



ZIMBABWE

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

**HIGHER EDUCATION EXAMINATIONS COUNCIL
(HEXCO)**

NATIONAL DIPLOMA

IN

CIVIL ENGINEERING

SUBJECT: Water and Sanitation

PAPER NO: 578/15/S07

DURATION: 3 hours

NOVEMBER/DECEMBER 2022 EXAMINATION

REQUIREMENTS

Answer booklet

INSTRUCTIONS TO CANDIDATES

Answer ALL questions.

This paper consists of 3 printed pages.

QUESTION 1

- a) Discuss methods used for mixer discharge measurement. (3 marks)
- b) What do you understand by the term 'flood routing' in hydrology. (3 marks)
- c) Explain how the 'yield method' is used in the investigation and analysis of ground water sources. (4 marks)

QUESTION 2

- a) What are the main causes of odour in water. (3 marks)
- b) How do you test the acidity and alkalinity of raw water. Why is it important to test these parameters? (7 marks)
- c) Describe the following in the tests for pathogenic organisms:
 - i) Indicator organisms-e-coli (3 marks)
 - ii) Membrane filtration (3 marks)
 - iii) Multiple tube technique (3 marks)
- d) State water borne diseases. (3 marks)

QUESTION 3

- a) In water treatment process, what do the following terms mean:
 - i) Flocculation (1 mark)
 - ii) Coagulation (1 mark)

In each of the above processes, describe each one. (6 marks)
- b) Harare water is characterised with particulate materials and bad odour in it. What might be the cause and elaborate ways to curb the situation. (7 marks)
- c) What factors must be considered in choosing a site for the abstraction of water. (6 marks)

PAPER NO: 578/15/S07-WATER AND SANITATION

- d) In water treatment process, explain the essence of chlorination. (4 marks)

QUESTION 4

- a) State four (4) ways of polluting the river and (4 marks)
For the any two, explain how you can solve the problem. (6 marks)
- b) Explain re-aeration and oxygen balance in water bodies. (15 marks)

QUESTION 5

- a) What is 'solid waste management'? (5 marks)
- b) Discuss the importance of solid waste management programs. (4 marks)
- c) Explain the following terms as used in sewage reticulation:
- i) Separate system (5 marks)
 - ii) Combined system (4 marks)

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