2011 Assessment Report

VICTORIAN CURRICULUM AND ASSESSMENT AUTHORITY

2011 VET Laboratory Skills GA 2: Written examination

GENERAL COMMENTS

VCE VET Laboratory Skills is one of the smaller VCE VET programs offered. Due to the small sample size, it was difficult to establish any trends.

Most students read the questions carefully and their answers demonstrated a clear understanding of the units of competence. However, a small number of students completed all three electives and some students did not attempt all questions on the short answer section of the paper.

As in previous years, questions involving calculations presented problems for some students. It is essential that students at this level are able to determine the molarity and concentration of chemical solutions, perform dilutions and balance chemical equations.

The unit PMLQUAL300B: Contribute to the achievement of quality objectives presented problems for a number of students.

2011 is the last year that the VCE VET Laboratory Skills examination will be based on the PML04 training package. From 2012 the examination will be taken from the revised VCE VET Laboratory Skills program based on the MSL09 training package. Teachers and trainers should refer to the exam specifications and the VCE VET Laboratory Skills program page on the VCAA website for further information.

SPECIFIC INFORMATION

For each question, an outline answer (or answers) is provided. In some cases the answer given is not the only answer that could have been awarded marks.

Section A – Multiple-choice questions

Question	% A	% B	% C	% D	Comments
1	93	7	0	0	Most students answered this question correctly.
2	0	7	57	36	The correct answer to this question was option C as it asked how quality objectives can be achieved in laboratory technicians' work. However, option D was also accepted as a correct response.
3	0	21	79	0	Most students answered this question correctly.
4	7	0	93	0	Most students answered this question correctly.
5	86	0	14	0	Most students answered this question correctly.
6	0	29	64	7	Most students answered this question correctly. A number of students chose option B, which would have been the correct response for a pH meter.
7	79	7	14	0	Most students answered this question correctly.
8	0	79	0	21	Most students answered this question correctly.
9	43	0	29	29	In biohazard cabinets, visible light allows operators to see what they are doing. UV lights are used to decontaminate the work surfaces when the cabinet is not in use. A number of students incorrectly chose options C or D.
10	14	43	14	29	Most students were unable to answer this question correctly. Plastic Petri dishes are usually purchased sterile having been sterilised with gamma rays. A number of students chose autoclaving (option B), which is the most common method of sterilisation. Plastic Petri dishes cannot be autoclaved because the heat distorts the plastic.
11	14	86	0	0	Most students answered this question correctly.

Question	% A	% B	% C	% D	Comments
12	43	36	14	7	Most students were unable to answer this question correctly. A number of students chose biohazard cabinet (option B). Biohazard cabinets do not generate aerosols when they are being used correctly; they contain any aerosols produced within them.
13	0	71	0	29	Most students answered this question correctly.
14	43	7	14	36	A number of students answered 2:18 (option A), which is not correct. It was 2 mL in a total volume of 20 mL, which is a dilution of 1:10 (option D).
15	14	0	64	21	Most students answered this question correctly; however, some students answered option A, which is the correct liquid but the reason is incorrect. It is important that students fully understand the safety implications of what they do. It is also important to read all parts of the question carefully.
16	0	64	0	36	Most students answered this question correctly. A number of students answered option D. It is essential that mouth pipetting does not occur at any time in the laboratory as infection or serious injury can result from accidental ingestion of bacteria or chemicals.
17	14	0	21	64	Most students answered this question correctly. A number of students answered option C, which was not correct. Option C would have been correct for W/V but the question specifically asked for V/V, therefore the answer needed to be a volume.
18	0	0	29	71	Most students answered this question correctly.
19	7	64	7	21	As in previous years, a number of students found the calculation difficult. These calculations are a fundamental requirement of this unit and students need to be able to perform them.
20	7	71	21	0	As in previous years, a number of students found the calculation difficult. These calculations are a fundamental requirement of this unit and students need to be able to perform them.

Section B – Short answer questions

Question 1a.

Marks	0	1	2	Average
%	0	7	93	**2.0**

5/7 and 9/7

Question 1b.

