

## CTSI Professional Competency Framework (CPCF) written examination

### Unit 4: Laboratory Equipment - Metrology

September 2022

#### Guidance for this examination

Please ensure that you indicate clearly, at the top of the answer booklet, the law viewpoint from which you will be answering: English, Scottish or Welsh.

The examiners may expect candidates to show knowledge of legislation which is in place but not in force (i.e., has been enacted) and regulations which have been made but are not yet in force, if they are directly relevant to the subject-matter of the examination.

#### Examination structure

This examination is one hour 30 minutes long (plus ten minutes' reading time).

Total of five questions.

Candidates should attempt **all** questions.

Please be aware that each question has been given a mixture of marks available (identifiable against each question).

#### Note:

The Laboratory Equipment – Metrology paper is a **closed book**; no materials are permitted to be taken into the examination room.

*The examination paper has **two** pages, including this front sheet.*

Candidates should attempt to answer **all** questions.

1. From the list below, define the statements, and where applicable, provide examples with your answers.

- Measurement uncertainty
- HACCP
- Borda's method of substitution
- Significant contribution to uncertainty budget
- Management Review

(20 marks)

2. An organisation wishes to create a mass calibration laboratory in their premises and have asked for your advice. There are nine storeys to the building, and they wish to utilise the ground floor space to conduct 500kg to 20kg calibrations up to F2 uncertainty. The first-floor laboratory needs to be constructed, in what is presently office accommodation, into an E2 mass laboratory from 10kg to 1mg.

Discuss the viability of such a proposal and what needs to be done to allow the required environmental stability, if the laboratories are created.

(30 marks)

3. A client would like to have non-standard glass measures calibrated to UKAS. Your quality manual does not have a validated procedure for determining the coefficient of thermal expansion of the glass for gravimetric calibrations.

Explain the procedure for conducting such a calibration and how you would ensure the validity of your method.

(20 marks)

4. Density measurement of a liquid is important to a measurement of its volume in a gravimetric determination. Using a method of your choosing, explain how it is conducted with a view to minimising any errors.

Briefly state the components that you would include in an uncertainty budget for determining the liquid's density.

(20 marks)

5. Preparing an audit schedule for an ISO 17025 organisation is a key feature of the quality control process. Describe how a schedule could be drawn up to ensure that each clause of the standard is covered on an annual basis. Ensure that your answer discriminates between a horizontal audit and a vertical one.

(10 marks)

**Total of 100 marks.**

**End of exam paper.**