T-LEVELS | Institute for Apprenticeships & Technical Education

T Level Technical Qualification in Science

Occupational specialism assessment (OSA)

Laboratory Sciences

Assignment 2 – Part B

Mark scheme

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Part A

Contents

Task 1 (a): assessor observation checklist

Criteria	**Assessor check**	**Marks awarded**	**Essential criteria** (All essential criteria must be awarded to pass)
Sterilisation of workstation and equipment including safe handling of ethanol		1	Yes
Well-organised workstation, ensuring all equipment is kept within close proximity to the Bunsen burner		1	
Correct personal protective equipment (PPE) is selected and worn, with effort made to keep gloves sterile		1	Yes
Safe handling of equipment during task		1	Yes
Appropriate and safe use of flaming technique		1	
Performed scientific techniques effectively: • measuring and transferring 1ml of water sample • carrying out streak technique including not fully removing the lid of the agar plate • using equipment correctly, without having to put equipment down whilst in use (manual dexterity)		1 mark for completing technique effectively and 1 mark for completing techniques accurately (Maximum 6 marks) **Guidance –** assessor must check the accuracy of recorded measurements and observations on at least 2 occasions	
Total awarded*		11 marks	

Task 1 (a)

Task 1 (a): performing aseptic techniques

Band	Mark	Descriptor
4	10–12	The student has demonstrated autonomy and judgement in following the multi-step standard operating procedure (SOP), carrying out all instructions in full and carrying out the task logically and in a time-efficient manner to maintain an aseptic environment.
3	7–9	The student has followed the multi-step SOP, carrying out most instructions in full, with only occasional minor omissions or errors (for example, boiling tube is not flamed after removing the required sample).
2	4–6	The student has followed the multi-step SOP to produce results, but in some areas attention to detail is lacking. Carried out all major steps in the correct order, although there may be some errors or omissions within some of the steps (for example, placing required equipment on the bench whilst in use).
1	1–3	The student has followed parts of the multi-step SOP correctly to produce results, carrying out most of the major steps, but may omit a key step and complete some of the steps in the wrong order, compromising the validity of results. Minor PPE errors (for example, one reminder to wear goggles appropriately, nothing which causes the assessment to be paused).
0	0	No creditworthy material as described in bands 4 to 1.

Indicative content

- the safe sterilisation of work area, handling the ethanol appropriately and safely
- knowledge of working safely with an open flame
- knowledge of hazards and risks associated with working with biological samples
- knowledge of aseptic techniques and the importance of flaming equipment
- the importance of not removing the agar plate lid
- sample is spread in line with SOP resulting in a streak plate
- consistent aseptic technique is used for both the control and sample plate
- plate is securely taped shut using multiple small pieces of tape and inverted
- plate is labelled with relevant details (for example, date, type of sample and initials)

Content mapping

K1.1 How health, safety and environmental practices apply to laboratory settings:

- safely performing a scientific techniques
- completing a scientific procedure

K1.47 When scientific and mathematical skills are applied when performing a range of scientific techniques:

- measuring
- manual dexterity
- observing
- analysing:
  - calculations

K1.47 When scientific and mathematical skills are applied when performing a range of scientific techniques:

- manual dexterity: performing aseptic technique

K1.52 When it is appropriate to use the following laboratory techniques:

- microbiology techniques: aseptic culturing

K1.67 The purpose and importance of SOPs within a laboratory environment

S1.68 Work safely in a laboratory when performing specific scientific techniques

S1.69 Comply with relevant health and safety legislation and regulations, including COSHH and biosafety containment levels, when handling and disposing of solids, liquids and gases relevant for the scientific technique being performed

S1.71 Use appropriate PPE when performing scientific tasks (for example, suitable eye protection and gloves)

S1.73 Apply scientific knowledge when undertaking scientific techniques by:

- choosing and justifying appropriate scientific techniques: aseptic techniques

S1.75 Apply a range of science and mathematical skills when performing practical scientific techniques

S1.78 Use the following practical scientific techniques to analyse environments and identify microorganisms within biological environments:

- aseptic culturing

S1.84 Select appropriate equipment to complete practical scientific techniques:

- microbiological equipment

S1.85 Demonstrate practical technical competence in the use of equipment:

