Science T-Level

T-LEVELS
@ Ada

ACADEMIC

A-Levels

Subject-based qualifications delivered over 2 years by school sixth forms, sixth form colleges and FE colleges

TECHNICAL

T-Levels

Classroom based programmes delivered over 2 years by an FE provider (80% in classroom and 20% on-the-job)

Apprenticeships

Work-based training for a minimum of 12 months (80% on-the-job and 20% off-the-job)

T-Level Purpose: *To prepare students for entry into skilled employment (including higher level apprenticeships and higher education), either immediately or after higher levels of technical education (L4+)*

A Levels
Mainly provider based. Minimal work experience
Full time education: no pay
Focus on specific subject content
Awarding organisation outcomes
Prepare students for higher education
Predominantly knowledge based

T Levels
Classroom 80%, workplace 20% (Industry Placement)
Employers: Choose whether to pay or not
Broader course content, students specialise later
Based on the same employer - designed standards
Can lead to employment, higher level apprenticeships or higher education
Combination of knowledge, skills and behaviours

Developed with Employers

Manufacturing Technology Centre
Cambridge Academy for Science and Tech
2 Sisters Food Group
GSK
Oxford NanoSystems Ltd
AstraZeneca Group
Royal Society of Chemistry
Royal Marsden NHS Foundation Trust

