# BINDURA UNIVERSITY OF SCIENCE EDUCATION
# FACULTY OF SCIENCE AND ENGINEERING
# DEPARTMENT OF CHEMISTRY

**Programme:** HBScED Chemistry Part 2.2

**Code:** CH451 Industrial Chemistry

AUG 2024

**Duration:** Two (2) Hours

**ANSWER QUESTION ONE AND ANY TWO QUESTIONS FROM SECTION A AND ANY TWO QUESTIONS FROM SECTION B. EACH QUESTION CARRIES 20 MARKS**

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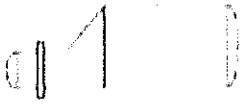
Q1 a) What the meaning of the following process symbols:

i.



ii.

iii.

**[2x3 Marks]**

b) Write a reaction equation to show how s super phosphate fertilizer is manufactured. **[4 Marks]**

c) Draw a well-labelled process flow diagram for a Visbreaking process. **[5 Marks]**

d) Explain the causes of eutrophication. **[5 Marks]**

**SECTION A: ANSWER ANY TWO QUESTIONS**

Q2 a) How is nitric acid produced using the Chile-Salpeter method? **[4 marks]**

b) Why was it discontinued in Germany? **[3 Marks]**

c) With a simple process flow diagram and reaction equations, describe Ostwald process for the production of nitric acid. **[9 Marks]**

d) State any four major uses of nitric acid. **[4 Marks]**

Q3 a) What are industrial gases? **[3 Marks]**

b) Describe with the help of an appropriate diagram, one electrolytic method for the manufacture of hydrogen. **[8 Marks]**

c) With the help of appropriate diagram explain how pressure swing technology is used to generate oxygen **[8 Marks]**

d) How else can oxygen be manufactured? **[2 Marks]**

Q4 a) With the help of appropriate diagram, describe the industrial manufacture of aluminium. **[9 Marks]**

b) What is the purpose of cryolite in the manufacture of aluminum? **[2 Marks]**

c) Explain why carbon electrodes are replaced regularly. **[4 Marks]**

d) State the four properties of aluminium that are enhanced through anodizing? **[5 Marks]**

**SECTION B: ANSWER ANY TWO WUESTIONS**

Q5 a) Draw a diagram illustrate a vacuum distillation process. **[4 Marks]**

b) What is the main purpose of an FCC process **[3 Marks]**

c) With the help of a process flow diagram, explain the Fluid Catalytic Cracking (FCC) process. **[7 Marks]**

d) Using appropriate reaction equations, explain the Claus process. **[6 Marks]**

Q6 a) Write reactions involved in the production of methanol from synthesis gas. **[6 Marks]**

b) Different companies have developed catalysts for the manufacture of methanol. Name any three such catalysts and respective process conditions. **[6 Marks]**

c) Draw a simplified process flow diagram for the manufacture of methanol. **[6 marks]**

d) One major us of methanol is the manufacture of formaldehyde. Which two types of catalysts are used in the manufacture of formaldehyde? **[2 Marks]**

Q7 a) Ethylation of benzene in the liquid phase is done in the presence of Lewis catalyst. Give any four examples of Lewis catalysts. **[4 Marks]**

b) The liquid phase ethylation of benzene is carried out in excess benzene. Give reasons. **[4 Marks]**

c) Ethylbenzene is converted to styrene. Describe the BASF process for dehydrogenation of benzene. **[8 Marks]**

d) Why is styrene kept under cooler conditions? **[4 Marks]**

**END OF EXAM**