



# T Level Technical Qualification in Science

Occupational specialism assessment (OSA)

## Metrology Sciences

Assignment 1 - Distinction

Guide standard exemplification materials

## T Level Technical Qualification in Science Occupational specialism assessment

# Guide standard exemplification materials

## Metrology Sciences

### Assignment 1

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## Introduction

The material within this document relates to the Metrology Sciences occupational specialism sample assessment. These exemplification materials are designed to give providers and students an indication of what would be expected for the lowest level of attainment required to achieve a pass or distinction grade.

The examiner commentary is provided to detail the judgements examiners will undertake when examining the student work. This is not intended to replace the information within the qualification specification and providers must refer to this for the content.

In assignment 1, the student must perform an equipment inspection, an equipment check, and a report on the findings.

After each live assessment series, authentic student evidence will be published with examiner commentary across the range of achievement.

# Task 1: visual Inspection

## Scenario

You have been hired by a national kitchen design and installation company to work in their quality control department.

Your company has asked you to review length measuring equipment for suitability, accuracy, and fitness for purpose.

You will need to report back to the director that equipment is suitable and fit for use. In the event that further equipment is required, you will need to recommend suitable equipment, based upon the benefit of investment.

The business is split into 3 areas:

- the design team who visit customers' homes to design and plan the new kitchen
- the manufacturing team who make the kitchen units in the factory
- the installation team who install the kitchens in customers' homes

## Task

Complete an inspection of 2 pieces of measurement equipment from each department (6 in total) in the company and record the findings.

Complete a risk assessment for the use of these pieces of equipment using the template provided.

## Student evidence

Criteria	Essential criteria (all essential criteria must be awarded to pass)	Assessor check	Marks awarded
Selected 2 suitable pieces of equipment from each department. Guidance: suitable means suitable for the task.	Yes	6 suitable pieces of equipment selected as required and are suitable for each department.	1 mark for selecting 6 pieces. 1 mark for 2 suitable pieces from each department. <b>(maximum 2 marks)</b>  2 awarded
Inspected each piece of equipment in respect of overall condition. Results recorded for later reporting.	Yes	6 pieces inspected and overall condition recorded.	1 mark for 2 items inspected and result of overall condition recorded. <b>(maximum 3 marks)</b>  3 awarded

Criteria	Essential criteria (all essential criteria must be awarded to pass)	Assessor check	Marks awarded
<p>Inspected each piece of equipment in respect of units. Results recorded for later reporting.</p>	No	6 pieces inspected and results recorded.	<p>1 mark for 2 items inspected and results recorded. <b>(maximum 3 marks)</b></p> <p>3 awarded</p>
<p>Inspected each piece of equipment in respect of markings and calibration marks. Results recorded for later reporting.</p>	No	6 pieces inspected and results recorded.	<p>1 mark for 2 items inspected and results recorded. <b>(maximum 3 marks)</b></p> <p>3 awarded</p>
<p>Applied safe handling requirements for equipment, including the use of personal protective equipment if required.</p>	Yes	Safe handling of all equipment throughout. No PPE required for the equipment selected.	<p>1 mark</p> <p>1 awarded</p>
<p>Maintained health and safety of the workstation throughout, for example, maintained organisation of all equipment being used, safe use of any chemicals or electrical equipment, appropriate handling of all equipment and tools.</p>	Yes	Correctly maintained the safety of the workstation throughout the task and safely used electrical equipment.	<p>1 mark</p> <p>1 awarded</p>
<p>Completed all required preparation tasks on the equipment, such as cleaning, fixturing, or clamping.</p>	No	All pieces of equipment were cleaned before inspection. No other preparation tasks were completed.	<p>1 mark for preparation of equipment.</p> <p>1 mark for cleaning equipment.</p> <p>1 mark for clamping/securing equipment. <b>(maximum 3 marks)</b></p> <p>1 awarded</p>

