

UNIVERSITY OF SWAZILAND
FACULTY OF HEALTH SCIENCES
DEPARTMENT OF ENVIRONMENTAL HEALTH SCIENCE
FINAL EXAMINATION [DECEMBER 2012]

TITLE OF PAPER : ENVIRONMENTAL POLLUTION
COURSE CODE : EHS 550
ACADEMIC YEAR : 2012/2013
TIME : 2 HOURS
MARKS : 75

INSTRUCTIONS

1. DO NOT OPEN THIS EXAMINATION PAPER UNTIL YOU ARE INSTRUCTED TO DO SO BY THE INVIGILATOR.
2. QUESTION ONE IS COMPULSORY. CHOOSE ANY OTHER TWO QUESTIONS IN ADDITION TO QUESTION ONE.
3. NO FORM OF PAPER SHOULD BE BROUGHT INTO THE EXAMINATION ROOM.
4. BEGIN YOUR ANSWERS TO EACH QUESTION ON A FRESH PAGE OF THE ANSWER BOOKLET. ENSURE THAT ALL PAGES OF THE ANSWER BOOKLET ARE NUMBERED ACCORDINGLY.
5. WRITE CLEARLY AND USE PROPER ENGLISH LANGUAGE GRAMMAR. MARKS WILL BE WITHHELD FOR CARELESSNESS IN HANDWRITING AND POOR ENGLISH GRAMMAR.

QUESTION ONE [TOTAL NUMBER OF MARKS = 25]

1. The two main primary air pollutants that are responsible for acid deposition, which often leads to significant environmental effects are; [2]
 - a. NO₂ and SO₂
 - b. NO, most sulphate and nitrate salts
 - c. SO₂ and NO_x
 - d. Most hydrocarbons and NO_x

2. Lichens can be used to determine the air quality and the spread of air pollution from an industrial source because; [2]
 - a. Lichens grow poorly in soils where nutrients have been leached by acid deposition.
 - b. Lichens are good air pollution detectors because they are always absorbing air as a source of nourishment.
 - c. Lichens are hearty pioneer species that live in most places (including rocks, trees, bare soil and buildings) that are affected by acid deposition, i. e., places that have high acid deposition.
 - d. Lichens secrete carbonic acid, which is one of the acids that descend to the earth's surface during acid deposition; therefore, they grow in places that only receive carbonic acid.

3. Which of the following statements best describes one of the means by which acid deposition can lead to disappearance of fish? [2]
 - a. The deposition of acids into lakes and streams raises the pH, which then leads to depletion of dissolved oxygen on which fish depends.
 - b. Fish die because when they come in contact with acidic water they begin to develop small burn wounds that are in most cases sources of further infection.
 - c. Acidic rainwater dissolves toxic elements, such as aluminum, from soils and rocks, which are carried in runoff. In streams and lakes, these toxic elements are the ones that lead to many effects, which include difficulty in breathing.
 - d. Acid deposition in streams and lakes raises the pH, which interferes with fish migratory patterns.

4. Acid deposition is known to lead to negative effects on birds living near acid contaminated lakes. Recent scientific investigations have concluded that one of these effects concerns the eggs that these birds lay. Which of the following statements below is true based on recent scientific investigations? [2]

- a. For aquatic birds to give offspring they need a constant supply of food (fish); however, since the acids wipe away fish, the birds fail to lay eggs.
 - b. Despite the possibility that there could be little food left for the birds, they are still able to lay eggs, except that the eggs are defective.
 - c. Aquatic birds often lay eggs not far from the areas where they feed, and usually such areas are wet. Therefore, when the acid-contaminated water gets in contact with the eggs, the eggs fail to hatch.
 - d. Acid deposition leads to wiping away of vegetation, and so, birds do not have any material to use when making nests. They end up laying eggs in the open where there is no shelter and other animals eat them.
5. There are four most corrosive and harmful pollutants that often lead to significant damages to materials. Choose one that does not fall into this category [2].
- a. SO_2
 - b. H_2O_2
 - c. O_3
 - d. HNO_3
6. A commuter in heavy traffic suddenly feels a severe headache, with dizziness and fatigue. Which of the following airborne pollutants is the most likely cause of the symptoms expressed [2]
- a. CO_2
 - b. SO_2
 - c. SO_3
 - d. CO
7. In radiation temperature inversion, at what time of the day would you expect to find higher levels of pollutants? [2]
- a. 0700 – 1000Hrs
 - b. 1000 – 1300Hrs
 - c. 1300 – 1600Hrs
 - d. 1600 – 1900Hrs
8. In Integrated Pest Management, the central goal is; [2]
- a. To focus on the use of biological techniques in controlling pests that attack especially ready-to-harvest crops.

