FACULTY OF ENGINEERING AND THE ENVIRONMENT

DEPARTMENT OF METALLURGICAL ENGINEERING

ORE GEOLOGY AND RESOURCES

EMR 2106

Final Examination Paper

September 2023

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 of 6 questions, answer **ANY FOUR QUESTIONS**
2. Each question carries 25 marks
3. Answer each question on a new page and write as eligible as possible

Additional Requirements

None

MARK ALLOCATION

Question 1 to 6	**25Marks**
Part Questions	**As shown in each part question**
Total Attainable	**100**

Question 1: **Ore genesis and ore classification** {25 marks}

a. Explain the surficial ore forming process and the process that concentrates the ore on surface. [5]
b. Using appropriate examples differentiate between syngenetic and epigenetic ores. [4]
c. With the aid of well annotated diagram, illustrate the formation of kimberlites, and hence diamond. [6]
d. With reference to the ores formed, explain the magmatic-hydrothermal ore-forming processes. [10]

Question 2: **Stratigraphy and mineral occurrence** {25 marks}

a. Zimbabwe has a number of economic minerals within the different lithologies that make up our stratigraphy. List AND explain any five of these minerals and their geological occurrence. [10]
b. Explain the physical properties of water that make it so important for the chemical, biological and geological processes. [4]
c. What are placer deposits? Explain how they form and include examples of minerals found in such environments. [4]
d. The great dyke of Zimbabwe is a layered mafic intrusion. Explain the term layered mafic intrusion and give two main ores found in LMI's. ` [4]
e. Describe the laterite formation process. [3]

Question 3: **Nickel in Epoch and Platinum Group Metals {25 marks}**

a. The Great Dyke is composed of short, narrow, narrow hills and ridges. Discuss the geology of the Great Dyke, its emplacement and mineralization. [8]

b. Describe the mineralization of nickel at Epoch Mine. In your description, include local geology, ore body sulphides, host rocks and ore minerals. [15]

c. List the six platinum group metals. [2]

Question 4: **Ore beneficiation** {25 marks}

a. Define the terms ore dressing and ore beneficiation. What are the four objectives of ore beneficiation? [4]

b. Grinding of ore is done wet. What are the principal purposes of ore grinding? [2]

c. A number of separation processes are carried out in ore concentration. Describe the 5 separation processes. [15]

d. List and discuss the steps in the cyanide extraction of gold. [4]

Question 5: **Economic geology of Zimbabwe and Resource reporting** {25 marks}

a. What are the nine major mineral resources of Zimbabwe? [6]

b. Briefly describe the three major history divisions that host Zimbabwe's mineralization.[9]

c. Define a mineral resource and list the geological evidence required for the estimation of mineral resources [5]

d. Where is the geological evidence required for resource reporting acquired. [2]

e. Mineral resources are divided into three categories. What are the categories? [3]

Question 6: **Sampling Theory, QA/QC and Resource estimation** {25 marks}

a. Explain the role of sampling in the stages of the Mine value chain and hence define sampling. [5]

b. Sampling errors come in two basic types, contamination and procedural. Briefly explain these two errors. [4]

c. Describe the mineral resource estimation process and explain why there should be a geological model in resource estimation. [5]

d. Describe the terms quality control (QC) and quality assurance (QA) and what they mean to sampling. [6]

e. Illustrate the SAMREC reporting code showing the three main categories. [5]

END OF QUESTION PAPER