

# T Level Technical Qualification in Science

Employer-set project (ESP)

## Laboratory Sciences

Project brief

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# Laboratory Sciences

## Project brief

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# Guidance for students

## Student instructions

- read the project brief and the task guidance carefully before starting your work
- you **must** work independently and make your own decisions on how to approach the tasks within the employer-set project – ideally your work should
  - be in an Arial font 12pt, within standard border sizes, however you may choose to hand write your work – if you choose to hand write your work, this should be in black ink
  - clearly show where sources have been used to support your own ideas and opinions
  - clearly reference all sources used to support your own ideas and opinions
  - reference any quotations from websites
- you **must** clearly name and date all of the work that you produce during each supervised session
- you **must** hand over all of your work to your tutor at the end of each supervised session
- you must not work on the assessment in between supervised sessions

## Student information

This employer-set project will assess your knowledge, understanding and skills from across the core content of the qualification.

In order to achieve a grade for the core component, you **must** attempt both of the external examinations and the employer-set project. The combined marks from these assessments will be aggregated to form the overall core component grade (A\* to E and U). If you do not attempt 1 of the assessments or fail to reach the minimum standard across all assessments, you will receive a U grade.

Your tutor will explain how the assessment time is broken down per task and will confirm with you if individual tasks need to be completed across multiple sessions.

At the end of each supervised session, your tutor will collect all employer-set project assessment materials before you leave the room. You must not take any assessment material outside of the room (such as via a physical memory device). You **must** not upload any work produced to any platform that will allow you to access materials outside of the supervised sessions (including email).

You can fail to achieve marks if you do not fully meet the requirements of the task, or equally if you are not able to efficiently meet the requirements of the task.

## Plagiarism

Plagiarism may result in the external assessment task being awarded a U grade. For further guidance, refer to your student handbook – plagiarism in external assessment and the maladministration and malpractice policy located at [www.qualhub.co.uk](http://www.qualhub.co.uk).

## Presentation of work

- any work not produced electronically must be agreed with your tutor, the evidence you produce should be scanned and submitted as an electronic piece of evidence
- all your work should be clearly labelled with the relevant task number and your student details and be legible (for example front page and headers)
- electronic files should be given a clear file name for identification purposes (see tasks for any relevant naming conventions)
- all pages of your work should be numbered in the format page X of Y, where X is the page number and Y is the total number of pages
- you must complete and sign the external assessment cover sheet (EACS) and include it at the front of your assessment task evidence
- you must submit your evidence to the tutor at the end of each session

SAMPLE

# Scenario: a possible scientific solution to the problem of plastic waste in science laboratories

## Introduction

According to Alice Bell, 10 November 2019 'can laboratories curb their addiction to plastic' (source: The Guardian).

In 2015, researchers at the University of Exeter weighed up their bioscience department's annual plastic waste, and extrapolated that biomedical and agricultural laboratories worldwide could be responsible for 5.5million tonnes of plastic waste a year<sup>1</sup>, equal to 83% of the plastic recycled worldwide in 2012<sup>2</sup>.

In 2019, the waste from the biology department at The University of York included single use plastics, such as petri dishes, sample tubes, vials, gloves, bottles and much more. Most recycling companies are unwilling to collect and recycle this laboratory waste as they are concerned that it will be contaminated and a danger to health.

Most laboratory plastic waste is bagged securely, sterilised with high pressure steam in an autoclave before being sent to landfill. This creates 2 problems:

- a huge amount of plastic is not being recycled
- a large amount of water and energy are used in the process

Reducing use of landfill, energy and water consumption will benefit the laboratory, and the environment.

Some laboratories are investigating the use of disinfectants to sterilise used plastics, to enable recycling companies to safely collect and process the materials. This will reduce plastic waste and use of landfill. Used plastics are sterilised by soaking in tanks of disinfectant. They are then washed and bagged prior to collection by the recycling company.

## Brief

You are required to investigate the most economic use of disinfectants in the sterilisation process. You will need to consider the types of disinfectant, mode of action, concentrations, soaking times, and how to test their effectiveness.

You must complete the following steps:

- research
- produce a plan for investigation
- analyse and evaluate the effectiveness of the investigation
- report on your findings
- reflect on the process

Complete the tasks below to guide you through these steps.

