UNIVERSITY OF SWAZILAND
FACULTY OF HEALTH SCIENCES
DEPARTMENT OF ENVIRONMENTAL HEALTH SCIENCE

# FINAL EXAMINATION

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| TITLE OF PAPER | ENVIRONMENTAL POLLUTION MANAGEMENT |
| COURSE CODE | EHM307 |
| DURATION | 2 HOURS |
| DATE | MAY 2018 |
| TOTAL NUMBER OF MARKS | 100 |
| INSTRUCTIONS | 1. DO NOT OPEN THIS PAPER UNTIL YOU ARE INSTRUCTED TO DO SO.<br>2. ANSWER QUESTION ONE AND ANY OTHER THREE QUESTIONS.<br>3. BEGIN YOUR ANSWERS TO EACH QUESTION ON A FRESH PAGE.<br>4. ENSURE THAT ALL ANSWER SHEETS ARE NUMBERED CORRECTLY.<br>5. POOR HANDWRITING AND CARELESSNESS IN ENGLISH LANGUAGE GRAMMAR SHALL RESULT IN LOSS OF MARKS.<br>6. ANY FORM OF MISCONDUCT DURING THE EXAMINATION IS PUNISHABLE IN LINE WITH RELEVANT ACADEMIC REGULATIONS. |

# QUESTION TWO [25 MARKS]

1. Love Canal was built in the;
   (a) 1860s
   (b) 1820s
   (c) 1850s
   (d) 1890s
2. The dumping of waste in the canal started in;
   (a) 1922
   (b) 1932
   (c) 1952
   (d) 1942
3. The category of waste that was dumped in the canal was;
   (a) Municipal solid waste
   (b) Pesticides
   (c) Oil removed from vehicles
   (d) Hazardous waste
4. To conceal the pollution;
   (a) The waste was sent to nearest landfills
   (b) A gold course was established over the site
   (c) Mine waste was dumped over the site to create an artificial sports ground
   (d) The site was capped with a layer of protective clay
5. One of the culprits of the Love Canal scandal was;
   (a) Ford Motor Group
   (b) Paint producing industries
   (c) Landfill operators
   (d) Hooker Chemicals
6. At the request of the Niagara Falls, the site was sold for;
   (a) $1
   (b) $10
   (c) $100
   (d) $1000
7. In the 1960s, one of the major developments that led to the uncovering of the pollution that occurred in the past was;
   (a) The construction of a major highway
   (b) The construction of an airport
   (c) The construction of a shopping complex
   (d) The construction of steel processing factory
8. Some of the places where problems of Love Canal pollution were experienced/observed were;
   (a) Basements and backyards of homeowners
   (b) Government offices
   (c) Surrounding fields
   (d) Grazing areas
9. Efforts to deal with the Love Canal problems are said to have amounted to;
   (a) $325 million
   (b) $425 million
   (c) $525 million
   (d) $625 million

10. Studies on health effects associated with the Love Canal scandal include;
    (a) A likelihood of more girls being born than boys
    (b) Colon cancers
    (c) Blindness
    (d) Deafness
11. Chemicals produced within the body that are profoundly important to reproduction, sexual identity, development, and metabolism are;
    (a) Receptors
    (b) Hormones
    (c) Hormone mimics
    (d) Hormone receptors
12. Amongst animals known to have been affected by environmental hormones are;
    (a) Monkeys
    (b) Ospreys
    (c) Frogs
    (d) Crocodiles
13. The potent synthetic estrogen, diethylstilbestrol (DES) was a pharmaceutical prescribed to pregnant women in the first trimester of pregnancy (the embryo phase) between 1948 and 1971 to prevent miscarriages. This caused;
    (a) Skin cancers
    (b) An epidemic of a rare cancer of the vagina
    (c) Miscarriages
    (d) Stillbirths
14. A major use of polychlorinated biphenyles (PCBs) is known to have been in;
    (a) Manufacture of pesticides
    (b) Insulation of electrical equipment
    (c) Testing for pesticides in water bodies
    (d) Cleaning of electrical equipment
15. One of the human health effects of exposure to PCBs is;
    (a) Miscarriages
    (b) Damage to thyroid gland
    (c) Stillbirths
    (d) Heart damage
16. Amongst animals, the effects of polybrominated diphenyl ethers (PBDEs) are likely to be observed on;
    (a) Horses
    (b) Dogs
    (c) Cats
    (d) Chickens
17. Chemicals that are often incorporated in large amounts into electrical equipment, electronics, plastics within television sets, automobiles, furniture foam, textiles, upholstery, and carpets, are;
    (a) PFOS
    (b) PCBs
    (c) PBDEs
    (d) All of the above
18. A major pest control revolution began following the discovery of;
    (a) PBBs
    (b) Fumigants
    (c) DDT
    (d) First generation pesticides