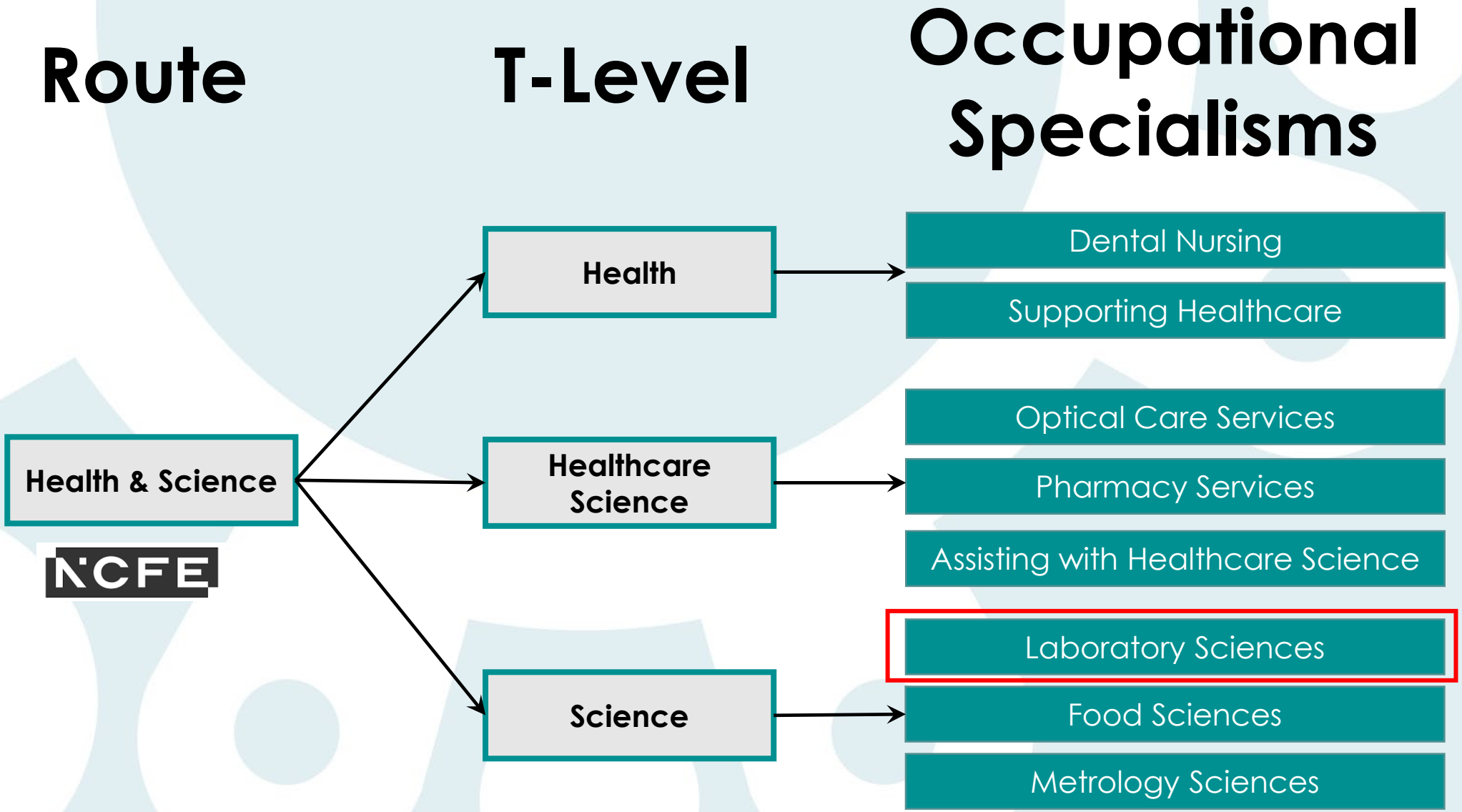
Developed with Employers

- Mid January 2022 vacancies in UK had risen to 122% of pre-pandemic levels
- Science vacancies at 129% of pre-pandemic levels
- This continues trend seen in previous years of a shortage within STEM related industries

Government shortage of skilled work lists:

- Health services
- Chemical scientists
- Biological scientists
- Majority of engineering professions
- Laboratory technicians
- Health professionals

These vacancies were across the UK



2 year course, equivalent to 3 A-Levels

The T-Level is split into two parts (known as components)

Core component - Year 1

1. Paper A: The Health and Science Sector
2. Paper B: Science concepts
3. Employer set project

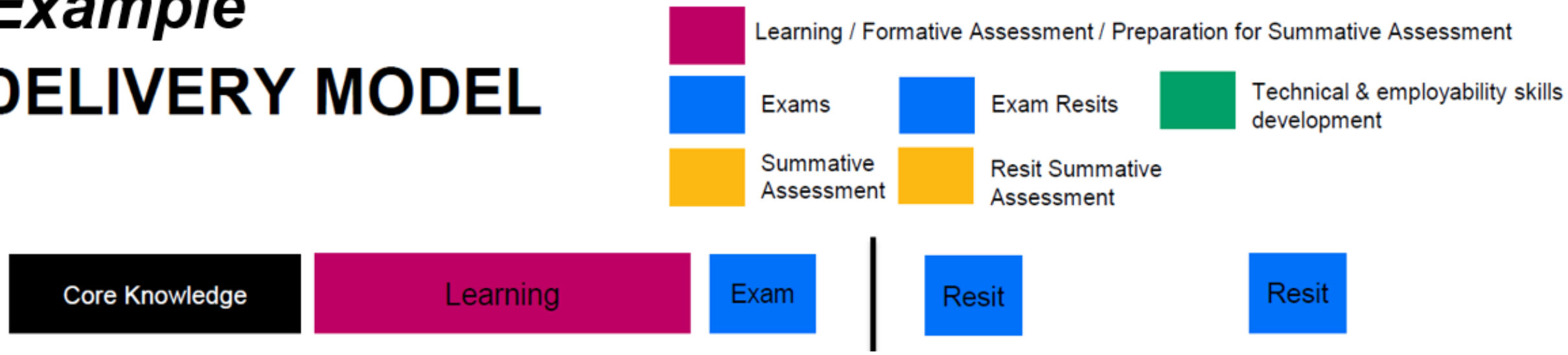
Occupational specialist component - Year 2

Four externally set assignments organised around performance outcomes

Industry placement with an employer (315 hours/45 days)

