

053106T4ACH

ANALYTICAL CHEMISTRY LEVEL 6

ASC/OS/ACHEM/CC/01/6

Apply Physics Principles

March/April 2026



**TVET CURRICULUM DEVELOPMENT, ASSESSMENT AND CERTIFICATION
COUNCIL (TVET CDACC)**

WRITTEN ASSESSMENT

Time: 2 HOURS

INSTRUCTIONS TO CANDIDATE

1. This paper consists of **TWO** sections: **A** and **B**.
2. Answer **ALL** questions in section A and **ANY THREE** (3) questions in section B.
3. Marks for each question are indicated in the brackets.
4. Candidates are provided with a separate answer booklet
5. Do not write on the question paper.

This paper consists of FIVE (5) printed pages

**Candidates should check the question paper to ascertain that all
pages are printed as indicated and that no questions are missing.**

SECTION A (40 MARKS)

Answer ALL the questions in this section.

1. Density is often used to identify unknown samples in the laboratory. The mass of a metal sample is 250 g and its volume is 50 cm³. Calculate its density in kg/m³. (4 marks)
2. Fluid movement is important in pipelines transporting chemicals.
 - a) Differentiate between laminar flow and turbulent flow. (2 marks)
 - b) State TWO conditions that favors laminar flow in a liquid. (2 marks)
3. During a physics demonstration, a stretched string was plucked to show how vibrations produce waves. The string produced waves of frequency 220 Hz, and the waves traveled at 110 m/s. Calculate the wavelength of the waves. (4 marks)
4. In an experiment, precise measurements are taken to study physical quantities.
 - a) State TWO sources of error that may occur when using a vernier caliper. (2 marks)
 - b) Explain why SI units are used in scientific measurements. (2 marks)
5. A student in the laboratory examined how forces influence the movement of objects and how friction affects laboratory equipment.
 - a) State Newton's Second Law of Motion. (2 marks)
 - b) Highlight TWO effects of friction on laboratory equipment and instruments. (2 marks)
6. During a laboratory activity, forces were applied to beams and levers to observe turning effects.
 - a) Define moment of a force. (1 mark)
 - b) Give TWO practical applications of the principle of moments in laboratory practice. (2 marks)
7. A student used a tuning fork and a flashlight in the laboratory to investigate the behaviour of sound and light waves. Discuss TWO differences between sound waves and light waves. (4 marks)
8. Optical instruments such as spectrophotometers depend on light behavior.
 - a) State the law of reflection of light. (2 marks)
 - b) Define refraction of light. (2 marks)
9. During motion analysis of laboratory equipment, certain quantities are used to describe movement. A laboratory trolley changes its velocity uniformly from 2.5 m/s to 8.4 m/s in 5 seconds. Calculate the acceleration of the trolley. (3 marks)

10. Heat transfer is an important consideration in laboratory experiments and equipment design. Name the THREE modes of heat transfer. (3 marks)
11. In a physics laboratory, measurements of physical quantities are routinely taken using standard instruments. State THREE basic physical quantities. (3 marks)

SECTION B (60 MARKS)*Answer any **THREE** Questions in This Section*

12. A sample trolley in a research facility moves along a straight track while transporting chemical samples.

- a) The trolley starts from rest and accelerates uniformly to a velocity of 12 m/s in 6 seconds. Calculate its acceleration. (3 marks)
- b) If the mass of the trolley is 50 kg, determine the force causing the motion. (3 marks)
- c) The trolley then moves a distance of 30 m under this force. Calculate the work done. (4 marks)
- d) What is kinetic energy. (2 marks)
- e) Calculate the kinetic energy of the trolley at a speed of 12 m/s. (4 marks)
- f) Describe TWO ways energy conservation is applied in analytical chemistry laboratories. (4 marks)

13. A laboratory investigation was carried out on the flow of liquids in pipes and the heating of materials. Answer the following questions.

- a) State the Bernoulli's principle. (2 marks)
- b) Explain TWO ways the speed of a liquid affects its pressure when flowing through a horizontal pipe. (4 marks)
- c) A liquid flows through a pipe of cross-sectional area $2.0 \times 10^{-4} \text{ m}^2$ at an average speed of 0.40 m/s. Calculate the volume of liquid flowing per second. (4 marks)
- d) Define thermal expansion. (2 marks)
- e) Explain TWO applications of thermal expansion in laboratory practice. (4 marks)
- f) Discuss TWO precautions taken when heating laboratory glassware. (4 marks)

14. In a teaching laboratory, equipment such as retort stands, beam balances and mounted apparatus must remain stable and well balanced during experiments.

- a) Define the principle of moments. (1 mark)
- b) A uniform metre rule of weight 2.5 N is pivoted at the 40 cm mark. A 5 N mass is suspended at the 90 cm mark. Calculate the force required at the 10 cm mark to keep the rule in equilibrium. (5 marks)
- c) A small weight of 3 N is placed 0.2 m from the pivot on a uniform lever of weight 6 N and length 1 m. Calculate the clockwise moment about the pivot. (4 marks)

- d) Discuss TWO factors that affect the stability of laboratory apparatus. (4 marks)
- e) Explain THREE benefits of reducing friction in laboratory machines and equipment. (6 marks)

15. A laboratory technician is investigating the properties of an unknown solid and the pressure of fluids used in an experiment.

- a) A solid has a mass of 400 g and a volume of 160 cm³. Calculate the density of the solid in kg/m³. (4 marks)
- b) When the solid is fully immersed in water, it experiences an up thrust of 2.5 N. Determine the volume of water displaced. (Take $g = 9.8 \text{ N/kg}$) (4 marks)
- c) Explain TWO factors that affect pressure in a liquid. (4 marks)
- d) A pressure gauge connected to a liquid shows a pressure of 18,000 Pa. If the density of the liquid is 1,000 kg/m³, calculate the depth of the liquid. (4 marks)
- e) Discuss TWO applications of pressure principles in analytical chemistry laboratories. (4 marks)

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