Criteria	Essential criteria (all essential criteria must be awarded to pass)	Assessor check	Marks awarded
Cleaned up the workstation and appropriate surfaces following the completion of the inspection, returned all equipment to storage location, disposed of any waste product appropriately.	No	Equipment was returned to its original location, surfaces were not cleaned down, but all waste was disposed of suitably.	1 mark for cleaning workstation and surfaces. 1 mark for return/storage of equipment used and/or any disposal of waste. <b>(maximum 2 marks)</b>  1 awarded
Total marks			18 marks  15 awarded

## Risk assessment form

<b>Person carrying out risk assessment:</b>	<b>D. Student</b>	<table border="1"> <thead> <tr> <th>THOSE AT RISK</th> <th>KEY</th> </tr> </thead> <tbody> <tr> <td>Own staff</td> <td>OWN</td> </tr> <tr> <td>Venue staff</td> <td>VEN</td> </tr> <tr> <td>Organisers</td> <td>ORG</td> </tr> <tr> <td>Visitors</td> <td>VIS</td> </tr> <tr> <td>Public</td> <td>PUB</td> </tr> <tr> <td>Contractors</td> <td>CON</td> </tr> <tr> <td>All persons onsite</td> <td>AOS</td> </tr> </tbody> </table>	THOSE AT RISK	KEY	Own staff	OWN	Venue staff	VEN	Organisers	ORG	Visitors	VIS	Public	PUB	Contractors	CON	All persons onsite	AOS
THOSE AT RISK	KEY																	
Own staff	OWN																	
Venue staff	VEN																	
Organisers	ORG																	
Visitors	VIS																	
Public	PUB																	
Contractors	CON																	
All persons onsite	AOS																	
<b>Persons responsible on site:</b>	A. Manager																	
<b>Venue:</b>	Customers' homes for which kitchen is installed																	
<b>Work activity:</b>	Safe use of inspection equipment																	
<b>Date of assessment:</b>	20/11/2020																	

Please read the guidelines prior to completing your risk assessment

### Section 1

Hazard	Who might be harmed? (see those at risk above)	Likelihood	Severity	Total risk level	Control measures (add any other control measures you will use)	Likelihood	Severity	Resultant risk level
<b>Damage to company reputation due to incorrect sizing of parts</b>	OWN - Company	Likely	3	9	To prevent the incorrect sizing of parts, the company must ensure that all inspection equipment has an up-to-date calibration certificate, and that staff are trained how to use and store the equipment.	Unlikely	1	2
<b>Puncture wound from vernier callipers</b>	OWN	Likely	2	6	Staff to carry vernier callipers in a container to prevent puncture wounds. Staff to be trained and made aware of the sharp jaws on the vernier callipers.	Unlikely	1	2

Hazard	Who might be harmed? (see those at risk above)	Likelihood	Severity	Total risk level	Control measures (add any other control measures you will use)	Likelihood	Severity	Resultant risk level
<b>Harm to customer from incorrect fitment due to measurement error</b>	OWN - Company	Likely	3	9	The incorrect fitment of parts will most likely be down to an incorrect measurement which could be a result of insufficient training or incorrect calibration of equipment. The company must ensure that all inspection equipment has an up-to-date calibration certificate and that staff are trained how to use and store the equipment.	Unlikely	1	2
<b>Tripping hazard on inspection equipment which is stored untidily</b>	CON	Likely	2	6	When not using inspection equipment, contractors should store equipment safely and orderly, therefore reducing the risks of tripping.	Unlikely	1	2
<b>Flooring – trip or slip hazards</b>	OWN	Likely	1	3	Move anything that is in the way and clean up any slips or anything.	Probable	1	1
<b>Desk area</b>	OWN	unlikely	1	1	Things such as oil or contaminants might be evident on the bench or might be transferred from hands onto other bits of equipment which might lead to dropping equipment and damaging it, which in extreme cases could lead to injury.	Unlikely	1	1



By signing the declaration below you have agreed that you will put the appropriate control measures in place to ensure that hazards are reduced and that the risks applicable to your area are controlled.

