NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY
DEPARTMENT OF APPLIED CHEMISTRY
BACHELOR OF SCIENCE HONOURS DEGREE
SUPPLEMENTARY EXAMINATIONS – AUGUST 2014
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.

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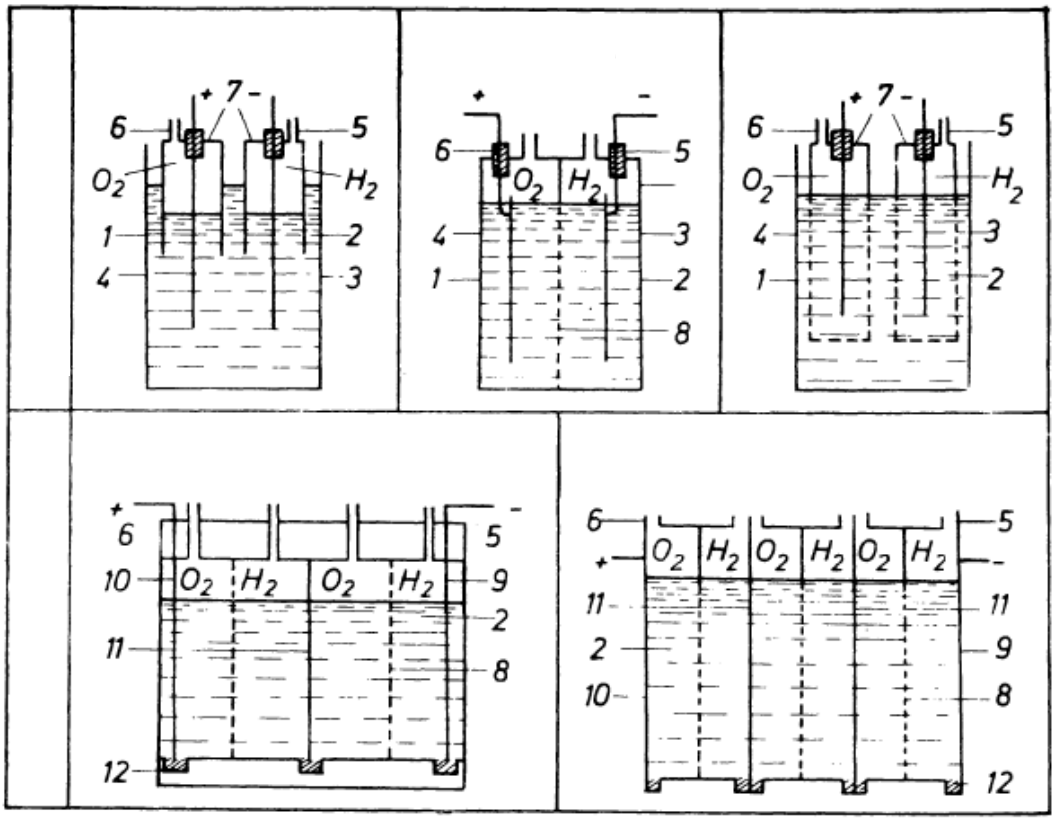
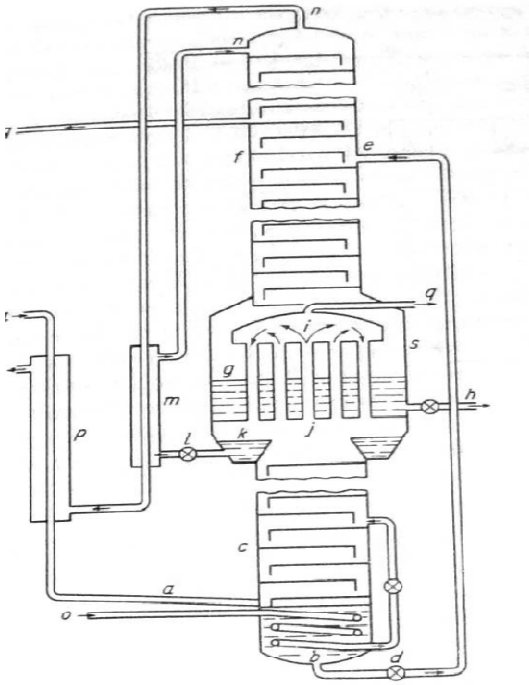
1. (a) Differentiate between the electrolytic cells for producing hydrogen that are shown below. (10 marks)

FIGURE 3.17: NORMAL TYPES OF WATER ELECTROLYSIS CELLS



(c) i) Label the diagram shown below (15 marks)



2. (a) Using a labeled process flow diagram of the water-gas shift converter explain the H.T. shift and the L.T. shift (8 marks)

(b) The reaction for the production of ammonia in the Haber Process is shown below.

$N_2 + 3H_2 \rightarrow 2\,NH_3$

(i) Increasing the pressure gives a higher yield of ammonia.
Most Haber process plants operate about 150 to 200 atmospheres pressure.
Suggest reasons why they do not operate at much higher pressures. (4 marks)

ii) Use a sketch to explain the relationship between yield of nitric acid and process temperature in the Oswald process. (8 marks)

(c) The diagram below shows porcelain pots

What are the substances and major components used to make the pots?
Explain technique for making the pots. (5 marks)

3. Using relevant process flow diagrams and sketches explain the similarities and dissimilarities of the following processes:
   a) Mullitization
   b) Clinkerization
   c) Vitrification
   d) Calcination
   e) Sintering (25 marks)

4. a) Using process flow diagrams compare and contrast the Contact process and the Ostwald process for manufacturing sulphuric acid and nitric acid respectively. (14 marks)

   b) Match the following ceramic products with their properties

	Ceramic articles	**Properties of ceramic**
I	Tiles	Resistant to chemical reactions
II	Spark plug	High melting point
III	Superconductor	Low electrical resistance
IV	Electrical cable holder	Good conductor of electricity

(4 marks)

   c) Use a sketch to demonstrate the process of extrusion moulding of ceramics. What are the advantages of extrusion over slip casting?

(7 marks)

5. a) Explain with examples how a flow chart can be used for the following:

   i) Process improvement (3marks)
   ii) Operational synergy (3marks)
   iii) Performance evaluation (3 marks)
   iv) Training of new employees (3 marks)

   b) With the aid of a process flow diagram explain the process of carbon dioxide manufacture from fuel oil or natural gas. Also state the uses of carbon dioxide. How can CO_2 purity be enhanced with m.e.a. solution.

(13 marks)

End of question Paper!!!