T Level Technical Qualification in Science

Occupational specialism assessment (OSA)

Laboratory Sciences

Assignment 1 - Pass

Guide standard exemplification materials

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Occupational specialism assessment

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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 1, the student must perform a literature review, complete a standard operating procedure (SOP) and complete a risk assessment.

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

Scenario

A commercial dairy that produces cheese has experienced problems of variable quality of product. This has been linked to the bacteriological quality of the raw milk used in the operation. A new storage routine is being trialled to reduce bacterial contamination.

The company wishes to compare the bacteriological quality of raw milk stored using the old and revised storage methods. Managers have identified total viable count as an appropriate method of measuring the levels of bacteria within the milk.

As a scientist working for this company, you have been asked to produce a standard operating procedure (SOP) for the total viable count technique (also known as aerobic or standard plate count) to determine the number of colony-forming units (CFU) in milk samples. The SOP will be used to compare milk samples from the different storage treatments.

There are 3 tasks in this assessment:

Task 1: Writing a literature review (that includes a literature search)

Task 2: Writing the SOP for the total viable count technique

Task 3: Writing a risk assessment for the SOP

Task 1

Carry out a literature search to determine suitable methods, and how to interpret results.

You will be provided with an online information package of literature sources. Search only these sources to find relevant material and to carry out your review.

Write a literature review which demonstrate how you have evaluated which literature to select for the task, including justifications for the literature selected.

Select key information that will be needed to write the SOP and to interpret the results, for example:

- information that would help to inform the methods, techniques and equipment used
- how results are determined
- the results expected
- safety considerations

Comment on the quality and reliability of the information used.

Reference any sources of information.

(28 marks)

(3 hours)

Student evidence – task 1

Literature review

I have been asked to develop a way to test whether an old storage method or a new one gives milk a better bacteriological quality or not. To do this I am doing this literature review to find examples of literature that may be useful in developing a way to test the bacteriological quality of the milk.

The first piece of literature is from Public Health England (PHE) and contains information about how to do total viable cell counts for food products including milk. As this source is PHE (and therefore from a trusted and competent source which provides reliable information), it is likely to be considered a good relevant source, so will be useful for doing the cell counts ourselves. The description of how to plate out the milk in this document is detailed enough to allow us to use the same method for determining the quality of our samples. As such, I would suggest that we follow this method for plating out the samples to enable us to count the number of colonies that grow as the result of the milk being spread onto the plates.

Another one of the sources is from a vets, in which they discuss how the number of bacteria in milk can impact on the health of animals. This might be useful for us in allowing to know how much bacteria is acceptable in our samples.

Therefore, I propose that we use the method presented in the PHE document to plate out our samples and determine which of them have a better bacteriological quality. This will be assessed by counting the number of colonies that grow on our plates – for we should only need the agar plates and an incubator so it should be feasible to do and not cost a lot.

There will be minimal safety considerations for this work beyond using a Bunsen burner when plating out our milk samples.

Task 2

Write a standard operating procedure (SOP) for use of the total viable count technique to determine the number of colony-forming units (CFU) in milk samples. The aim of the SOP is to allow comparison of the CFU of milk stored in 2 different ways.

Design and write your SOP.

Your SOP should follow safe working practices. You will be writing a full risk assessment in task 3.

Include a hypothesis in the introduction to your SOP.

Your SOP must include any necessary controls and should indicate how the data from the 2 milk storage methods will be recorded.

(58 marks)

(3 hours)

Student evidence – task 2

Standard operating procedure (SOP)

Procedure: Total viable cell count to determine the bacteriological quality of raw milk samples

Author: P. Student

Date: June 2020

Purpose of this SOP: This SOP describes a protocol for assessing the bacteriological quality of 2 raw milk samples.