- correctly manipulating the equipment
- using equipment safely and for intended purpose

S1.89 Follow SOPs to ensure compliance with regulations and quality standards when performing scientific techniques

Task 1 (b)

Task 1 (b): calculation of CFU/ml, mean and standard deviation of data

Band	Mark	Descriptor
4	10–12	The student has consistently, correctly applied the CFU/ml equation to each of the test samples, evidenced by clear working out. CFU/ml results have successfully been transferred to a LIMS system and recorded in a clear tabular format, presenting a complete, identifiable and relevant set of results that is fit for purpose and supports analysis and further investigation, including the following elements: • in clear tabular format and logical structure • with appropriate units and notation • suitable representation of the number of repeats for all samples • calculations are complete, clear and accurate with no calculation errors • records allow data to be easily verified
3	7–9	The student has correctly applied the CFU/ml equation to the majority of the test samples. CFU/ml results have successfully been transferred to a LIMS system and recorded in a clear tabular format, presenting a complete, identifiable and relevant set of results that is fit for purpose and supports analysis and further investigation, including the following elements: • in tabular format and organised structure • appropriate units and notation with minimal error • suitable representation of the number of repeats for most samples • calculations are complete and accurate, with occasional minor errors • records allow data to be verified, although may include minor lapses in clarity (for example, result changed or deleted without explanation)
2	4–6	The student has correctly applied the CFU/ml equation to the majority of the test samples. Majority of CFU/ml results have successfully been transferred to a LIMS system and recorded in a clear tabular format, presenting a complete, identifiable and relevant set of results that is fit for purpose and supports analysis and further investigation, including the following elements: • some organisation • inconsistent use of appropriate units and notation • suitable representation of the number of repeats for some samples • calculations are partially correct but may contain several minor errors or a single major error
1	1–3	The student has correctly applied the CFU/ml equation to a minority of the test samples. Only 1 or 2 CFU/ml results have successfully been transferred to a LIMS system. Data is recorded

Band	Mark	Descriptor
		with little attempt at a coherent structure, is incomplete, and sometimes unclear or unnecessary data is used. Work includes the following elements: • little evidence of attempt to structure results • inconsistent use of appropriate units and notation • not all test results have been transferred to the LIMS sheet • calculations have some aspects that are correct but may follow an incorrect approach, be limited in extent, or contain major errors (for example, including the control sample in mean calculation)
0	0	No creditworthy material as described in bands 4 to 1.

Indicative content

- each mean CFU/ml is calculated for the test samples through correct application of CFU/ml equation provided
- method of working out of CFU/ml is evidenced
- data is well presented in LIMS system
- omission of control sample from mean CFU/ml calculation
- the tables' headings should explain what the column or row represents
- the calculation of the means will be accurate with clearly set out calculations and each step will be mathematically accurate
- the student will produce tables with clear labels and units in the headings, and means should be placed at the right-hand side of the table
- standard deviation is calculated, appropriate data is selected and relevant calculation formula is used within a spreadsheet
- Example data analysis:

Test sample	CFU/ml
1	208750
2	225000
3	217500
4	197500

Mean = 212188 CFU/ml
Standard deviation = 10246

Content mapping

S1.75 Apply a range of science and mathematical skills when performing practical scientific techniques

K2.6 How the following considerations inform data processing and subsequent analysis of the results in a laboratory environment:

- regulatory requirements (for example, validation, conformity to known analytical standards)

- relevant calculations (for example, magnification and Rf values)
- conversion of units (for example, consistent use of units across different data sets)
- appropriate statistical techniques to determine the validity or significance of the results (for example, standard deviation, p value, uncertainty values)

S2.20 Select appropriate statistical techniques to analyse and interpret results from scientific tasks:

- mean
- standard deviation

S2.22 Use the results of calculations and statistical analysis to interpret and evaluate data from scientific tasks to:

- determine trends
- assess statistical validity
- support technical arguments
- draw conclusions
- communicate effectively to a range of stakeholders

Performance outcome (PO) grid

Task	PO1	PO2	PO3	Total
1 (a)	23	0	0	23
1 (b)	7	5	0	12
Total marks	30	5	0	35
% weighting	86%	14%	0%	100%

Document information

Owner: Head of Assessment Design