<b>Signed</b>	<b>D. Student</b>
<b>Print name</b>	D. Student
<b>Review date</b>	20/11/2020

## Task 2: completing metrology measurement equipment checks

### Scenario

You have examined 6 pieces of length measuring equipment from 3 different departments and recorded your findings. You are now preparing to compare the equipment to the suitable standard.

The director of the company has asked you to collect all your results and measurements in order to monitor which company equipment is accurate.

This will help to evaluate the effectiveness of the current equipment pool and allow you to recommend where changes should be made in the future.

### Task

Measure one piece of equipment against a suitable standard and record the results.

Use the piece of equipment to measure the unit template provided and record the results.

### Student evidence

Criteria	Essential criteria (all essential criteria must be awarded to pass)	Assessor check	Marks awarded
Applies safe handling requirements for equipment, including the use of personal protective equipment if required.	Yes	Safe handling and practices were adhered to throughout the task with appropriate use of equipment. No PPE required.	1 mark 1 awarded
Maintained health and safety of the workstation throughout, for example, maintained organisation of all equipment being used, safe use of any chemicals or electrical equipment, appropriate handling of all equipment and tools.	Yes	Correctly maintained the safety of the workstation throughout the task.	1 mark 1 awarded

Criteria	Essential criteria (all essential criteria must be awarded to pass)	Assessor check	Marks awarded
Completed all required preparation tasks on the equipment, such as cleaning, fixturing, or clamping.	No	Equipment to be used was re-cleaned at the start of this task, no other preparation activity was carried out.	1 mark for preparation of equipment. 1 mark for cleaning equipment. 1 mark for clamping/securing equipment. <b>(maximum 3 marks)</b>  1 awarded
Selected a suitable standard to check the selected piece of equipment.	Yes	Correct standard used for comparison.	1 mark  1 awarded
Taken measurement of the equipment under test from a minimum of 2 points, including minimum or maximum, and one other.	Yes	Measurement was taken across multiple points to ensure accuracy. Minimum, maximum and midpoint were used.	1 mark for measurement from minimum or maximum <b>and</b> from one other point. <b>(maximum 1 mark)</b>  1 awarded
Suitable piece of equipment has been selected to measure the template.	Yes	Suitable piece of equipment used to measure the template – 1m wooden rule.	1 mark  1 awarded
Taken measurements of equipment following the correct standard procedure consistently and accurately, with no errors for calibration and measurement.	No	A standard procedure was followed to allow for a comparison and was accurately carried out with no calibration or measurement error.	1 mark for following standard procedure consistently and accurately. 1 mark for no calibration errors. 1 mark for no measurement errors. <b>(maximum 3 marks)</b>  3 awarded

Criteria	Essential criteria (all essential criteria must be awarded to pass)	Assessor check	Marks awarded
Taken measurement of template following the correct standard procedure consistently and accurately, with no errors for calibration and measurement.	No	The correct procedure was used consistently throughout the measurement task, with no error in calibration or measurement.	1 mark for following standard procedure consistently and accurately. 1 mark for no calibration errors. 1 mark for no measurement errors. <b>(maximum 3 marks)</b>  3 awarded
Cleaned up the workstation and appropriate surfaces following the completion of the inspection, returned all equipment to storage location, disposed of any waste product appropriately.	No	Equipment was returned to its original location, surfaces were not cleaned down, but all waste was disposed of suitably.	1 mark for cleaning workstation and surfaces. 1 mark for return/storage of equipment used and/or any disposal of waste. <b>(maximum 2 marks)</b>  1 awarded
Total marks			16 marks  13 Awarded

## Task 3: assessing the results of metrology measurements

### Scenario

You have completed your inspection and measurement of the equipment used in different departments of the company.