Example

DELIVERY MODEL



Core component - Year 1 Detail

Paper A: The Health and Science Sector

10 sub topics in total, A1-A10 covering these themes:

- Ethics within the science sector
- Scientific and clinical practices
- Scientific methodology
- Experimental equipment and techniques
- Data handling and processing
- Managing data and information
- Health, safety and environmental regulations

Paper B: Science concepts

Three strands covering Biology, chemistry and physics within 2 topics:

B1 Core Science concepts

B2 Further Science concepts

Core component - Year 1 Detail

Paper B: Science concepts

B1 Core:

Biology

Cell and tissues
Proteins, carbohydrates and lipids
Exchange and transport
Genetics
Microbiology and immunology

Chemistry

Material and chemical properties
Acids/Bases and chemical change
Rate of reaction
Chemical analysis

Physics

Electricity
Magnetism and electromagnetism
Waves
Particles and radiation

B2 Further:

Biology

Classification of biological molecules
Enzyme and protein structure
Cell Cycle
Respiration
Pathogens

Chemistry

Formulae and equations
Kinetic change
Analytical techniques

Physics

Gas laws
Pressure
Fluid and viscosity

Core component - Year 1 Detail

Paper B: Science concepts OCR Chemistry A-Level

K1.19 **How to apply the International Union of Pure and Applied Chemistry (IUPAC) rules to name the following organic compounds:**

- straight chain alkanes and cycloalkanes:
  - methane, ethane, propane, butane, cyclopropane and cyclobutane
- straight chain alkenes:
  - ethene, propene, butene and pentene
- alcohols:
  - methanol, ethanol, propan-1-ol, propan-2-ol and butan-1-ol, butan-2-ol
- carboxylic acids:
  - methanoic acid, ethanoic acid, propanoic acid and butanoic acid
- aldehydes and ketones:
  - ethanal, propanal, propanone and butanone
- amines:
  - ethylamine and propylamine

Naming and representing the formulae of organic compounds

(a) application of IUPAC rules of nomenclature for systematically naming organic compounds

Nomenclature will be limited to the functional groups within this specification.
E.g. $CH_3CH_2CH(CH_3)CH_2OH$ has the systematic name: 2-methylbutan-1-ol.
Learners will be expected to know the names of the first ten members of the alkanes homologous series and their corresponding alkyl groups.

K1.25 **How to calculate free energy change to link enthalpy and entropy:**

- using the Gibbs equation ($\Delta G = \Delta H - T\Delta S$ system)

Free energy

(d) explanation that the feasibility of a process depends upon the entropy change and temperature in the system, $T\Delta S$, and the enthalpy change of the system, ΔH

(e) explanation, and related calculations, of the free energy change, ΔG, as: $\Delta G = \Delta H - T\Delta S$ (the Gibbs' equation) and that a process is feasible when ΔG has a negative value

K1.23 **How to use standard electrode potentials to determine the direction of electron flow in electrochemical cells:**

- electrode that is relatively more negative (oxidation half-cell) will release electrons more readily and electrons will flow from this electrode

Electrode potentials

(f) use of the term *standard electrode (redox) potential*, $E^{\ominus}$, including its measurement using a hydrogen electrode

(g) the techniques and procedures used for the measurement of cell potentials of:

(i) metals or non-metals in contact with their ions in aqueous solution

(ii) ions of the same element in different oxidation states in contact with a Pt electrode

Assessment - Year 1 Detail

Testing Core knowledge in the first year

Paper A

T-LEVELS | Institute for Apprenticeships & Technical Education

T Level Technical Qualification in Science (603/6989/9)

