NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF APPLIED SCIENCES

DEPARTMENT OF APPLIED CHEMISTRY

Industrial Inorganic Chemistry III

SCH 4214

End of Semester Examination Paper

March 2025

Examiner's Name: Mr Donatus Dube

External Examiner's Name: Prof. G. Mehlana

INSTRUCTIONS

1. Answer ALL questions from Section A and any three (3) from Section B
2. Section A carries 40 while each question in Section B carries 20 marks
3. Use of calculators is permissible

MARK ALLOCATION

QUESTION	MARKS
1.	**20**
2.	**20**
3.	**20**
4.	**20**
5.	**20**
6.	**20**
TOTAL POSSIBLE MARKS	**100**

SECTION A

Answer all Questions from this section. This section carries 40 marks.

1. a) Define comminution in mineral processing (use illustration). (4 marks)

   b) Write chemical formulae for any two oxides and any two sulphide gold ores (8 marks)

   c) Describe the process of cupellation in gold assaying (4 marks)

   d) What is the toughest metal on earth and what is it used for? (4 marks)

2. a) What is a foundry pattern and how is it made? (6 marks)

   b) What makes gold difficult to extract from refractory gold ores? (3 marks)

   c) Why is Manganese steel used for ball mill liners? (2 marks)

   d) Write the chemical formulae of the following minerals stating the metals that are extracted from them:

      i. Sylvanite
      ii. Sperrylite
      iii. Hematite (9 marks)

SECTION B

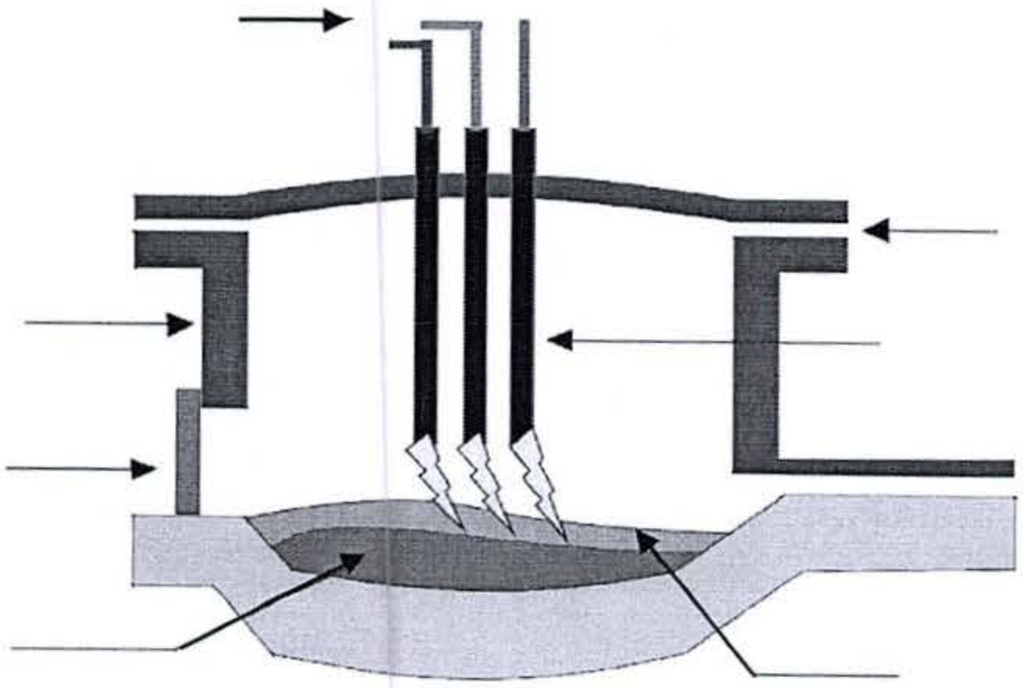
Answer any 3 (three) questions from this section. Each question carries 20 marks.

3. a) Draw the flow diagram of the process of extracting gold from its refractory gold ores at How Mine (10 marks)

   b) Draw a labelled sketch of a mould used for casting Manganese (Hadfield) steel at Nmir and Chapman, Bulawayo (8 marks)

   c) What is emerald diamond? (2 marks)

4. a) Redraw and label the diagram below



(7 marks)

b) Name refractory materials employed on the following sections of the furnace:

i. Roof

ii. Walls

iii. Slag line

iv. Base (8 marks

c) Draw the Fe-C phase diagram indicating the positions of eutectic and eutectoids (5 marks)

5. a) With the aid of a process flow diagram and reaction equations explain how copper matte is converted to pure copper (10 marks)

b) Explain the differences between cartridge brass and muntz metal (6 marks)

b) Explain the process of brillianteering in diamond manufacturing. (4 marks)

6. Use sketches and/diagrams to explain the following:
   a) Outokumpu process
   b) Argon Oxygen Decarburisation (AOD) process
   c) Hall process
   d) Carbothermic reduction process (20 marks)

End of question Paper!!!