**Exam:** Unit 4: Metrology Laboratory Equipment **Exam cycle:** May 2022

**Date:**

Candidates should attempt to answer all questions

1. Define the statements below and state when it is applicable, with examples.
   Parallax error
   Adhesion and cohesion of a liquid
   Repeatability and reproducibility
   Euramet cg18
   Proficiency testing

(20 marks)

2. An auditor queries a stated value for a mass on one of your issued calibration certificates and asks for clarification on the validity of the result. Describe the processes you would follow to determine whether the auditor has a valid comment, and what internal quality control checks you could instigate to prove your stated value.

(30 marks)

3. A client would like to have non-standard metallic disks calibrated to F1 level. Your quality manual does not have a validated procedure for determining the density of metals for mass calibrations. Explain the procedure for conducting such a calibration and how you would ensure the validity of your method, paying particular regard to air density and any air buoyancy corrections.

(20 marks)

4. Replicate testing is a necessary quality requirement with accredited organisations. Outline the procedure when conducting a replicate testing for a range of E2 masses, especially in the procedures, comparing the results, and the preparation of the associated uncertainty budgets.

(20 marks)

5. Accurately reporting the result in micrometer determinations is crucial to the stated result. Outline the procedure to be followed to allow this and explain how this is allowed for when preparing an uncertainty budget for dimensional calibrations.

(10 marks)

**(total of 100 marks)**

**End of exam paper.**