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

v1.1: Additional sample material
20 November 2023
603/6989/9

NCFE CACHE

T Level Technical Qualification in Science
Occupational specialism assessment (OSA)

Laboratory Sciences

Mark scheme

Assignment 2

Part B

Contents

Task 1(a)

Task 1(a): assessor observation checklist

Criteria	**Assessor check**	**Marks awarded**	**Essential criteria** (all essential criteria must be awarded to pass)
Safe handling of reagents during task		1	Yes
Safe storage and disposal of reagents		1	Yes
Well organised workstation to facilitate the completion of the task		1	
Safe handling of equipment during task		1	Yes
Use of appropriate PPE in preparation and completion of the task		1	
Performed scientific techniques effectively: • measuring • observing • use equipment correctly		1 for completing technique effectively **and** 1 for completing techniques accurately. **(maximum 6 marks)** **Guidance** Assessor must check accuracy of recorded measurements and observations on at least 2 occasions during the task.	
Total awarded*		11 marks	

Task 1(a): following the standard operating procedure (SOP) for measuring activity of β-lactamase

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-efficien**t manner to produce **accurate** results.
3	7–9	The student has followed the multi-step standard operating procedure (SOP), carrying out **most** instructions in full, with only **occasional minor omissions or errors**, for example preparation of the serial dilution was not performed as accurately as it should be.
2	4–6	The student has followed the multi-step standard operating procedure (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, some samples were not measured every 15 minutes
1	1–3	The student has followed parts of the multi-step standard operating procedure (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.
0	0	No creditworthy material as described in bands 4 to 1.

Indicative content

- the SOP is read and fully understood by the student
- all steps are followed in the SOP in the correct order
- all equipment is used as described in the SOP
- all elements of safe lab working are in place, with correct PPE worn throughout the procedure
- any serial dilutions are calculated correctly and measured out accurately to reflect the calculations
- results are recorded accurately and contemporaneously
- measurements are taken at the correct times, or if there is any deviation from the set times this is noted and factored in

Task 1(b)

Task 1(b): assessment of β-lactamase activity

Band	Mark	Descriptor
4	10–12	The student has used **highly relevant** and **appropriate** methods to create the standard curve and assess the level of β-lactamase present in the sample, presenting a **complete**, **identifiable**, and **relevant** set of results which is **fit for purpose** and **supports analysis and further investigation**, including the following elements: • in clear tabular format and logical structure • to appropriate significant figures • with appropriate units and notation • suitable 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 used **relevant** and **appropriate** methods to create the standard curve and assess the levels of β-lactamase present in the sample, presenting an **identifiable** and **relevant** set of results which is **fit for purpose** and su**pports analysis and further investigation**, including the following elements: • in tabular format and organised structure • to appropriate significant figures • appropriate units and notation with minimal error • suitable 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 used **some relevant** methods to create the standard curve and assess the levels of β-lactamase present in the sample, presenting a set of results which includes some data to support further analysis. Results are recorded with **some structure**, although is **incomplete** and **occasionally unclear**, or unnecessary data is used. Work includes the following elements: • some organisation • some appropriate significant figures • inconsistent use of appropriate units and notation

Band	Mark	Descriptor
		• suitable 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 created the standard curve and assess the levels of β-lactamase present in the sample, presenting a set of results which includes **limited data** to support further analysis. Data is recorded 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 significant figures • inconsistent use of appropriate units and notation • repeats carried out for some samples but not based around identification of concordant results • calculations have some aspects that are correct but may follow an incorrect approach, be limited in extent, or contain major errors
0	0	No creditworthy material as described in bands 4 to 1.

Indicative content

- the student is able to produce a standard curve that is linear in the expected range, and reproducible, with each dilution giving absorbance readings that fit with the expected trends
- a standard curve is created using standards and samples of bacteria absorbance results
- the sample β-lactamase concentration is calculated from the standard curves
- β-lactamase concentration is calculated using all three of the dilutions and compared to assess linearity
- anomalous results are not used
- all tables should have clearly ruled lines and columns with no units in each row or column, these should only be found in the headings of each table
- the tables' headings should explain what the column or row represents
- the calculation of the concentrations will be accurate with clearly set out calculations and each step will be mathematically accurate and to the correct significant figures, ideally 3sf
- the student will produce tables with clear labels and units in the headings
- readings taken are to correct the number of decimal places (for example, 2dp)

Content mapping:

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

S1.77 Use the following practical scientific techniques to analyse substances:

- preparation of serial dilutions

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

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

- volumetric, graduated and mechanical (variable volume) pipettes

K1.51 When it is appropriate to use the following techniques to identify/determine, separate or analyse substances and environments:

- colorimetry to determine concentration

K1.63 The principles of producing reliable and verifiable results:

- recording in a clear and unambiguous way (for example, use of tables, indelible ink, not using sticky notes or loose papers, ensuring writing is legible)
- using appropriate units, notation and correct number of significant figures
- critically reviewing data obtained (for example, identifying any anomalous results)
- repeating investigations and referencing why any action was taken, where appropriate

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)
- customer requirements for the presentation of data (for example, graphs)
- using complementary experimental methodologies from existing peer-reviewed studies to confirm results (for example, by the use of online databases)
- using laboratory control charts and trend charts (for example, to confirm equipment and/or protocols are within tolerance)

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

- mean
- standard deviation
- chi-square test
- t-test

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)	12	0	0	12
Total marks	35	0	0	35
% weighting	100	0	0	100

Document information

The T Level Technical Qualification is a qualification managed and approved by the Institute for Apprenticeships and Technical Education. NCFE is currently authorised by the Institute to develop and deliver the T Level Technical Qualification in Science.

Owner: Head of Assessment Design

Change History Record

Version	Description of change	Approval	Date of issue
v1.0	Additional sample material		01 September 2023
v1.1	Sample added as watermark	November 2023	20 November 2023