Core knowledge and understanding

Paper A Elements: 1–10

Paper number: Sample

Specimen 2021 **Morning/Afternoon**

Time allowed: 2 hours 30 minutes

To be completed by the examiner			
Question	Mark	Question	Mark
1 (a)		7	
1 (b)		8 (a)	
1 (c)		8 (b)	
1 (d)		8 (c)	
1 (e)		8 (d)	
2		9	
3		10	
4 (a)		11(a)	
4 (b)i		11(b)	
4 (b)ii		11(c)	
5 (a)		11 (d)	
5 (b)		12	
6		13	
		TOTAL MARK	

Student instructions

- Use black or blue ink.
- Fill in the boxes at the bottom of this page.
- Answer **all** questions.
- Read each question carefully.
- You **must** write your responses in the spaces provided. There may be more space than you need.
- You may do rough work in this answer book. Cross through any work you do not wish to be marked.

Student information

- The marks available for each question are shown in brackets. This is to help you decide how long to spend on each question.
- The maximum mark for this paper is **112**.
- In questions **2, 6, 9** and **13**, you will be assessed on your quality of written communication (QWC) and use of specialist terminology. Specifically, your ability to:
  - use good English
  - express and organise ideas clearly and logically
  - use appropriate technical terms.
- In question **1(d)**, you will be assessed on your application of mathematics.
- You may use a calculator.

Please complete the details below clearly and in BLOCK CAPITALS.

Paper B

T-LEVELS | Institute for Apprenticeships & Technical Education

T Level Technical Qualification in Science (603/6989/9)

Core knowledge and understanding

Paper B – Biology, Chemistry, Physics and Science in Context

Paper number: Sample

Specimen 2021 **Morning/Afternoon**

Time allowed: 2 hours 30 minutes

To be completed by the examiner			
Question	Mark	Question	Mark
1(a) (i)		7 (a)	
1 (a) (ii)		7 (b)	
1 (b)		7 (c)	
1 (c)		7 (d)	
2 (a)		8	
2 (b)		9 (a)	
2 (c)		9 (b)	
2 (d)		9 (c)	
2 (e)		9 (d)	
3 (a)		9 (e)	
3 (a) (i)		10	
3 (a) (ii)		11	
3 (b)		12	
3 (c)		13	
4		14 (a)	
5		14 (b)	
6 (a)		14 (c)	
6 (b)			
6 (c)			
		TOTAL MARK	

Student instructions

- Use black or blue ink.
- Fill in the boxes at the bottom of this page.
- Answer **all** questions.
- Read each question carefully.
- You **must** write your responses in the spaces provided. There may be more space than you need.
- You may do rough work in this answer book. Cross through any work you do not wish to be marked.