19. An example of first generation pesticides is;
    (a) Hydrogen sulfide
    (b) Hydrogen
    (c) Hydrogen cyanide
    (d) Hydrogen gas
20. The following descriptions: extremely resistant to breakdown, persist in the environment, highly toxic to sensitive organisms, passed up the food chain, etc., are relevant to;
    (a) First generation pesticides
    (b) Organic phosphates
    (c) Chlorinated hydrocarbons
    (d) Carbamates
21. Birth defects, neurologic disorders, and damage to wildlife and environment are some of the reasons that lead to the banning of;
    (a) Dieldrin, aldrin, endrin, lindane, etc.
    (b) Parathion, malathion, dichlorvos, etc.
    (c) Pyrethrum, rotenone, hydrogen cyanide, etc.
    (d) Carbon tetrachloride, ethylene dibromide, methylene bromide, etc.
22. Chemicals known to have high environmental persistence are;
    (a) Organic pesticides
    (b) Chlorinated hydrocarbons, fumigants, inorganic pesticides, etc
    (c) Carbamates
    (d) Organochloric carbamates
23. The exposure of animals (e.g., rats and rabbits) could lead to;
    (a) Various types of cancers
    (b) Higher reproduction rates
    (c) Loss of appetite
    (d) Damage to the digestive systems
24. Based on their uses, the family of persistent organic pollutants (POPs) that is likely to be found in higher quantities in the bodies of children is;
    (a) PFOS
    (b) PCBs
    (c) All POPs
    (d) PBDEs
25. Of the three families of POPs, the most persistent in the environment is;
    (a) PFOS
    (b) PBDEs
    (c) PCBs
    (d) None of the above; environmental persistence is generally the same in all POPs.

# QUESTION TWO [25 MARKS]

1. Knowledge of an insect's lifecycle can be used to control it from causing damage to crops. In **Figure 1**, demonstrate your understanding of this concept by labeling A to D (the five stages of an insect's lifecycle) and 1 to 7 (types of hormones that control the development of an insect) **[12]**.

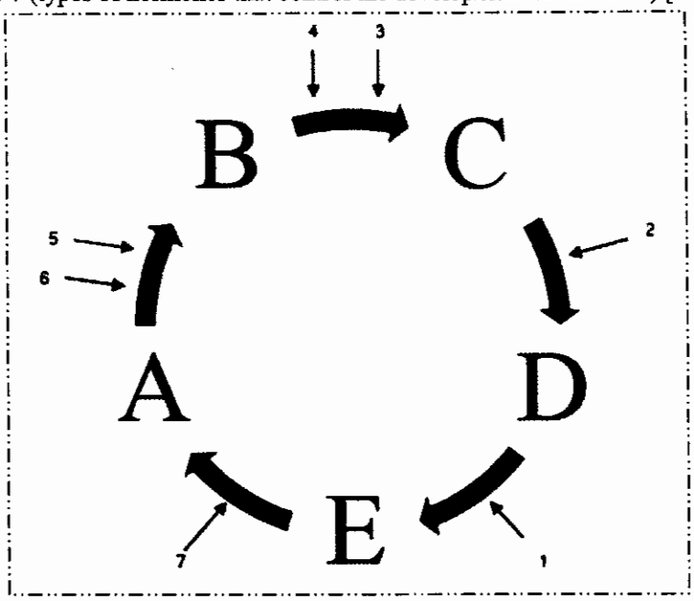



**Figure 1:** Five stages of an insect's life cycle and major hormones responsible for development

2. According to the United Nations Food and Agriculture Organization (FAO), international expenditures on pesticide exports and imports have been increasing since the 1960s, as shown in **Figure 2(a)**. However, despite these increases, recent projections suggest that the numbers of insects, weeds and diseases are on the increase, as shown in **Figure 2(b)**. Describe the key causes of these observations **[8]**.

