

Examination: TA3210 Extractive metallurgy

21 June 2006 Time: 9:00 AM – 12:00 AM

This examination contains 5 questions with total mark of 70. This accounts for 70% of the total evaluation of the course. The rest 30% is accounted for by 3 reports for 3 case studies.

Question 1: General questions in metallurgical processes

(15 marks)

- (1) Please describe briefly the essential pyrometallurgical and hydrometallurgical unit operations.
 - (2) Cost for metals production and metals price are affected by many factors. Please describe these factors and explain how these factors could affect the production cost and market price.
 - (3) What are typical feed preparation operations? What types of chemical reactions are involved?
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Question 2: Ironmaking and steelmaking

(20 marks)

- (1) Please describe how metallic iron (hot metal) is produced in Blast Furnace Process. Your description should include at least the following aspects: raw materials, main chemical changes of feed along the movement in the furnace, various zones of the blast furnace, and different products of smelting operation.
 - (2) What are the important steelmaking processes? What are the main objectives of these steelmaking processes? Please describe the main refining reactions during steelmaking.
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Question 3: Refining of metals

(10 marks)

- (1) What types of impurities can be identified in metals during their extraction processes?
 - (2) What are the typical refining operations (including their principles) before the metals could be sold to the end-users?
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Question 4: Hydrometallurgical processes

(15 marks)

- (1) What are the functions of leaching operation in hydrometallurgical processes? What types of leaching processes can be identified, and what are their main characteristics?
 - (2) How the leaching solutions (containing target metal ions and impurities) are purified in hydrometallurgical processes?
 - (3) How the targeted metals are precipitated as metal products in hydrometallurgical processes? Please explain the basic principles and the main process parameters.
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Question 5: Copper making

(10 marks)

Copper occurs in majority as sulphide ores in the earth. Please describe the main extraction and refining steps of copper-making, including their objectives and main chemical reactions.

(End)