ZIMBABWE

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

HIGHER EDUCATION EXAMINATIONS COUNCIL (HEXCO)

NATIONAL DIPLOMA

IN

ACT, METALLURGY

SUBJECT: Analytical Chemistry

PAPER NO: 501/15/S02
501/22/S02

DURATION: 3 hours

JUNE 2026 EXAMINATION

REQUIREMENTS

INSTRUCTIONS TO CANDIDATE

1. **Answer any four (4) questions.**

2. **Each question carries 25 marks.**

3. **Neat diagrams where appropriate is a must.**

This paper consists of 3 printed pages.

PAPER NO: 501/15/S02 – ANALYTICAL CHEMISTRY
501/22/S02 – ANALYTICAL CHEMISTRY

QUESTION 1

a) Describe the term solvent extraction in relation to hydro-metallurgy. (4 marks)

b) Highlight any two (2) organic solvents used in solvent extraction. (2 marks)

c) State four (4) applications of the solvent extraction method. (4 marks)

d) Explain the principle in the photo-multiplier tube. (10 marks)

e) Evaluate the principle of conductometric titration. (5 marks)

QUESTION 2

a) Outline three (3) methods in which chromatography can be classified based on. (3 marks)

b) Define the following terms used in chromatography:

i) Analyse (2 marks)
ii) Identify (2 marks)
iii) Purify (2 marks)
iv) Quantify (2 marks)
v) Mobile phase (2 marks)
vi) Stationary phase (2 marks)
vii) Stationary phase (2 marks)

c) Explain the principle of operation of HPLC. (10 marks)

QUESTION 3

a) Highlight any four (4) limitations of the Beer-Lambert law. (4 marks)

b) Describe the electronic transitions of molecules in IR spectroscopy. (5 marks)

c) Distinguish between Beer and Lambert's law. (4 marks)

d) Provide three (3) applications of UV V16 spectrophotomer. (4 marks)

e) Differentiate between FTIR spectroscopy and UV V16 spectrophotometer. (8 marks)

QUESTION 4

a) Provide your understanding on the following terms:

i) Electrode potential (3 marks)
ii) Cell potential (3 marks)
iii) Reference electrode (3 marks)

b) Describe the use of glass electrode to measure pH. (7 marks)

c) Explain the principle of operation of mass spectrometer. (9 marks)

QUESTION 5

a) Discuss the isotope dilution method of analysis. (5 marks)

b) Outline four (4) methods of handling and disposing radioactive materials. (4 marks)

c) With aid of diagrams differentiate x-ray diffraction and x-ray fluorescence. (10 marks)

d) State six (6) applications of x-ray instruments. (6 marks)

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