The director has asked you:

- to complete a short report to summarise your findings and the issues you have identified
- to provide possible recommendations to improve the measurement systems, and justify them

### Task

Produce a report that:

- presents all results and measurements from task 1 (inspection of 6 pieces of equipment) and task 2 (measurement of the provided template) in a suitable format
- summarises your findings from the inspection of selected pieces of equipment and measurement of the template
- provides recommendations for the future, based on the inspections, measurements, and the equipment currently available

### Student evidence

This report sets to identify issues associated with the inspection equipment and through an evaluation of ideas, provide recommendations for the measurement systems.

Initially I completed a visual inspection of 6 different types of inspection equipment used within 3 different departments at a kitchen fitting company. The outcome of my visual inspection can be found in the supporting tables below. I recognised from visual inspections that the condition of the equipment in the home fitting section was considerably worse than that used in the factory, and I believe that this may be because contractors have to purchase their own tools, this is a major issue as if the fitting section is not as accurate as the factory teams, it may mean the fitting is of poor quality, as there will be more error in the measurements and therefore the accuracy of the cut and fit, which leads to poor customer service.

To identify errors in the chosen inspection equipment I compared it against a suitable standard and found some issues. I found that the pin holding the metal hook on the end of the tape measure was loose and when I compared this against the suitable standard of a tape measure that there was 0.5cm difference when the hook was pulled or pushed against. This means that depending on the tool used, the measurements could be different. This is a particular problem if the fitting team work in pairs, it would mean that depending on who did the measurement, they would be different. The knock-on consequence of an error such as this one is that someone could cut a kitchen component (such as a worktop) 0.5cm too small and this would then not be fit for purpose so would need to be replaced. In this example replacing the worktop would cost the company extra in terms of labour to fit the new worktop and the cost of manufacturing the worktop. Additionally, the customer may be dissatisfied at the delay which may impact on future business.

I then used the inspection equipment and measured the template. My results are shown in the tables below.

The director should get the inspection equipment calibrated at regular intervals and have certification to prove that this has been completed. Calibrating equipment will ensure a greater accuracy in the measurement of parts which will therefore reduce the number of re-works. There should be a process where all tools are checked regularly, from the factory to the fitting team and a standard approach to tools taken, so that the tolerances are all consistent, which will help eliminate error.

Finally, the director should be aware that technology is changing rapidly and therefore, there may be new products available for completing inspection tasks, which may be more accurate or save time. These include laser scanning and CMM machines. For low level jobs such as this, the cost of the new equipment might outweigh the benefits in terms of accuracy, however, if the company intends on taking on more complex and difficult jobs, that require much more accuracy, then the automated and digital products will be much better.

### Task 1

#### Inspection of equipment

Equipment	Inspection
Metal tape measure (fitting use)	In overall good condition after cleaning. The end of the tape measure is a little bit loose and I can't tighten it so that might make the results wrong if I use that. All of the markings on it are clear apart from 1 spot where there is a little bit of wear. There is a crinkle in the tape measure right at the beginning where it has been trapped previously, this could mean the measure could slip when trying to take measurements.
1M wooden ruler	There is a little chip off the end of the ruler past the 1m mark which will deteriorate over time and will eventually be unusable. The back side of it is flat so it lays true to the bench still, so it is still usable. All of the cm units can be read but the inches side has been worn down in places.
1m metal ruler	The metal rule is in good overall condition. All markings and units are visible and there are no issues with the construction of the tool. The metal rule has been checked against suitable standards and the units and markings are accurate.
Digital vernier calliper	The digital calliper is in good condition apart from the screen is very dark in one corner. This means that the screen should be repaired as the tool relies on the accuracy of the reading.
Metal tape measure (factory use)	This tape measure is in a much better condition than the one from the fitting team. There are no issues with the overall condition of the tape other than surface scratches to the casing. All units are readable and the metal hook is secure.
Digital laser measure	The digital laser measure is in poor condition. It did not turn on immediately and the calibration was not correct when

	checked against another tool for a comparison. This tool should be checked and recalibrated if possible or replaced if not.
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## Task 2

