



NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF APPLIED SCIENCES

DEPARTMENT OF APPLIED CHEMISTRY

INDUSTRIAL INORGANIC CHEMISTRY I

SCH 2114

End of Semester Examination Paper

December 2016

This examination paper consists of 3 pages

Time Allowed: 3 hours

Total Marks: 100

Special Requirements:

Examiner's Name: Mr Donatus Dube

INSTRUCTIONS

1. Answer any four (4) questions
2. Each question carries 25 marks
3. Use of calculators is permissible

MARK ALLOCATION

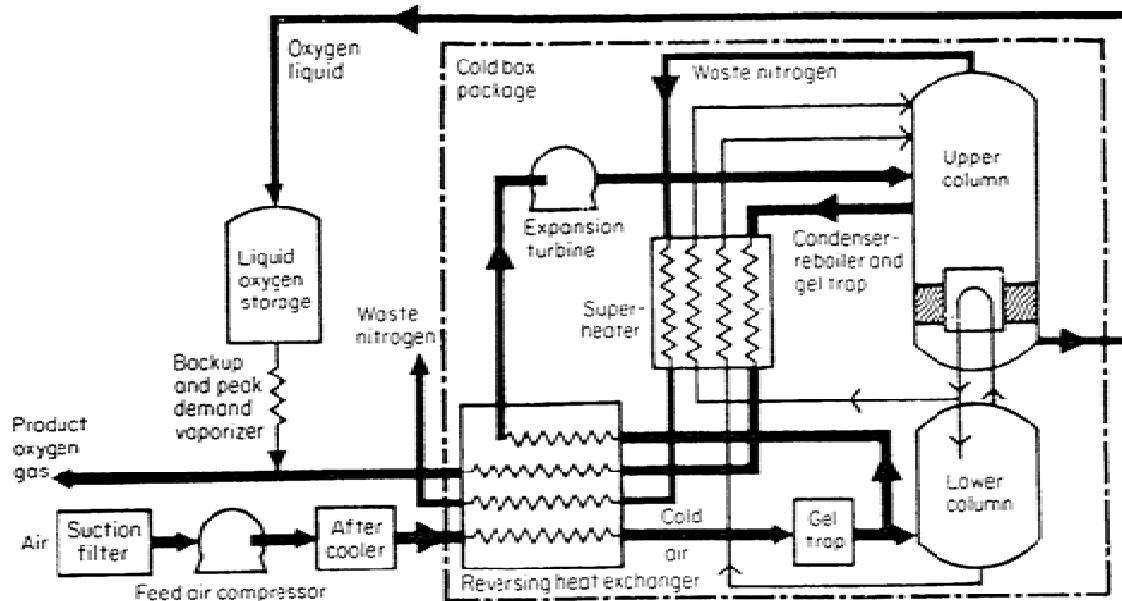
QUESTION	MARKS
1.	25
2.	25
3.	25
4.	25
5.	25
TOTAL POSSIBLE MARKS	100

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1. a) Define cryogenic engineering

(2 marks)

b) Study the flow chart shown below and answer the subsequent questions



- i. Write an account of the process shown on the diagram (8 marks)
- ii. Draw a labeled diagram of the double column rectifier (8 marks)
- iii. Explain why it is possible to have boiling Oxygen on one side and condensing Nitrogen on the other side of the heat exchanger of the rectifier (5 marks)

c) What is nano science? (2 marks)

2. a) Explain 3 hazards associated with mining and processing of sulphur (6 marks)

b) Using appropriate equations account for the following conditions in the Contact process manufacture of sulphuric acid

- i. The mixture of SO_2 and O_2 is equal in proportion by volume
- ii. The pressure used is close to atmospheric
- iii. Temperature applied is as high as $400 - 450^\circ\text{C}$ (9 marks)

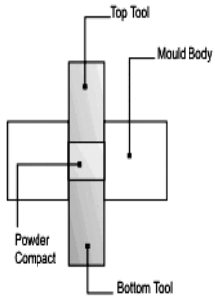
c) Draw sketches to illustrate and explain the temperature control in the Ostwald process

(6 marks)

d) Explain two uses of nitrous oxide

(4 marks)

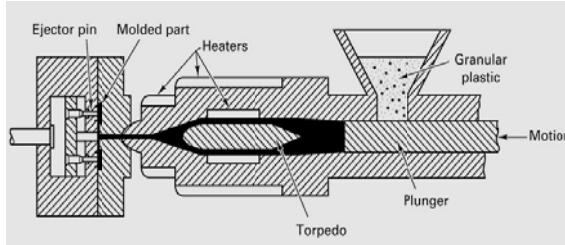
3. a) Study the sketches of the ceramic forming techniques shown below:
- Name the area of application
 - Compare the advantages and disadvantages of each technique.
 - What are the application limitations of each technique?



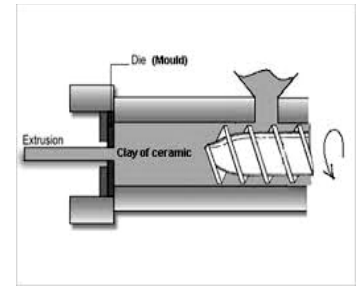
Die pressing



Slip casting



Injection moulding



Extrusion (12 marks)

- b) With the help of relevant manufacturing process diagrams explain the manufacturing processes of:

i) urea ii) tripple super phosphates (10 marks)

c) Write a balanced equation of hydration of Nitrogen Dioxide to Nitric Acid (3 marks)

4. Using process flow diagrams demonstrate the following manufacturing processes:

- Fischer-Tropsch process
- Frasch process
- Steam hydrocarbon reformation process
- Haber process
- Preparation of silver nano particles (25 marks)

5. a) Identify areas of application of the following as catalysts

i) Nickel ii) Iron iii) Rhodium iv) Chromium oxide v) Vanadium pentoxide vi) Cobalt (12 marks)

b) Explain three industrial uses of carbon dioxide (3 marks)

c) How is argon used in the cleaning of liquid steel? (5 marks)

d) Why are some atmospheric gases produced by cryogenic air separation while others are not? (5 marks)

End of question Paper!!!

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