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<sup>1</sup> [www.exeter.ac.uk/news/featurednews/title\\_488903\\_en.html](http://www.exeter.ac.uk/news/featurednews/title_488903_en.html)

<sup>2</sup> [www.nature.com/articles/528479c](http://www.nature.com/articles/528479c)

# Task 1: research a strategy

## What you have to do

You have been provided with a database containing a range of potentially relevant sources for your research. All the resources are linked to the problem of plastic waste in biomedical and agricultural laboratories brief. Some sources will be more relevant or reliable than others.

The sources are shown on the source content page of the database.

- carry out a literature review
- justify why you have chosen specific sources and rejected others – your justification should be based on
  - how reliable you think the source is and why
  - how relevant you think the source is and why
  - using an academic referencing technique when citing or referencing literature

Add any notes about your work in your project diary. These notes will not be marked. They are to help you to complete task 6 which is a reflective evaluation.

## Resources

- employer-set project brief and task 1 student guidance
- computer access
- NCFE CACHE provided database
- project diary

## Assessment objectives

AO2: Apply core knowledge and skills to the development of a scientific project (18 marks)

AO4: Use English, mathematics and digital skills as appropriate (4 marks)

## Core Skills

CS2: Researching

CS7: Reflective evaluation

## The evidence I have to submit for this task

A literature review, as described in what you need to do above.

## How the evidence will be assessed

This will be externally marked by examiners.

## **Time for completion of task 1**

3 hours. Plus 30 minutes for completion of reflective diary.

SAMPLE

## Task 2: plan a project

### What you have to do

Use the sources that you selected in your literature review to complete a project plan.

The project plan must:

- set out how you will investigate the most economic use of disinfectants in the sterilisation process
- include all appropriate risk assessments
- identify the data you need to collect in order to conduct the investigation
- describe how you will collect the required data

Add any notes about your work in your project diary. These notes will not be marked. They are to help you to complete task 6 which is a reflective evaluation.

### Resources

- employer-set project brief and task 2 student guidance
- NCFE CACHE database
- literature review (from task 1)
- project diary
- risk assessment template
- risk matrix

### Assessment objectives

AO1: Plan their approach to meeting the project brief (12 marks)

AO2: Apply core knowledge and skills to the development of a scientific project (12 marks)

AO4: Use English, mathematics and digital skills as appropriate (4 marks)

AO5: Realise a project outcome and review how well the outcome meets the brief (8 marks)

### Core Skills

CS1: Project management

CS2: Researching

CS3: Working with others (risk assessment)

CS4: Creativity and innovation

CS6: Communication (written)

CS7: Reflective evaluation

### The evidence I have to submit for this task

Your project plan.



## **How the evidence will be assessed**

This will be externally marked by examiners.

## **Time allowed for completion of task 2**

3 hours. Plus 30 minutes for completion of reflective diary.

SAMPLE

## Task 3: analyse data

### What you have to do

Due to the limitations of time and resources, you are not required to carry out the investigation you have planned.

Therefore, you have been provided with a raw data pack, obtained from an organisation which developed and carried out a similar plan to solve the same problem. The raw data pack is in the form of a laboratory information management system (LIMS) spreadsheet.

You must:

- analyse the data provided to measure the effectiveness of the organisation's plan
- produce a report of your analysis, to include
  - presentation of data to enable peer review
  - selection of appropriate statistical techniques
  - application of appropriate statistical techniques
  - justification for your conclusions

Add any notes about your work in your project diary. These notes will **not** be marked. They are to help you to complete task 6 which is a reflective evaluation.

### Resources

- employer-set project brief and task 3 student guidance
- computer access
- NCFE CACHE LIMS spreadsheet
- project diary

### Assessment objectives

AO2: Apply core knowledge and skills to the development of a scientific project (16 marks)

AO3: Select relevant techniques and resources to meet the brief (6 marks)

AO4: Use English, mathematics and digital skills as appropriate (6 marks)

AO5: Realise a project outcome and review how well the outcome meets the brief (6 marks)

### Core Skills

CS4: Creativity, innovation

CS5: Problem solving

CS6: Communication (written)

CS7: Reflective evaluation

### The evidence I have to submit for this task

Your analysis report including any charts and graphs.

## **How the evidence will be assessed**

This will be externally marked by examiners.

## **Time allowed for completion of task 3**

3 hours. Plus 30 minutes for completion of reflective diary.

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## Task 4: present outcomes and conclusions

### What you have to do

4(a) Use your report from task 3 to produce an A2 scientific poster.