### Measuring the template

I selected a metal tape measure to measure the template due to the ease of use and how reliable I can make the results as it is very easy to check and recheck

Piece	Measurements
Length 1	60.24cm, 60.25cm, 60.24cm
Length 2	60.19cm, 60.20cm, 60.20cm
Width 1	61.2cm, 60.96cm, 60.92cm, 60.96
Width 2	62.1cm, 61.98cm, 61.98cm
Base Diagonal	60.65cm, 60.66cm, 60.65cm
Height 1	59.85cm, 59.9cm, 59.9cm
Height 2	59.9cm, 59.9cm, 59.9cm

## Examiner commentary

The student has completed a thorough inspection of some measuring equipment. The student has completed all 6 inspections in detail which meets all of the essential criteria. The report demonstrates metrological knowledge and understanding of the requirements of the equipment and there are highly appropriate methods used within the inspection.

The student has completed all of the critical elements of the inspection and comments will have been made relating to all critical features, as well as comments relating to the general condition of the piece of equipment. To demonstrate higher level critical skills through the inspection the student has shown consideration of user safety, accuracy of measurement and outcomes for the business and customer.

The student has clearly demonstrated understanding of the impact of incorrect equipment. The inspection demonstrates detailed knowledge of the equipment and has been executed effectively, exploring all aspects of the equipment thoroughly.

During task 2 the student has completed a basic measurement task and displayed extensive metrological techniques to complete the task with no error in technique or results evident throughout. They have demonstrated an established understanding of the strengths and issues in order to determine the most effective piece of equipment available. They also displayed metrological theoretical knowledge and skills to effectively compare that piece of equipment to a suitable standard and complete the measurement of the provided template. The student has made well founded judgements to reflect on the performance of the equipment to complete real life measurement activities.

The student has demonstrated excellent manipulation skills in order to complete the measurement task, with the correct procedure constantly used for measurement. The measurements have been conducted in a safe way throughout the activity.

In the final task, the student makes detailed and well-informed judgements of the suitability of the equipment, based upon the performance during the first 2 tasks, and demonstrates a thorough understanding of the industry and its needs with the recommendations provided. This has been completed through thorough examination of the information discovered throughout the process.

The student provides realistic and justified recommendations, considering suitability, cost, and accuracy. The recommendations are based on well supported arguments, with suitable alternatives suggested and discarded based on logical decision making. The results of the inspection and measurement are presented in a clear format that is suitable for the industry. The student has provided a clear supporting commentary of the results and the activities undertaken to obtain the results.



## Overall grade descriptors

The performance outcomes form the basis of the overall grading descriptors for pass and distinction grades.

These grading descriptors have been developed to reflect the appropriate level of demand for students of other level 3 qualifications, the threshold competence requirements of the role and have been validated with employers within the sector to describe achievement appropriate to the role.

### Occupational specialism overall grade descriptors:

Grade	Demonstration of attainment
Pass	The evidence is logical but displays minimal knowledge of basic metrological content in response to the demands of the brief.
	The student makes some use of relevant knowledge and understanding of how metrology informs practices in many sectors and demonstrates a limited understanding of perspectives or approaches associated with basic measurement tasks and principles.
	The student makes adequate use of facts/theories/approaches/concepts and attempts to demonstrate breadth and depth of metrological knowledge and understanding.
	The student is able to identify some metrological information from appropriate sources and makes use of appropriate information/appraise relevancy of information and can combine information to make decisions.
	The student makes minimal judgements/takes appropriate action/seek clarification with metrological sources of guidance and is able to make limited progress towards solving non-routine problems in real life measurement activities/situations.
	The student attempts to demonstrate metrological skills and knowledge of the relevant concepts and techniques reflected in a measurement services role and generally applies this across different contexts and measurement skill sets.
	The student shows adequate understanding of unstructured measurement-related problems that have not been seen before, using limited knowledge to find solutions to problems and make justification for strategies for solving problems, explaining their reasoning.
Distinction	The metrological evidence is precise, logical and provides a detailed and informative response to the measurement related demands of the brief.
	The student makes extensive use of relevant knowledge and understanding of how metrology informs practices in many sectors and demonstrates an understanding of perspectives or approaches associated with basic measurement tasks and principles.