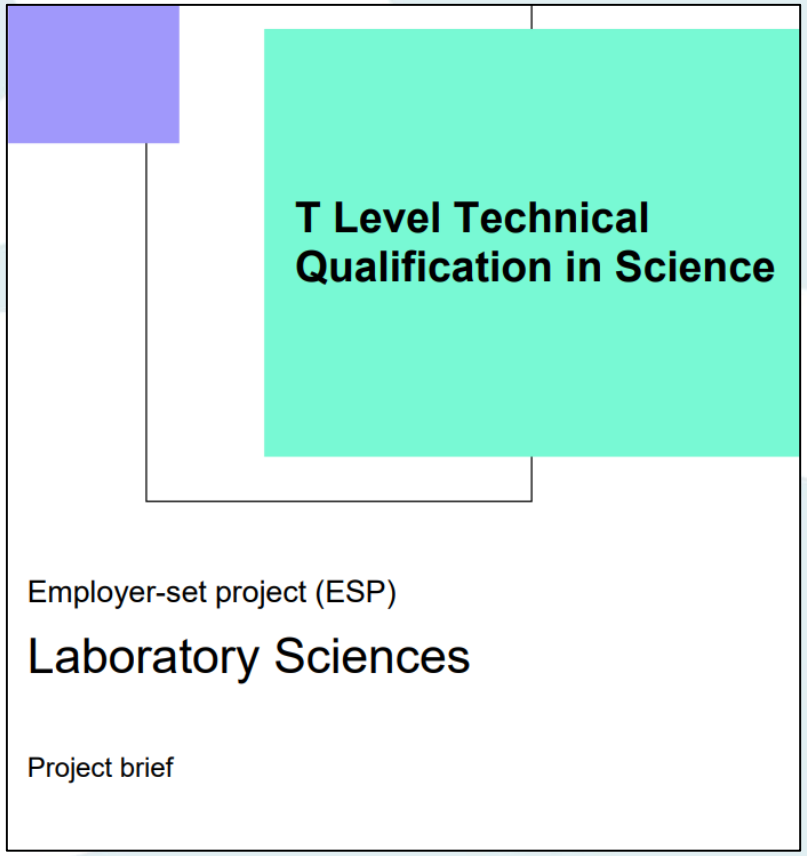
Student information

- The marks available for each question are shown in brackets. This is to help you decide how long to spend on each question.
- The maximum mark for this paper is **119**.
- In questions **5**, **8** and **14 (c)**, you will be assessed on your quality of written communication (QWC) and use of specialist terminology.
- In questions **3 (a) (ii)**, **3 (b)**, **6 (b)**, **6 (c)**, **7 (a)**, **7 (b) and 7 (c)**, you will be assessed on your application of maths.
- You may use a calculator.

Please complete the details below clearly and in BLOCK CAPITALS.

Assessment - Year 1 Detail

Employer set project- Developed with employers



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[1], equal to 83% of the plastic recycled worldwide in 2012[2].

