T-LEVELS | Institute for Apprenticeships & Technical Education

T Level Technical Qualification in Science

Occupational specialism assessment (OSA)

Laboratory Sciences

Assignment 2 - Distinction

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	Measuring was accurate,	1 mark for completing	Yes

techniques effectively: • measuring • observing • use equipment correctly (manual dexterity)	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	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	
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.

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.

Initial sample			**Day 5 sample**		
Replicate	Sodium thiosulfate added (ml)	Oxygen concentration (mg/ dm^3)	Replicate	Sodium thiosulfate added (ml)	Oxygen concentration (mg/dm^3)
1	12.4	3.968	1	2.5	0.800
2	12.7	4.064	2	3.0	0.960
3	12.1	3.872	3	2.9	0.930
mean	12.4	3.968	Mean	2.8	0.900

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 were used, and carefully titrating small volumes at a time into the sample in order to obtain the correct endpoint.

The student collected the 250 cm^3 sample of water by carefully measuring out the 250 cm^3 in a 250/500 ml measuring cylinder, checking the correct volume had been obtained by checking the meniscus, before transferring into the bottle, and stoppering the bottle to ensure no air is trapped.

The student carefully measured out exactly 1 cm^3 of solution A, again checking the meniscus and ensuring no air was taken up with the solution to ensure the correct volume was obtained, and added this to the water sample without introducing any air into the water sample.

The student repeated the above using solution B; the solution was then carefully mixed and allowed to stand for 10 minutes to allow precipitation.

The burette was washed with the sodium thiosulfate solution prior to the titration, and this excess was safely collected for disposal, before refilling the burette with fresh sodium thiosulfate solution and adjusting the volume to 50 ml.

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

Sodium thiosulfate was then progressively added to the continuously mixed sample until it reached a point at which it turned a pale yellow colour; at this point, 2 cm^3 of starch solution was measured out and added to the sample. The titration was then slowly continued until the sample turned colourless.

The volume of sodium thiosulfate added to the sample was then accurately recorded, subtracting the end volume (measured from meniscus) from the starting volume.

This volume was then used to calculate the mass of oxygen in the sample (12.4 cm^3 was added to reach the endpoint then the sample contained 0.08 x 12.4 = 0.992 mg of O_2 in 250 cm^3 – this was then converted to mg per dm^3 by the calculation 0.992 ÷ 0.25, giving a final result of 3.97 mg/dm^3 to 3 significant figures).

This was then repeated 2 or 3 times using the sample and the whole process repeated for the second sample.

All results were recorded in a table along the lines of the above.

Examiner commentary

The student is able to accurately and safely carry out all steps described in the SOP, showing well founded judgements and actions. The student shows extensive knowledge and working practices for a wide range of concepts and theories, recording their results in detail, correctly interpreting them, and presenting them in a manner that allows for an easy examination and judgement of the result. The student shows strong practical skills, correctly following the procedure and selecting and using appropriate equipment throughout, making only one or 2 minor errors in the procedure. The student is confident in the implementation of a range of relevant concepts and techniques, allowing them to successfully and accurately complete the procedure set out. The student presents and analyses their data in order to draw a conclusion as to the outcome of the experiment.

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

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