



NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF SCIENCE AND TECHNOLOGY EDUCATION

**DEPARTMENT OF SCIENCE, MATHEMATICS AND TECHNOLOGY
EDUCATION**

B.S.Ed. - CHE

PST 2041 INDUSTRIAL CHEMISTRY

December Examination Paper

2024

This examination paper consists of 3 pages

Time Allowed: 3 hours

Total Marks: 100

Special Requirements: NONE

Examiner's Name: I. MATIBELA

INSTRUCTIONS

1. Answer **ALL** questions in **section A** and any **THREE** questions in **section B**
2. Each question carries 20 marks.
3. Begin each question on a new page.

Section A (40 marks)

Answer ALL questions in this section A

Question 1 [20 marks]

- (a) The knowledge of chemistry is valuable in various spheres of life. Using an example, give your views on the applications of chemistry in Forensics [6]
- (b) Suggest two advantages and four disadvantages of food additives. [4]
- (c) Trinitrotoluene (TNT) is used in defence for military ammunition and bomb fills. Outline giving structures and conditions for the synthesis of TNT from benzene. [10]

Question 2 [20 marks]

- (a) Polyvinylchloride (PVC) is a polymer.
- (i) What type of polymer is PVC? [2]
- (ii) Draw and name different structural arrangements of PVC. [6]
- (b) Aluminium phosphide is used as a pesticide.
- (i) How does it work as a pesticide? [4]
- (ii) Give advice for household use of aluminium phosphide in relation to how the pesticide works. [2]
- (c) Ammonia and sulphuric acid are some of the important industrial products. Justify the industrial temperature and pressure used for economical production of:
- (i) Ammonia, [3]
- (ii) Sulphuric acid. [3]

Section B (60 marks). Answer any THREE questions.

Question 3 [20 marks]

- (a) Nylon 66 is a polymer manufactured from diacid and diamine monomers. Describe the synthesis of both monomers the hexane-1,6-dioic acid and diamine-1,6-diaminohexane from benzene [10]
- (b) Petroleum oil is a natural resource that takes many years to be formed. Give details on the purification of petroleum oil. [10]

Question 4 [20 marks]

- (a) One method of making ceramics is a process called sintering.
- (i) Explain the process of sintering in the production of advanced ceramics. [2]
- (ii) Discuss the role of the following in the sintering process;

1. Temperature and [2]
 2. Pressure. [2]
- (b) Aluminium metal is another the important industrial product. Give details on the aluminium
- (i) Extraction, [8]
 - (ii) Purification, [4]
- (c) State and give reasons of any two uses of aluminium in the food industry. [2]

Question 5 [20 marks]

- (a) Assess the potential positive impact of petroleum oil discovery in Zimbabwe to the local chemical industry. [4]
- (b) Outline the steps in the industrial manufacture of nitric acid (include conditions and balanced chemical equations). [8]
- (c) An Advanced level learner used the following ingredients in a recipe for making a drinking juice during a continuous assessment learning area (CALA) in chemistry.
- (i) Baobab fruit powder,
 - (ii) Citric acid (E330) and
 - (iii) Saccharin (E954).

Describe the role(s) of each ingredient used in the drinking juice. [8]

Question 6 [20 marks]

Using **phenol** as a starting reagent, give chemical equations and conditions, for the industrial manufacture of:

- (a) Paracetamol, [10]
- (b) Ibuprofen [10]

END OF EXAMINATION PAPER