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.

Assessment - Year 1 Detail

Employer set project- Developed with employers

Clear tasks that have real work application and are reflective of activities they may need to carry out within industry.

1-4 hours per task (6 tasks within the exemplar) to be completed over a series of days/weeks.

Evidence is then collected and submitted to the exam board for marking.

Built around 7 core skills relevant to employers

NOT an exam hall experience. You work individually and collaboratively towards a set goal.

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

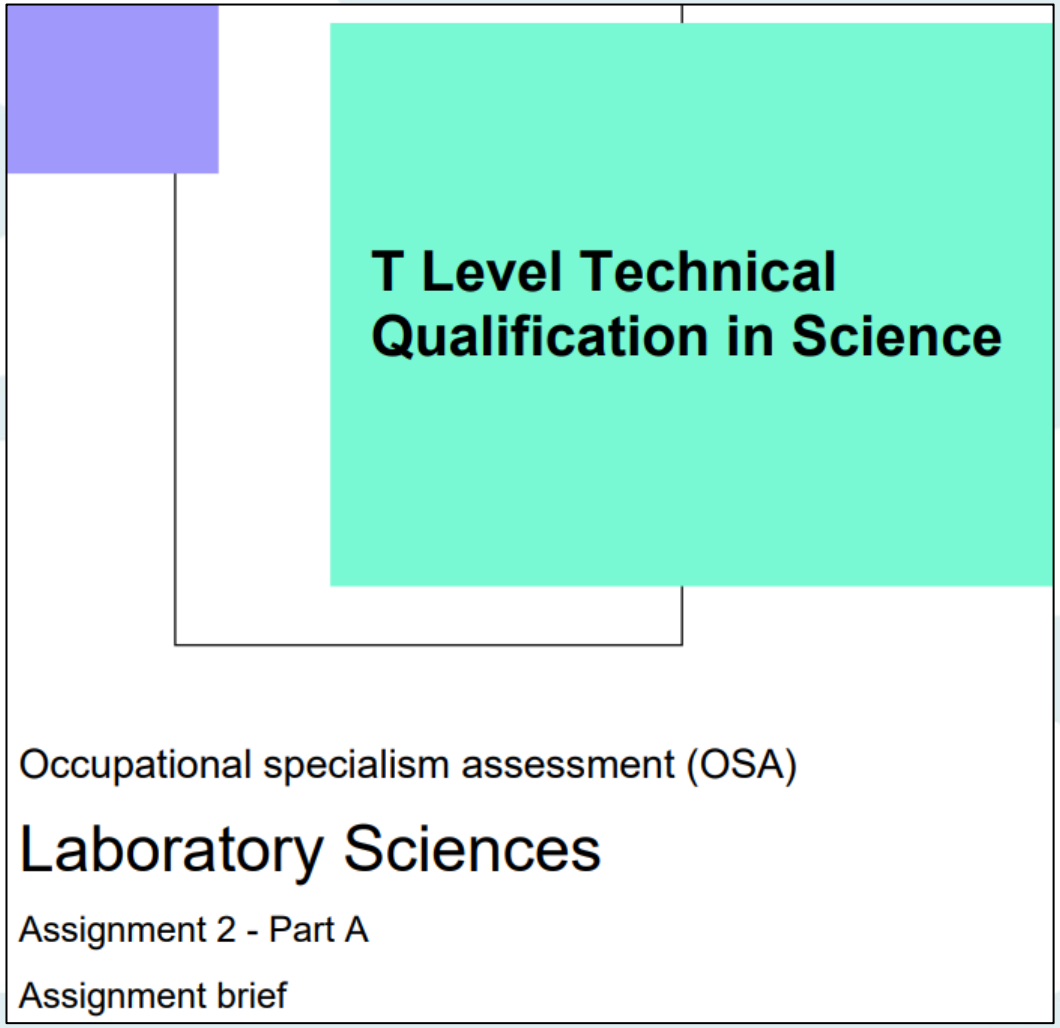
A literature review, as described in what you need to do above.

