



ZIMBABWE

**MINISTRY OF HIGHER AND TERTIARY EDUCATION,
INNOVATION, SCIENCE AND TECHNOLOGY DEVELOPMENT**

**HIGHER EDUCATION EXAMINATIONS COUNCIL
(HEXCO)**

NATIONAL DIPLOMA

IN

**APPLIED CHEMICAL TECHNOLOGY, APPLIED BIOTECHNOLOGY,
PHARMACEUTICAL TECHNOLOGY, METALLURGICAL ASSAYING**

SUBJECT: Organic Chemistry

**PAPER NO: 501/15/S01
501/19/S01
501/22/S01**

DURATION: 3 hours

JUNE 2026 EXAMINATION

REQUIREMENTS

Data Booklet

INSTRUCTIONS TO CANDIDATE

- 1. Answer any five (5) questions.**
- 2. Each question carries twenty (20) marks.**

This paper consists of 3 printed pages.

QUESTION 1

- a) Define an isomer. (2 marks)
- b) Draw and name the isomers of an organic compound with the molecular formula C_5H_{10} . (8 marks)
- c) A molecule has a molecular weight of 146 g/mol has 49.31% C, 43.79% O and the rest is hydrogen:
- i) Determine the empirical formula. (4 marks)
 - ii) Determine the molecular formula. (2 marks)
- d) Explain Sp^3 hybridisation. (4 marks)

QUESTION 2

- a) Use an example to explain Williamson ether synthesis. (10 marks)
- b) Describe the mechanism by which benzene is nitrated. (10 marks)

QUESTION 3

- a) Draw the structural formula for the following:
- i) 1,2 diethyl cyclo-hexane (2 marks)
 - ii) Butan-2-one (2 marks)
 - iii) Ethanol (2 marks)
 - iv) 2,2-dichloro-3 methyl heptane (2 marks)
- b) Differentiate between primary, secondary and tertiary alcohols. (4 marks)
- c) Describe the following with the aid of relevant examples:
- i) Geometric isomerism (4 marks)
 - ii) Optical isomerism (4 marks)

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QUESTION 4

Explain the following reaction mechanisms as used in organic chemistry:

- a) E_1 (5 marks)
- b) E_2 (5 marks)
- c) Friedel crafts acylation (5 marks)
- d) SN_2 (5 marks)

QUESTION 5

- a) Given butanol and butanoic acid, show clearly the reaction that would take place naming the products produced. (10 marks)
- b) Outline the reaction mechanism of sulphonation of benzene. (10 marks)

QUESTION 6

- a) Explain structure and bonding of benzene as postulated by Kekule. (5 marks)
- b)
 - i) Explain the Markonikov's rule. (4 marks)
 - ii) Using the Markonikov's rule show the mechanism of chloro-ethane and hydrogen bromide. (7 marks)
 - iii) Explain the chemical and physical properties of carboxylic acids. (7 marks)

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