



NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY
DEPARTMENT OF APPLIED CHEMISTRY
BACHELOR OF SCIENCE HONOURS DEGREE
END OF FIRST SEMESTER EXAMINATIONS – JANUARY 2011
INDUSTRIAL INORGANIC CHEMISTRY I – SCH 2114
TIME: 3 HOURS

INSTRUCTIONS TO CANDIDATES

Answer ***any four*** questions from the five provided. Start your answers to different questions on new pages. Each question carries 25 marks.

1.
 - a) You are tasked to design a process for manufacturing oxygen for the latest space development programme for your country. Identify the areas in this programme that will utilize the oxygen including the gas purity levels.
(5 marks)
 - b) Design a process flow chart for the manufacture and delivery of the oxygen to the end users in the programme.
(10 marks)
 - c) Select and discuss the best method of manufacture and purification of hydrogen to be used as a fuel for the spacecraft. Give reasons for your choice.
(10 mark)

2.
 - a) Draw a labelled diagram of a typical sulphur mine.
(5 marks)
 - b) State ***three*** (3) ways you would solve the problem of bleed water in sulphur mining.
(6 marks)
 - c) The production of sulphuric acid by the contact process is highly capital intensive (i.e. requires high capital investments). Identify the major pieces of equipment that are required.
(5 marks)
 - b) Identify ***three*** (3) challenges that a contact process will inevitably exhibit and suggest ways of dealing with each challenge.
(9 marks)

3. a) Compare and contrast the manufacturing process of super phosphate and ammonium nitrate fertilizers. (10 marks)
- b) State *two* (2) agricultural conditions that suit application of each of the following fertilizers: i) ammonium nitrate ii) urea and iii) super phosphates (6 marks)
- c) Discuss *two* (2) challenges that are inevitably encountered in the manufacture of each of the fertilizers mentioned in b) above. Suggest methods that can be employed to counter these challenges (9 marks)
4. Discuss the following properties of ceramics indicating how they are measured (show illustrations):
- Thermal conductivity (5 marks)
 - Refractoriness (5 marks)
 - Compression strength (5 marks)
 - Toughness (5 marks)
 - Superconductivity (5 marks)
5. a) Explain the following uses of Nitrogen gas (show illustrations).
- Bright annealing
 - Ladle metallurgy (6 marks)
- b) Explain the following uses of Carbon Dioxide gas (show illustrations).
- Foundry core-making
 - Beverage fizzing (6 marks)
- c) Explain the following uses of Nanoceramics (show illustrations).
- Water purification
 - Tile making (6 marks)
- d) Write the principal chemical reactions in the following processes.
- Water-gas-shift in manufacture of hydrogen
 - Clinkerization in manufacture of cement
 - Digestion of fluorapatite in manufacture of phosphoric acid (7 marks)

End of question Paper!!!