	<p>The student makes decisive use of facts/theories/approaches/ demonstrating extensive breadth and depth of metrological knowledge, understanding and selects highly appropriate skills/techniques/methods.</p>
	<p>The student is able to comprehensively identify metrological information from a range of suitable sources and makes exceptional use of appropriate information/appraise relevancy of information and can combine information to make coherent measurement decisions.</p>
	<p>The student makes well founded judgements/takes appropriate action/seek clarification with metrological sources of guidance and is able to use that to reflect on real life measurement activities/situations.</p>
	<p>The student demonstrates extensive metrological skills and knowledge of the relevant concepts and techniques reflected in a measurement services role and precisely applies this across a variety of contexts and tackles unstructured problems that have not been seen before, using their knowledge and measurement skill sets to analyse and find suitable solutions to the measurement problems.</p>
	<p>The student can thoroughly examine metrological data/information in context and apply appropriate analysis in confirming or refuting conclusions and carrying out further work to justify strategies for solving problems, giving concise explanations for their reasoning.</p>

## Risk matrix

Risk matrix - evaluation of risks							Action level
Almost certain	5	5	10	15	20	25	20–25 STOP
Highly likely	4	4	8	12	16	20	
Likely	3	3	6	9	12	15	12–16 URGENT
Unlikely	2	2	4	6	8	10	8–10 ACTION
Extremely improbable	1	1	2	3	4	5	4–6 MONITOR
	X	1	2	3	4	5	1–3 NO ACTION
		Minimal	Minor injury	7 day + injury	Serious or major injury	Severe	
			CONSEQUENCE				

## Risk assessment form

<b>Person carrying out risk assessment:</b>		<table border="1"> <thead> <tr> <th>THOSE AT RISK</th> <th>KEY</th> </tr> </thead> <tbody> <tr> <td>Own staff</td> <td>OWN</td> </tr> <tr> <td>Venue staff</td> <td>VEN</td> </tr> <tr> <td>Organisers</td> <td>ORG</td> </tr> <tr> <td>Visitors</td> <td>VIS</td> </tr> <tr> <td>Public</td> <td>PUB</td> </tr> <tr> <td>Contractors</td> <td>CON</td> </tr> <tr> <td>All persons onsite</td> <td>AOS</td> </tr> </tbody> </table>	THOSE AT RISK	KEY	Own staff	OWN	Venue staff	VEN	Organisers	ORG	Visitors	VIS	Public	PUB	Contractors	CON	All persons onsite	AOS
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All persons onsite	AOS																	
<b>Persons responsible on site:</b>																		
<b>Venue:</b>																		
<b>Work activity:</b>																		
<b>Date of assessment:</b>																		

Please read the guidelines prior to completing your risk assessment

### Section 1

Hazard	Who might be harmed? (see those at risk above)	Likelihood	Severity	Total risk level	Control measures (add any other control measures you will use)	Likelihood	Severity	Resultant risk level

Hazard	Who might be harmed? (see those at risk above)	Likelihood	Severity	Total risk level	Control measures (add any other control measures you will use)	Likelihood	Severity	Resultant risk level

By signing the declaration below you have agreed that you will put the appropriate control measures in place to ensure that hazards are reduced and that the risks applicable to your area are controlled.

<b>Signed</b>	
<b>Print name</b>	
<b>Review date</b>	

## Document information

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Owner: Head of Assessment Design

## Change History Record

Version	Description of change	Approval	Date of Issue
v1.0	Published final version.		June 2021
v1.1	NCFE rebrand		September 2021