- b. The application of cultural, environmental, genetic and chemical techniques in order to reduce pest populations to levels that do not cause economic damage, while protecting human health and the environment.
 - c. To apply as much pesticide as possible in order to ensure that all pests are eliminated so as to ensure a good harvest.
 - d. The application of environmental controls in order to alter the biotic and abiotic conditions in crops, making them inhospitable to pests.
9. On a sunny day, at what time of the day would you expect to find higher levels of photochemical smog? [2]
- a. 0600 – 0900Hrs
 - b. 0900 – 1200Hrs
 - c. 1200 – 1500Hrs
 - d. 1500 – 1800Hrs
10. Industrial smog is common in many urban areas with a combination of factors, especially in [2]
- a. Industrial cities in moist and hot climates
 - b. Industrial cities in moist and cold climates
 - c. Industrial cities in dry and hot climates
 - d. Industrial cities in dry and cold climates
11. Recently, it has been estimated that health risk from air pollution is six times greater for children than for adults. Do you agree with this estimation? [2].
- a. Yes
 - b. No
12. Describe one reason for the answer you have chosen in question 11 above [3].

QUESTION TWO [TOTAL NUMBER OF MARKS = 25]

1. Long-term exposure to air pollution may result in a number of diseases, including chronic bronchitis, emphysema, lung cancer and bronchial asthma. In each of the health effects presented below, state the disease that is closely associated to the given effects.
- a. Symptoms of this condition include a persistent cough, mucus build-up and difficult breathing [2].

- b. As they grow older, people suffering from this condition often experience the breakdown of the alveoli in their lungs. This reduces the surface area for the exchange of oxygen with blood. Breathing becomes more and more labored [2].
 - c. During an attack, the passage ways that carry air to the lungs (bronchi and bronchioles) fill with mucus, making breathing difficult [2].
 - d. Most cases of this condition are caused by allergic reactions to common stimulants such as dust, pollen and skin cells (dander) from pets [2].
 - e. This condition results in irreversible damage (break down) to air sacks or alveoli [2].
2. What is cultural eutrophication? [3].
 3. How do ballast tanks contribute to oil pollution in the seas? [3].
 4. State four examples of oxygen demanding wastes [4].
 5. Discuss the main destructive impacts of oil on aquatic birds [5].

QUESTION THREE [TOTAL NUMBER OF MARKS = 25]

1. A recently established nuclear power plant along the Maputo shoreline has been found to be the source of both the overwhelming increase in aquatic animals in the area as well as periodic mass deaths. Describe how these events occur [7].
2. Some 70 years ago, the Ngwenya Coal Mine was known to be contaminating groundwater sources in the area. Recently, a number of residents have started to drill boreholes to access groundwater, due to scarcity of surface water sources. In the absence of a water testing laboratory that can determine the suitability of this water for drinking, you (an Environmental Health Officer working in the area) are the only professional that can advise the people. Your advice is that [1];
 - a. People can use this water.
 - b. People cannot use this water.
3. State your reasons for choosing either (a) or (b) in question 2 above [5].

4. Four groups of domestic animals (five chickens, five goats, five cats and five dogs) are taken to the laboratory for a number of tests to determine their state of health. Even before tests are carried out, you are convinced that cats will show the highest levels of polybrominated diphenyl ethers (PBDEs). Explain why? [3].
5. PCBs are known to concentrate in bottom sediments. However, they can move into the water above via a number of mechanisms. Describe two ways by which PCBs can move from sediments into the water above [4].
6. What are pesticides? [2].
7. State any three examples of first generation pesticides [3].

QUESTION FOUR [TOTAL NUMBER OF MARKS = 25]

1. Organochlorines and organophosphates are applied to many farms in Matsapha in an attempt to control pests. Laboratory analysis carried out on water samples obtained from the Great Usuthu River in Siphofaneni (32km down south) have detected one category of these chemicals in high quantities, and the source is suspected to be the Matsapha farms.
 - a. The category of chemicals detected in high quantities in these water samples is most likely to be [2];
 - 1) Organochlorines
 - 2) Organophosphates
 - b. Describe one reason for choosing either (1) or (2) in question 1 (a) above [3].
2. In another laboratory, fat samples of fish obtained from the same place (Great Usuthu River at Siphofaneni), were analysed and found to have high levels of one of the categories of the chemicals mentioned in question 1 (a).
 - a. The category of chemicals that was found in in high quantities in the fat of these fish most likely is [2];
 - 1) Organochlorines
 - 2) Organophosphates
 - b. Describe one reason for choosing either (1) or (2) in question 7 (a) above [3].
3. State any three anthropogenic sources of key pollutants (criteria pollutants) [3].

4. Amongst the major air pollutants, state two examples of carbon oxides, two examples of volatile organic compounds and two examples of nitrogen oxides [6].

5. People who are exposed to major air pollution sources, such workers in mines, smelters, drivers in heavy traffic, etc, are often considered to be at higher risk of suffering harm to health. With regard to people who are not employed and spend most of their time either in their houses or vehicles;
 - a. Would you expect them to be at risk of suffering any harm from air pollution? [2].
 - 1) Yes
 - 2) No
 - b. Describe any two reasons for your choice in question 15 (a) above [4].