How the evidence will be assessed

This will be externally marked by examiners.

Assessment - Year 2 Detail

Occupational specialism assignments



Experimental practical

Scenario

A commercial dairy produces a large amount of wastewater from manufacturing processes. The wastewater is contaminated with milk products and therefore has a high biological oxygen demand (BOD).

Wastewater is treated before discharge to a local river. The BOD of treated wastewater is regularly measured to check the effectiveness of treatment.

To calculate BOD, the oxygen content of the water is measured initially and after 5 days. Oxygen concentration can be measured using a Winkler titration.

Task 1

1(a): Carry out a Winkler titration to determine the initial oxygen content in the samples of wastewater provided following the standard operating procedure (SOP) and the safety information provided. During this activity, you will be observed by an assessor to make judgements on your practice. (23 marks) (3 hours)

1(b): Record your results in a suitable table and carry out any necessary calculations. (12 marks) (3 hours)

Four assignments over the course of year 2.

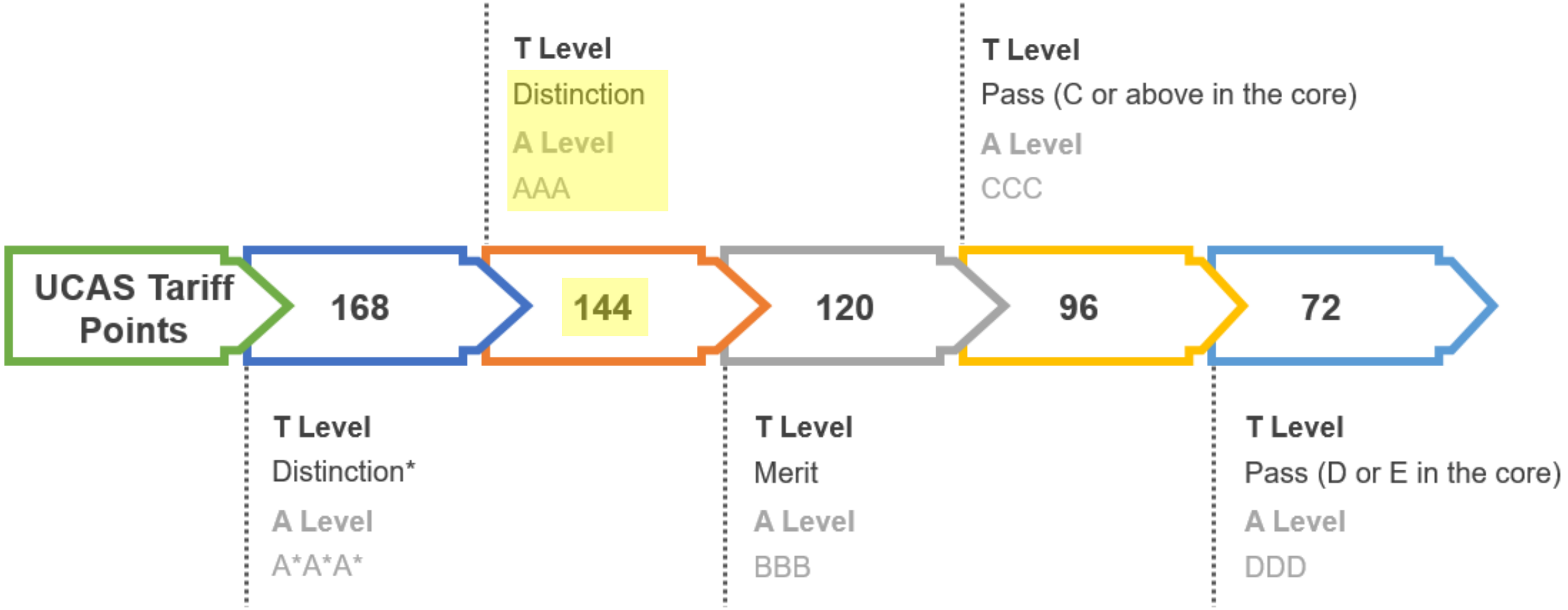
Tasks within assignments are practical and written with time allocated appropriately.

Reflect tasks commonly undertaken within laboratory Science

Once again, not an exam hall experience.

Calculation of the T-Level Qualification Grade

Core Component Grade (Year 1 exams and ESP)	Occupational Specialism Grade (Year 2 assignments)			
		Distinction	Merit	Pass
	A*	Distinction*	Distinction	Distinction
	A	Distinction	Distinction	Merit
	B	Distinction	Merit	Merit
	C	Merit	Merit	Pass
	D	Merit	Pass	Pass
	E	Pass	Pass	Pass


T Level
Distinction
A Level
AAA
T Level
Pass (C or above in the core)
A Level
CCC
UCAS Tariff Points
168
144
120
96
72
T Level
Distinction*
A Level
A*A*A*
T Level
Merit
A Level
BBB
T Level
Pass (D or E in the core)
A Level
DDD

2022 Results Nationally

92% of learners pass and above

70% going on to further education

Destinations:

- Over 125+ higher education providers have confirmed T-Levels are suitable for entry, 80+ universities, 12 Russell Group
- Degree level apprenticeships
- Employment

UCL

Loughborough

University of Nottingham

University of Manchester

University of Exeter

University of Birmingham

Brunel university

University of West London

https://www.gov.uk/government/publications/t-level-resources-for-universities/providers-that-have-confirmed-t-levels-suitable-for-entry-on-one-course

Flexibility of the Course

University of Manchester

Degree courses that can be taken with a T-Level in Science:

Biosciences
Medicine (with foundation year)
Pharmacy
Public health

Degree Apprenticeships

Laboratory Scientist degree- Pfizer

104 UCAS points (merit)

Level 5 Apprenticeships

Chemical Sciences apprentice

Hammersmith hospital
80 UCAS points (pass)

Work

The NHS alone has 350 careers to explore

Course entry requirements

To Secure a place you will need the following:

8 GCSEs at Grade 5 or above, including Maths and English

A Grade 6 in Science (Triple Science: 665 and Combined Science: 66)

Any Questions?