Your poster must show:

- the problem being addressed/investigated
- the results of your analysis, including any graphs and charts
- your conclusion

4(b) Present the main points from your poster to your tutor. Your tutor will make observations on your presentation and ask questions if further detail is needed. The presentation will be recorded by video.

Add any notes about your work in your project diary. These notes will **not** be marked. They are to help you to complete task 6 which is a reflective evaluation.

### Resources

- employer-set project brief and task 4 student guidance
- computer and printer access
- access to NCFE CACHE provided LIMs spreadsheet
- your analysis report
- A2 paper, various coloured markers, scissors and glue and/or IT software/applications to create poster (or parts of) for printing, and printing facilities
- project diary

### Assessment objectives

AO2: Apply core knowledge and skills to the development of a scientific project (12 marks)

AO3: Select relevant techniques and resources to meet the brief (6 marks)

AO4: Use English, mathematics and digital skills as appropriate (4 marks)

AO5: Realise a project outcome and review how well the outcome meets the brief (6 marks)

### Core skills

CS4: Creativity, innovation

CS6: Communication (written and verbal)

CS7: Reflective evaluation

### The evidence I have to submit for this task

Your A2 scientific poster.

Video recording of presentation.

## **How the evidence will be assessed**

This will be externally marked by examiners using the video recording and assessor commentary.

## **Time allowed for completion of task 4**

4(a) 3 hours.

4(b) 1 hour. Plus 30 minutes for completion of reflective diary.

SAMPLE

## Task 5: group discussion

### What you have to do

You have been provided with an email from your customer, querying the method you used to disinfect the plastics for recycling.

In your allocated group, discuss the concerns the customer has raised and how it would be best to respond to these concerns. You will need to refer back to your research notes to contribute effectively to the discussion. It is suggested 10 minutes are given over to this at the start of the discussion.

Each group member will then take it in turns to make suggestions and to agree an approach. It is suggested that groups consist of 5 or 6 individuals to allow sufficient time for discussion in 40 minutes; this will allow ample time for individuals to give their opinion and respond to others.

Take notes during the team discussion of the points and suggestions made.

Following the discussion, students will need to (individually) draft an email to the consumer group to respond to the concerns raised. This email needs to be handwritten on paper provided by the assessment centre, with the student's name and student reference number to be included for submitting as evidence. Usual exam conditions apply during this part of the task (max 10 minutes).

There is an overall time limit of 1 hour for this task. In this time, students will:

- be asked to read the email from the consumer group in their groups
- be given 10 minutes to familiarise themselves with their literature review, their plan, their data analysis and scientific poster
- discuss their suggestions for responding to the consumer group
- draft an email to the customer group to respond to the concerns raised

**Note: The group discussion and email the student produces will be externally assessed by NCFE.**

### Student resources required

- your literature review (task 1)
- the experience of developing your project plan (task 2)
- your data analysis and report (task 3)
- your A2 scientific poster and its presentation (task 4)

### Tutor resources required

Assessment sheet for tutor commentary.

Video recording equipment.

## **The assessment objectives and core skills covered by this task:**

### **Assessment objectives**

AO2: Apply core knowledge and skills to the development of a scientific project (4 marks)

AO3: Select relevant techniques and resources to meet the brief (2 marks)

AO5: Realise a project outcome and review how well the outcome meets the brief (3 marks)

### **Core skills**

CS3: Working with others

CS4: Creativity, innovation

CS5: Problem solving

CS6: Communication (verbal)

CS7: Reflective evaluation

### **The evidence I have to submit for this task**

Your recorded discussion.

The email that was discussed.

### **How the evidence will be assessed**

This will be externally marked by examiners.

### **Time allowed for completion of task 5**

1 hour.

## Task 6: reflective evaluation

### What you have to do

Write a reflective evaluation of your work. This should be based on:

- your literature review (task 1)
- the experience of developing your project plan (task 2)
- your data analysis and report (task 3)
- your A2 scientific poster and presentation (task 4)

Your reflections should include:

- an evaluation of your approach to each task, including your chosen tool for analysis
- any changes you would make to your approach to each task

### Resources

- employer-set project brief and task 5 student guidance
- your literature review
- your project plan
- your analysis report
- your A2 scientific poster
- your project diary
- access to the NCFE CACHE provided database and the NCFE CACHE provided LIM's spreadsheet
- reflective evaluation template

### Assessment objectives

AO2: Apply core knowledge and skills to the development of a scientific project (7 marks)

AO3: Select relevant techniques and resources to meet the brief (2 marks)

AO4: Use English, mathematics and digital skills as appropriate (4 marks)

AO5: Realise a project outcome and review against the intended project aims (5 marks)

### Core skills

CS6: Communication (written)

CS7: Reflective evaluation

### The evidence I have to submit for this task

Your written reflective evaluation.