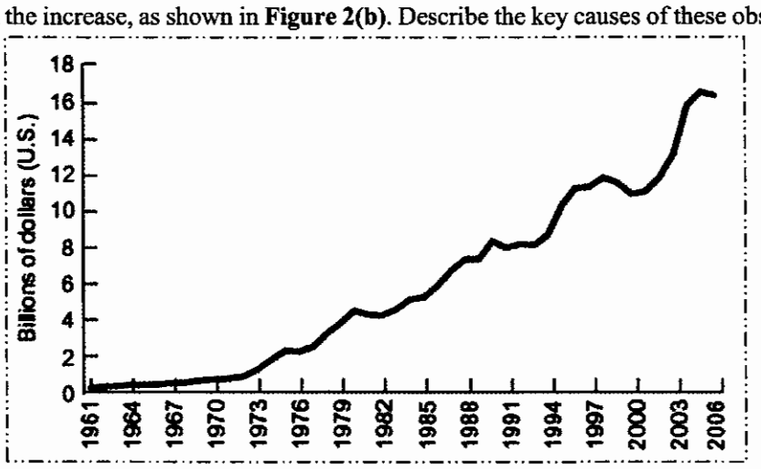



**Fig 2(a):** Value of global trade in pesticides (imports)

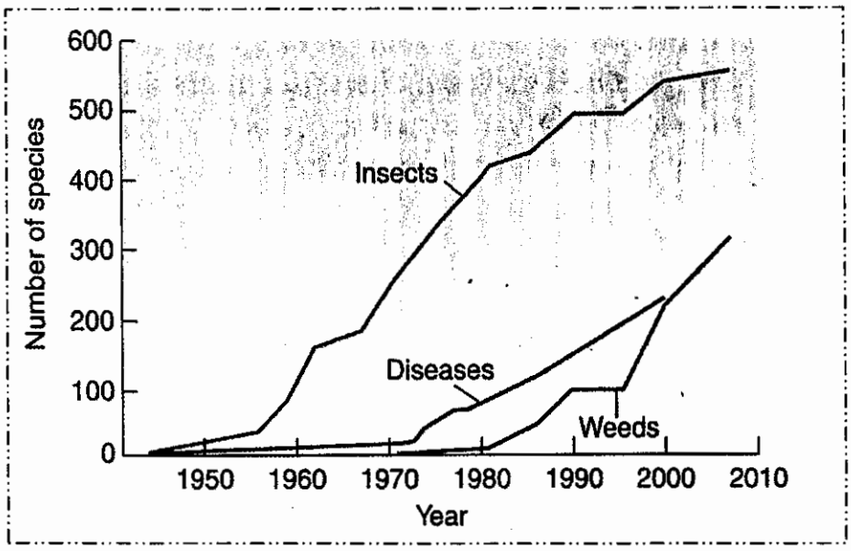



**Figure 2(b):** Estimates of insects, plant pathogens (disease organisms), and weeds between 1950 and 2010

3. During the 1950s and 1960s, populations of birds fell drastically due to the impacts of pesticides. State any five examples of such birds [**5**].

## QUESTION THREE [25 MARKS]

1. Describe some of the problems that might be observed on bird species that have been exposed to DDT [**8**].
2. A lot of women deliberately take estrogenic pharmaceuticals (birth control pills and hormone replacement therapy). A portion of the hormones and their metabolites are excreted into toilets. Sewage treatment plants do not remove them so estrogen is found in concentrations up to about 10 parts per trillion (ppt) in plant effluent. How do these affect fish in receiving waters? [**5**]
3. 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 spend most of their time either in their houses, would you expect them to be at risk of suffering any harm from air pollution? [**2**]
   (a) Yes
   (b) No
4. Describe the reasons for your choice in question 3 above [**5**].
5. State any five combustion sources of indoor air pollutants [**5**].

## QUESTION FOUR [25 MARKS]

1. What is carbon monoxide (CO)? [**2**]
2. Three groups of people (group A, B and C) were exposed to equal levels CO, as shown in **Figure 3**. The predominant pre-existing condition amongst people in group A was chronic bronchitis, in group B was emphysema, and in group C was bronchial asthma. The number of fatalities was, however, greatest in group C. Explain why fatalities were particularly high in group C [**10**].

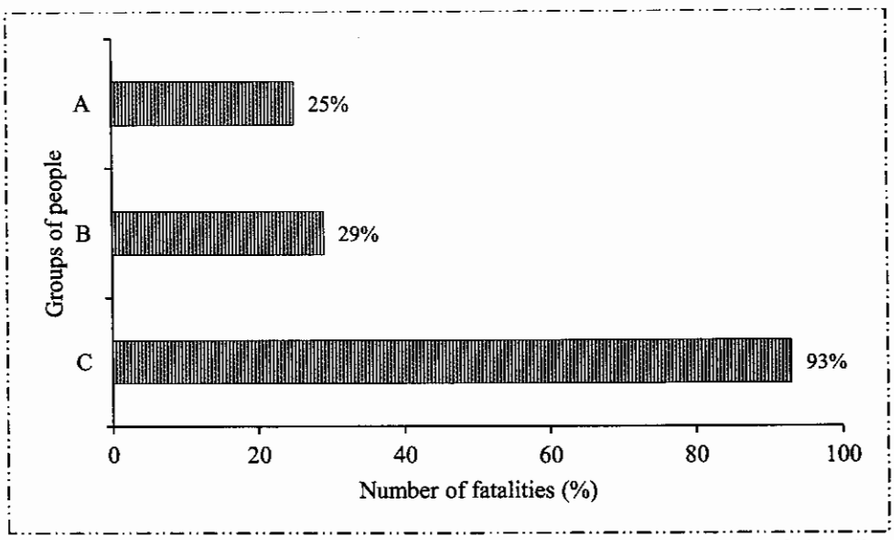



**Figure 3**: Number of fatalities in groups of people exposed to different types of air pollutants

3. State any six health problems that could be experienced by people exposed to high levels of CO **[6]**.
4. State any five sources of CO **[5]**.
5. What can a homeowner do in order to avoid the accumulation of CO in his/her house? **[2]**

## QUESTION FIVE [25 MARKS]

1. **Figure 4(a)** and **(b)** are greatly simplified models which illustrate the formation of two major outdoor air pollution problems. Study the diagram carefully and answer the questions that follow.

