

**UNIVERSITY OF SWAZILAND**

**DEPARTMENT OF CHEMISTRY**

**C615/ERM645/CHE636**

**SPECIAL TOPICS IN ENVIRONMENTAL/ANALYTICAL CHEMISTRY**

**MAY 2016**

**FINAL EXAMINATION**

**TIME ALLOWED:**

**THREE (3) HOURS**

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**Instructions:**

- 1. This examination paper has Six (6) questions: Three (3) questions in Section A and Three (3) questions in Section B.**
  - 2. Answer Any Two (2) questions from Section A and Any Two (2) questions from Section B.**
  - 3. Each question is worth 25 marks.**
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**SECTION A: ESSENTIALS OF ENVIRONMENTAL TOXICOLOGY AND ECOTOXICOLOGY**

**Question 1 [25]**

- (a) Explain the following terms in relation to Environmental Toxicology:
- (i) Toxin (9)
  - (ii) Toxicity
  - (iii) Venom (9)
- (b) Outline the four distinct types of toxicity that characterize the duration and location of the poisonous state (16)

**Question 2 [25]**

- (a) Explain the terms toxicokinetics and toxicodynamics in relation to toxicity. (9)
- (b) Describe a general procedure for testing toxicity of a chemical substance in:
- (i) Earthworms (8)
  - (ii) Bees (8)

**Question 3 [25]**

- (a) Discuss the factors that affect the distribution of toxic substances to tissues. (12)
- (b) Describe the general ways in which toxicants interact with cells in an organism. (13)

## SECTION B: ENVIRONMENTAL LAW

### **Question 4 [25]**

- (a) Swaziland is a signatory to the Minamata Convention.
- (i) Outline the principles of the Minamata Convention (4)
  - (ii) Outline the steps that the Swaziland Environment Authority must take to domesticate the Minamata Convention (4)
  - (iii) Explain how "level 1" and "Level 2" mercury inventories are carried out according to United Nations Environment Protection (UNEP) procedures. (5)
- (b) The pollution of soils by hazardous substances that cross the borders is controlled by the Basel Convention.
- (i) Outline the principles of the Basel Convention and its implications on the usage of hazardous waste disposal facilities by Swaziland in South Africa. (4)
  - (ii) Outline how the convention relates to the Swaziland Waste Regulations of 2000. (4)
  - (iii) Outline how the convention affects any proposals for strategic petroleum industry development in Swaziland, especially in regards to waste oil disposal. (4)

### **Question 5 [25]**

- (a) In relation to the Swaziland Air Pollution Control Regulations of 2010,
- (i) Explain how international conventions have lead to the development of this legislation. (4)
  - (ii) Explain how pulp mills have adopted emission controls to comply with this legislation. (4)
- (b) In relation to the Swaziland Ozone Regulations of 2003,
- (i) Discuss the international convention that led to these regulations. (4)
  - (ii) Describe the process that the Swaziland Environment Authority has undertaken to result in the gazetting of these regulations. (5)
- (c) In regard to ozone depleting substances (ODS),
- (i) List the ODS compounds that are being phased out in Swaziland and enforced by law. (2)
  - (ii) List the industries that are affected by this legal phasing out of ODS. (3)
  - (iii) Describe any three principal ways in which the phasing out of ODS is enforced in Swaziland. (3)

**Question 6 [25]**

- (a) In relation to the Environment Management Act 2002 of the Swaziland statutes,
- (i) Explain how international conventions have led to the development of this legislation. (4)
  - (ii) Explain how the Environment Management Act 2002 has superceded the Swaziland Environment Authority Act 1993. (4)
- (b) In relation to the Water Pollution Control Regulations of 2010,
- (i) Explain the "Polluter – Pays" principle, and how the Water Pollution Control Regulations of 2010 effects this principle. (4)
  - (ii) Explain the role of public participation fora on the processes that led to the gazetting of these regulations. (4)
- (c) Explain the procedures for handling spills in so far as the Water Pollution Control Regulations of 2010 is concerned. (4)
- (d) International treaties and conventions govern water usage and its quality for transboundary rivers.
- (i) Under which river basin authorities do the following fall:
    - Lusushwana River at Matsapha? (1)
    - Mlumati River in Matsamo? (1)
  - (ii) Briefly discuss the Inco Maputo Agreement in relation to the protocol on shared water courses between Swaziland, Mozambique and South Africa. (3)