Equipment and reagents required:

- raw milk samples
- H2O
- Pasteur pipettes
- tubes for mixing
- microbiology plates
- Bunsen burner
- 37 degrees centigrade incubator

Protocol:

Step	Instructions
1	Take some samples of milk stored using the old method and the new method
2	Dilute the samples so that you have the original sample and a 1/10 dilution, a 1/100 dilution and a 1/1000 dilution
3	While using a Bunsen burner, add each serial dilution to the plate and spread it around the plate – also, prepare a control plate in which only water is spread onto the plate
4	Put the plates into the incubator overnight
5	Take the plates out of the incubator and count up the number of colonies on each plate
6	From this work out the number of colony-forming units on each plate in relation to the original concentration of the samples

Analysis:

Compare how many colonies are produced for each sample using the old storage method and the new storage method; the one with the least colonies is a better method. To determine this, the CFU obtained for each sample and dilution should be plotted on a graph.

Task 3

Write a risk assessment for the total viable count procedure described in your SOP (task 2).

Use the template provided.

(16 marks)

(1 hour)

Student evidence – task 3

Risk matrix

Risk matrix – evaluation of risks							**Action level**
Almost certain	**5**	**5**	**10**	**15**	**20**	**25**	**20-25 STOP**
Highly likely	**4**	**4**	**8**	**12**	**16**	**20**	
Likely	**3**	**3**	**6**	**9**	**12**	**15**	**12-16 URGENT**
Unlikely	**2**	**2**	**4**	**6**	**8**	**10**	**8-10 ACTION**
Extremely improbable	**1**	**1**	**2**	**3**	**4**	**5**	**4-6 MONITOR**
	X	**1**	**2**	**3**	**4**	**5**	**1-3 NO ACTION**
		Minimal	Minor injury	7 day + injury	Serious or major injury	Severe	
			Consequence				

Risk assessment form

Person carrying out risk assessment:	P. Student
Persons responsible on site:	A. Manager
Venue:	Commercial dairy
Work activity:	Total viable cell count technique
Date of assessment:	07/10/2020

Those at risk	**Key**
Own staff	OWN
Venue staff	VEN
Organisers	ORG
Visitors	VIS
Public	PUB
Contractors	CON
All persons onsite	AOS

Please read the guidelines prior to completing your risk assessment.

Section 1

Hazard	**Who might be harmed? (see 'those at risk, above)**	**Likelihood**	**Severity**	**Total risk level**	**Control measures (add any other control measures you will use)**	**Likelihood**	**Severity**	**Res. risk level**
Raw milk	OWN	Unlikely	1	2	Clean if spilled.	NA	NA	2
Bunsen burner	OWN	Unlikely	3	6	Be careful around the flame so as not to burn yourself or set anything on fire.	Unlikely	2	4

By signing the declaration below, you have agreed that you will put the appropriate control measures in place to ensure that hazards are reduced and that the risks applicable to your stand are controlled.

Signed	**P. Student**
Print name	P. Student
Review date	07/10/2020

Examiner commentary

The student makes a limited assessment of a small range of sources, focusing on only limited elements such as the author rather than the content of the material. The student is able to use these limited sources to identify a potentially applicable method, though they offer very limited further assessment of the method and its direct relatability to the task at hand. The student makes a limited appraisal of the relevancy of the information, judging PHE to be a reliable source but not assessing whether the information contained in the source is relevant or how it relates to the current task. Despite this, the student is able to successfully identify a potential method that could be used to address the set problem. The student is able to address the majority of the guidance explicitly set out in the task. The student goes on to state they plan on replicating a method from one of the pieces of literature, with no assessment, using their own minimal knowledge and understanding, or other sources, as to whether this is directly applicable to the brief.

The student provides a brief summation of the purpose of the SOP with a list of equipment that would allow the protocol to be completed, though the equipment list is not fully detailed. The protocol included does address the brief though it does not include all the detail that it should do (such as it does not explain how to calculate the CFU count), making only adequate use of theories, facts, approaches and concepts. The student is able to present the required technique they identified in their literature review successfully in the form of a basic SOP, which could be successfully followed with some guidance or further explanation.

The student is able to identify some potential hazards using their own judgement and knowledge but does not fully explain each risk. The proposed control measures, while valid, are not fully explained and do not fully inform on how to mitigate the risks. A minor error is made in calculating the risk score.

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

Version	Description of change	Approval	Date of Issue
v1.0	Published final version.		June 2021
v1.1	NCFE rebrand		September 2021