## **How the evidence will be assessed**

This will be externally marked by examiners.

## **Time allowed for completion of task 6**

2 hours.

SAMPLE

## Appendix 1: customer email

While we appreciate your experience within the industry and how you have kept up to date with recycling plastics through disinfecting, we would like to understand more about the methods used and the concentration of the disinfectants.

We would therefore appreciate it if you could review the methods used with your colleagues to see if there is a more accurate way of achieving the same result and how you arrived at the decision you did. If you think there are any other alternative methods available that might be more suitable, could you please recommend those for us to consider using in future.

SAMPLE

## Appendix 2: literature list

[www.magazine.eacr.org/a-few-key-ways-to-reduce-plastic-waste-in-the-lab](http://www.magazine.eacr.org/a-few-key-ways-to-reduce-plastic-waste-in-the-lab)

[www.radleys.com/blog/how-to-use-plastic-more-sustainably-in-the-lab](http://www.radleys.com/blog/how-to-use-plastic-more-sustainably-in-the-lab)

[www.genfollower.com/life-science-labs-minimizing-plastic-waste/](http://www.genfollower.com/life-science-labs-minimizing-plastic-waste/)

[www.environmentjournal.online/articles/how-scientists-are-recycling-tonnes-of-plastic-waste-from-labs/](http://www.environmentjournal.online/articles/how-scientists-are-recycling-tonnes-of-plastic-waste-from-labs/)

[www.theguardian.com/environment/2019/nov/10/research-labs-plastic-waste](http://www.theguardian.com/environment/2019/nov/10/research-labs-plastic-waste)

[www.ucl.ac.uk/sustainable/sites/sustainable/files/labs\\_plastics\\_poster.pdf](http://www.ucl.ac.uk/sustainable/sites/sustainable/files/labs_plastics_poster.pdf)

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[www.labconscious.com/green-lab-supplies-and-lab-equipment-guide/#lab-waste/](http://www.labconscious.com/green-lab-supplies-and-lab-equipment-guide/#lab-waste/)

[www.the-scientist.com/careers/life-scientists-cut-down-on-plastic-waste-64547](http://www.the-scientist.com/careers/life-scientists-cut-down-on-plastic-waste-64547)

[www.kcl.ac.uk/aboutkings/strategy/sustainability/get-involved/staff/sustainability-champions/lab-champions/case-studies/recycling-laboratory-plastics](http://www.kcl.ac.uk/aboutkings/strategy/sustainability/get-involved/staff/sustainability-champions/lab-champions/case-studies/recycling-laboratory-plastics)

[www.sciencedaily.com/releases/2015/12/151223221353.htm](http://www.sciencedaily.com/releases/2015/12/151223221353.htm)

[www.thebiologist.rsb.org.uk/biologist/158-biologist/features/2072-how-to-reduce-your-lab-s-plastic-waste](http://www.thebiologist.rsb.org.uk/biologist/158-biologist/features/2072-how-to-reduce-your-lab-s-plastic-waste)

[www.sciencing.com/sterilize-petri-dishes-5892646.html](http://www.sciencing.com/sterilize-petri-dishes-5892646.html)

[www.bestseekers.com/best-disinfectant-sprays/](http://www.bestseekers.com/best-disinfectant-sprays/)

[www.pharmaguidances.com/cleaning-and-disinfection-of-microbiology-lab-2](http://www.pharmaguidances.com/cleaning-and-disinfection-of-microbiology-lab-2)

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[www.safety.rochester.edu/labbiosafe/pdf/DisinfectantsforBiohazardousMaterials.pdf](http://www.safety.rochester.edu/labbiosafe/pdf/DisinfectantsforBiohazardousMaterials.pdf)

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[www.bristol.ac.uk/safety/media/gn/biowaste-gn.pdf](http://www.bristol.ac.uk/safety/media/gn/biowaste-gn.pdf)

[www.virkon.us/](http://www.virkon.us/)

## Document information

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Owner: Head of Assessment Design

## Change History Record

Version	Description of change	Approval	Date of Issue
v1.0	Post approval, updated for publication.		January 2021
v1.1	NCFE rebrand.		September 2021
v1.2	Sample added as a watermark	November 2023	20 November 2023