



**FACULTY OF ENGINEERING AND THE ENVIRONMENT**  
**DEPARTMENT OF METALLURGICAL ENGINEERING**  
**FUELS, ENERGY, AND THE ENVIRONMENT**  
**EMR 2205**  
**Final Examination Paper**  
**JUNE 2019**

This examination paper consists of 4 pages

**Time Allowed: 3 hours**

**Total Marks: 100**

**Examiner's Name: Mr. N Ndlovu**

**INSTRUCTIONS**

1. This question paper consists section **A** and **B**. Answer all questions in section **A** and TWO questions in section **B**.
2. All questions have a total mark of 20.
3. Answer each question on a new page and write as eligible as possible

**Additional Requirements**

**None**

**MARK ALLOCATION**

<b>Question 1 to 3</b>	<b>20 Marks</b>
<b>Part Questions</b>	<b>As shown in each part question</b>
<b>Question 4 to 6</b>	<b>20 marks</b>
<b>Total Attainable</b>	<b>100</b>

## **Section A**

### **Question 1**

1a. Define the following terms used in the metallurgy. [10]

- i. Effluent [2]
- ii. Particulates [2]
- iii. Environment [2]
- iv. Biomass [2]
- v. EMA [2]

1b. There are a number of energy sources used in the metallurgical processing plants. Differentiate between renewable and non-renewable energy sources, giving two examples of each. [6]

1c. Name 2 natural sources of solid fuels and give 2 advantages of using them. [4]

### **Question 2**

2a. What is the importance of an EIA when a project is to be established in an area? [6]

2b. In ferrochrome smelting, large quantities of chrome slag are produced and these are poured into a tailings dam. What hazardous effect will these chrome tailings have to both the environment and health? [10]

2c. State and discuss the wastes of chromate beneficiation. [4]

### **Question 3**

3a. Describe the natural cyanide attenuation process. [5]

3b. List and explain four methods of cyanide destruction. [8]

3c. What is the impact of oil and gas production on the environment? [4]

3d. What are the advantages of biological methods for the removal and recovery of heavy metals in a wastewater treatment plant? [3]

## **Section B**

### Question 4

Outline a well detailed procedure the construction of a tailings dam that will comply with the Environmental Management Agency (EMA) standards. [20]

### Question 5

Of the many environmental and public health risks associated with burning fossil fuels, the most serious in terms of its universal and potentially irreversible consequences is global warming. Discuss the hazardous effects of burning fossil fuels. [20]

### Question 6

6a. Plants for processing various metals produce effluents heavily charged with heavy metal ions such as chromium, lead, and iron. State how these metals can be removed from the water source? [10]

6b. Explain the process of effluents treatment by biofilm reactors in the mining and metallurgical industries. [10]

**TOTAL ATTAINABLE: 100 MARKS**