T-LEVELS | Institute for Apprenticeships & Technical Education

T Level Technical Qualification in Science

Occupational specialism assessment (OSA)

Laboratory Sciences

Assignment 2 - Pass

Guide standard exemplification materials

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Contents

Introduction

The material within this document relates to the Laboratory 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 2, the student must perform the scientific experiment and record results.

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

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

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)

b) Record your results in a suitable table and carry out any necessary calculations.

(12 marks)

(3 hours)

Student evidence

Criteria	Assessor check	Marks awarded	Essential criteria (All essential criteria must be awarded to pass)
Safe handling of chemical agents during task	PPE worn correctly, safe transit, safe mixing, no mixing	1	Yes
Safe storage and disposal of chemical agents	Storage maintained correctly, disposal processes correct	1	Yes
Well organised workstation to facilitate the completion of the task	Clear and organised workstation. Logical set out of equipment	1	Yes
Safe handling of equipment during task	Good handling of equipment, no over carrying, logical use	1	Yes

Use of appropriate PPE in preparation and completion of the task	Gloves and protective coat worn, eye goggles and correct use of the fume cupboard	1	Yes
Performed scientific techniques effectively: • measuring • observing • use equipment correctly (manual dexterity)	Measuring was accurate, read on level surface. All measurements were checked then double checked before combination. All techniques carried out correctly. Full attention given throughout the experiment and observed all changes. Dextrous use of equipment and chemicals, avoiding breakages and spillages. Accurate recording of measurements, clear and concise documentation	1 mark for completing technique effectively and 1 mark 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	Yes
Total awarded*		11 marks	

Recording results

Student to record their results in a way that is similar to the table below, including details of the initial sample and the 5 day sample of sodium thiosulfate and oxygen concentration.

Initial sample			**Day 5 sample**		
Replicate	Sodium thiosulfate added (ml)	Oxygen concentration (mg)	Replicate	Sodium thiosulfate added (ml)	Oxygen concentration (mg)
1	12.5	1	1	1.5	0.12
2	12.4	0.99	2	2.3	0.18
3	13	1.04	3	1.8	0.14
mean	12.6	1.01	mean	1.8	0.15

Summary of observed student performance, in place of audio-visual recording:

The student consistently and correctly wore the correct PPE at all times (for example, goggles, lab coat and gloves).

The student safely handled all chemicals at all times and stored and disposed of chemicals correctly.

The student safely handled all equipment.

The student organised the workstation efficiently (setting up chemicals in the order in which they are required, and removing them from the immediate area when they were no longer required to prevent accidental confusion between bottles).

The student was able to correctly use the required equipment effectively and accurately, which involved correctly using pipettes for accurate measurements, checking the meniscus of any cylinders, bottles and burettes to ensure the correct volumes are used, and carefully titrating small volumes at a time into the sample in order to obtain the correct endpoint.

The student collected 250 cm^3 of the water sample by pouring it directly into the glass bottle, using measurement lines on the bottle to confirm the volume added.

The student used a 1 cm^3 pipette to transfer 1 cm^3 of solution A; this solution was then added directly into the water as per SOP and no air was introduced into the water.

The student then repeated the above in a similar manner for solution B.

The contents of the bottle were then transferred to a larger flask and taken to the fume hood, where 1.5 cm^3 of concentrated sulfuric (VI) acid was measured out as above for solution A/B.

The burette was at this point filled with sodium thiosulfate, and liquid was allowed through into the jet space of the burette, with the burette being washed (but not thoroughly). As this was done after addition of the sulfuric acid, the titration did not begin as quickly as it should have.

A large volume of sodium thiosulfate was then quickly added to the sample until it started to become a pale yellow, at which point the starch indicator was added, and the sample was swirled to mix intermittently.

The volume of sodium thiosulfate remaining in the burette was subtracted from the ~50 ml starting volume – the volume of sodium thiosulfate added to the sample was recorded.

This volume was recorded and then used by the student to calculate the mass of oxygen in the sample, though correct significant figures were not used. For example, if 12.4 cm^3 was added to reach the endpoint, then the sample contains 0.08 x 10 = 1 mg (rather than the accurate result of 0.992 mg) of O_2 in 250 cm^3; this result was not then used to calculate to concentration in mg/dm^3 and was instead reported as is.

The student then repeated the steps, recording each result.

The titration was repeated in a similar manner for the second sample.

The results were reported as a single value for each sample (for example, volume of oxygen in sample A = xxx mg/dm^3, volume in sample B = yyy mg/dm^3).

Examiner commentary

The student safely carries out the procedure and is able to use the equipment selected correctly in an accurate manner for the most part, however, they are not consistently precise with the procedure, demonstrating a lack of knowledge of the importance of accuracy and precision (for example, lack of mixing, inaccurate volumes and incorrect use of the burette), potentially producing invalid results. The student records some elements of their results but not enough to confirm the accuracy of their calculations/repeats.

The student is able to make some use of their relevant knowledge regarding laboratory equipment and procedures to select the correct equipment for each part of the protocol, generally using it in the correct manner, though they do not always use it in a manner that would ensure high levels of precision and accuracy, demonstrating basic levels of understanding of the relevant concepts and techniques required.

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.

Pass	The evidence is logical but displays minimal relevant knowledge or understanding in response to the demands of the brief.
	The student makes some use of relevant knowledge and understanding of how it informs practices of the sector and demonstrates a limited understanding of skills or approaches associated with the laboratory sciences sector.
	The student makes adequate use of facts/theories/approaches/concepts and attempts to demonstrate breadth and depth of knowledge and understanding of the different aspects of the task.
	The student is able to identify some information from appropriate sources and makes use of appropriate information/appraise relevancy of information and can combine information to make decisions.
	The student makes only select judgements/takes appropriate action/seeks clarification with guidance and is able to make limited progress towards solving non-routine problems in real life situations.
	The student demonstrates skills and knowledge of the relevant concepts and techniques reflected in a laboratory science setting and generally applies this across different contexts.
	The student shows adequate understanding of unstructured 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 evidence is precise, logical and provides a detailed and informative response to the demands of the brief.
	The student makes extensive use of relevant knowledge and has extensive understanding of the principles and practices of the sector and demonstrates an understanding of the different approaches/skills associated with the laboratory science sector.
	The student makes decisive use of facts/theories/approaches/concepts, demonstrating extensive breadth and depth of knowledge and understanding and selects highly appropriate skills//tasks/techniques/methods.
	The student is able to comprehensively identify information from a range of suitable sources and makes exceptional use of appropriate information/appraises relevancy of information and can combine information to make coherent decisions.
	The student makes well founded judgements/takes appropriate action/seeks clarification and

	guidance and is able to use that to reflect on real life situations in a laboratory science role.
	The student demonstrates extensive knowledge of relevant concepts and techniques reflected in a laboratory science role and precisely applies this across a variety of contexts and tackles unstructured problems that have not been seen before, using their knowledge to analyse and find suitable solutions to the problems.
	The student can thoroughly examine 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.

Document information

The T Level Technical Qualification is a qualification approved and managed by the Institute for Apprenticeships and Technical Education.

Owner: Head of Assessment Design

Change History Record

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v1.1	NCFE rebrand		September 2021