1.1 Summarise **Figure 4(a)** into three balanced chemical equations which show the formation of nitric acid, nitric oxide and nitrogen dioxide in sequential order **[6]**.

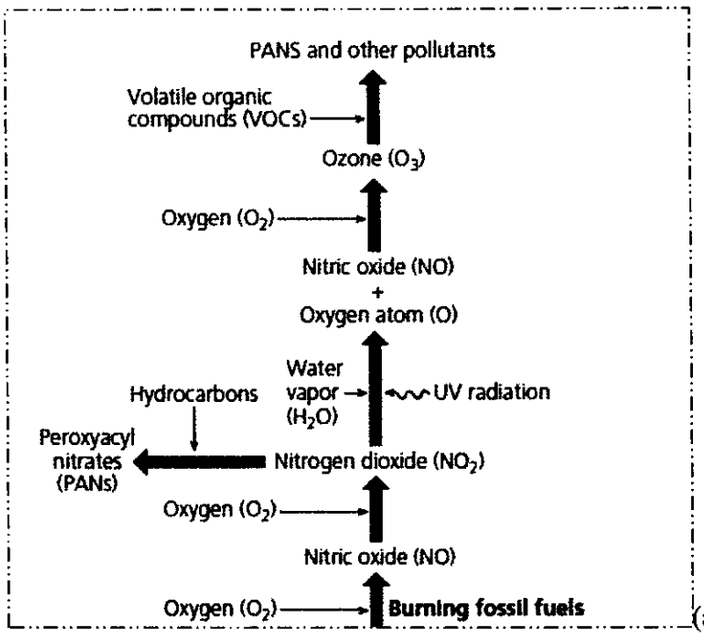
1.2 Summarise **Figure 4(b)** into four balanced chemical equations which show the formation of ammonium sulphate, sulfur dioxide, sulfuric acid and sulfur trioxide in sequential order **[8]**.

1.3 What are the two major air pollution problems shown in **Figure 4(a)** and **(b)**? **[2]**

1.4 Nitric oxide is one of the major primary pollutants in **Figure 4(a)**. State any three sources of nitric oxide **[3]**.

1.5 State any four health effects that high levels of nitrogen oxides can cause to people **[4]**.

1.6 State any two primary pollutants that are associated with problems shown in **Figure 4(a)** and **(b)** **[2]**.



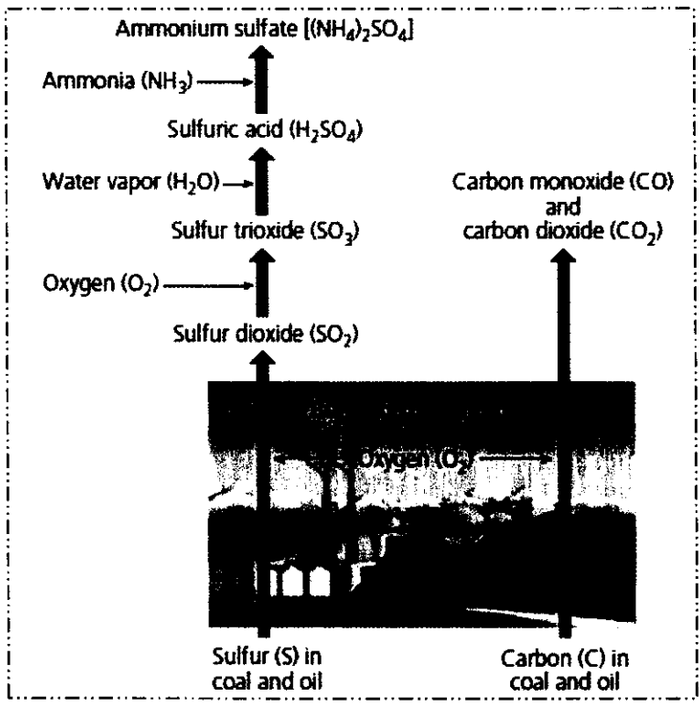




**Figure 4 (a)** and **(b):** Greatly simplified models of the main processes that contribute to the formation of two major outdoor air pollution problems.