

**UNIVERSITY OF SWAZILAND**  
**FINAL EXAMINATION - 2009/2010**

**TITLE OF PAPER** : Special Topics in Environmental Chemistry

**COURSE NUMBER** : C515

**TIME** : Three (3) Hours

**INSTRUCTIONS** : There are five questions. Answer **ANY FOUR** Questions. Each question carries 25 marks.

***You must not open this examination paper until the chief invigilator has granted permission to do so.***

### **Question 1**

- (a) Explain the following terms in relation to environmental toxicology:
- (i) Toxins (3 marks)
  - (ii) Toxicity (3 marks)
  - (iii) Xenobiotics (3 marks)
- (b)
- (i) Describe the different types of toxicity. (4 marks)
  - (ii) Explain how toxicants are classified. (4 marks)
  - (iii) Outline the steps involved in toxicity testing (4 marks)
  - (iv) Which variables affect toxicity and toxicity testing? Explain. (4 marks)

### **Question 2**

Identify and describe under five different categories, the major classes of pollutants. Pay special attention in each case to the structure, main properties and occurrence of the pollutants.

(25 marks)

### **Question 3**

- (a) Explain the ways in which toxicants interact with cells. (13 marks)
- (b) Discuss the factors affecting the distribution of toxicants in tissues. (12 marks)

### **Question 4**

- (a) In relation to the Environmental Management Act of 2002,
- (i) What is meant by the “Polluter Pays Principle” and how does the EMA 2002 incorporate this principle? (3 marks)
  - (ii) What are the socio-economic implications of the “Polluter Pays Principle” in the industrial development of third world countries? (3 marks)
  - (iii) Effluent from ethanol distilleries utilizing molasses fermentation is argued by some to be nutritious, while some consider it to be ecotoxic. Explain. (3 marks)
  - (iv) What is meant by a “Protector Order” in the context of the Environmental Management Act, 2002? (3 marks)

- (v) Describe the planning and operating budgetary steps that local industries must take in order to comply with the requirements of the water pollution control Regulations promulgated under EMA 2002 and the purification of Industrial Water and Effluent Regulations promulgated under the Natural Resources Act of 1951. (4 marks)
- (b) 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 mark)
  - Mlumati River in Matsamo? (1 mark)
- (ii) Briefly discuss the Inco Maputo Agreement in relation to the protocol on shared water courses between Swaziland, Mozambique and South Africa. (3 marks)
- (iii) What are the functions of the water basin authorities in relation to the SADC Protocol on Shared Watercourse Systems? (4 marks)

**Question 5**

- (a) Mining is the backbone of economic development in Southern Africa, and with it comes many environment-legal challenges.
- (i) Explain the difference between “open cast” and “underground” mining in the local coal industry, and how visual impacts are mitigated under the Mining Act. (3 marks)
- (ii) Describe the “Dense Medium Separation” technique involved in diamond mining, and describe the impact of diamond mine tailings on the environment. (3 marks)
- (iii) What is “asbestosis”, and why is it a legacy of mining dumps in Swaziland? (3 marks)
- (iv) Explain how mine tailings are regulated in Swaziland with regards to the Water Pollution Prevention Regulations of 2010? (4 marks)
- (b) Swaziland does not have waste disposal facilities for many industries. In regard to 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 marks)
- (ii) Outline how the convention affects any proposals for designing a nuclear plant in Swaziland in view of the regional power challenges. (4 marks)
- (iii) Outline how the convention affects any proposal for strategic petroleum industry development in Swaziland, especially in regards to waste oil disposal. (4 marks)

**Question 6**

- (a) Each and everyone of us has a carbon foot print which contributes to global warming.
- (i) What is meant by “Global Warming”? (2 marks)
  - (ii) What causes Global Warming? (2 marks)
  - (iii) What is meant by the “carbon footprint” of an entity in relation to global warming? (2 marks)
  - (iv) Describe how Swaziland, a minor contributor to climate change, is affected by its proximity to neighbouring South Africa in terms of air pollution. (3 marks)
  - (v) What are the socio-economic implications of the Air Pollution Control Regulations of 2010 on existing industries in Swaziland? (3 marks)
- (b) Swaziland is a signatory to international protocols on climate change, starting with the UN Conference on the Human Environment held in Stockholm in 1972. In relation to climate change:
- (i) Describe the Montreal Protocol as it affects the production and use of chlorofluorocarbons in Swaziland. (3 marks)
  - (ii) Describe the Kyoto Protocol as it affects the automotive industry in Swaziland. (3 marks)
  - (iii) Describe the Copenhagen Deal of 2009 as it affects Swaziland coal resources and Swaziland’s intention to develop thermal power. (4 marks)
  - (iv) What are carbon credits? How are they calculated? How are they traded internationally? (3 marks)