) Briefly explain the nomenclature of the homologous series of the aliphatic hydrocarbon family alkanes (5marks).

TOTAL 25 MARKS.

QUESTION FIVE:

(a) List five properties of pesticides (5 marks)
(b) Describe the processes by which pesticides are retained or lost in the soil (10 marks).

(c) You are the environmental health officer at Siteki. A tanker carrying a certain volatile halogenated hydrocarbon crushes and spills the whole content around the Siteki hotel. Explain the measures and procedures that you will take to prevent health and environmental damage. (10 marks)

TOTAL 25 MARKS