Marks	0	1	2	Average
%	11	29	61	**1.5**

To make the nonconformances more visible, ways the data could be presented include:

- graph
- two error bars
- statistical analysis
- relevant, specific type of graph
- shading areas of conformance or nonconformance.

Question 1c.

Marks	0	1	2	3	Average
%	4	46	14	36	**1.8**

- increase safety by using alcohol rather than a mercury thermometer
- use a digital/electronic thermometer
- chart recorder
- data logger
- maximum-minimum thermometer monitors all day and night/continuously

In general, this question was answered poorly. Improvements should have included replacing the mercury thermometer with something safer, increasing the frequency of temperature reading and suggestion of better monitoring equipment.

Question 2

Marks	0	1	2	3	Average
%	39	21	4	36	**1.4**

It would be more efficient because there would be:

- less wastage of time and reagents
- less time spent making up reagents, allowing the technician to do other tasks
- less reagent used.

A number of students found this question very difficult. They had trouble analysing the situation and did not answer the question, or did not explain how this change would be more sustainable. Some students, however, did obtain full marks.

Question 3a.

Marks	0	1	2	Average
%	7	43	50	**1.5**

- gown
- gloves (sterile)

The answer must have included a gown that covered the front of the body, not a laboratory coat. Wearing a mask or covered shoes could not be accepted in this particular situation.

Question 3b.

Marks	0	1	2	3	Average
%	14	11	25	50	**2.1**

Any three of the following:

- sterile medium
- sterile bottles
- sterile dispensing equipment
- sterile pipettes and bulbs or transfer pipette with sterile tips
- bottle rack
- bunsen burner/incinerette.

Note that the equipment used for the transfer needed to be sterile.

Question 3c.

Marks	0	1	2	3	Average
%	29	14	18	39	**1.7**

Any three of the following:

- clean and disinfect the work area/biohazard cabinet
- organise all equipment
- switch on the fan
- switch off the UV light
- label the containers.

Question 3d.

Marks	0	1	2	Average
%	21	25	54	**1.3**

- clean and disinfect equipment after use
- clean and disinfect the work area/biohazard cabinet after use
- record in a logbook
- switch off the fan
- switch on the UV light

Question 4

Marks	0	1	2	3	4	5	Average
%	18	14	7	14	18	29	**2.9**

One mark was awarded for mentioning each of the following or equivalent in the description:

- use of a sterile pipette with bulb or a displacement pipette with sterile tips
- flaming the mouth of the bottle
- holding cap with little finger or not placing cap on bench
- avoiding production of aerosols
- dispensing the liquid slowly down the inside of the bottle (to prevent aerosols)
- using aseptic technique.

A number of students suggested using an inoculating loop for this transfer but this is physically impossible as loops will not hold 1 mL. Most students attempted this question and gave some correct aspects of aseptic technique but did not give complete descriptions.

Question 5a.

Marks	0	1	2	Average
%	14	54	32	**1.2**

- check with her supervisor
- calculate the equivalent mass of anhydrous salt required

Question 5b.

Marks	0	1	2	3	Average
%	39	4	7	50	**1.7**

500 ÷ 1000 = 0.5
0.5 × 0.5 = 0.25
0.25 mol

Question 5c.

Marks	0	1	2	3	Average
%	43	0	0	57	**1.7**

0.25 × 159.61 = 39.9

Students either performed this calculation correctly or did not know what was required. A number of students did not attempt this question.

Question 6a.

Marks	0	1	2	3	Average
%	43	0	0	57	**1.7**

0.05 M

Students either performed this calculation correctly or did not know what was required. A number of students did not attempt this question.

Question 6b.

Marks	0	1	2	Average
%	43	0	57	**1.2**

2.92 grams (5.84 was also accepted, as the question did not specifically mention the quantity in part a.)

Students either performed this calculation correctly or did not know what was required.

Questions 6c–d.

Marks	0	1	2	Average
%	14	39	46	**1.3**

Question 6c.
Volumetric flask

Question 6d.
Analytical grade

Section C – Electives
Elective 1 – PMLTEST308A – Perform microscopic examination

Question 1a.

Marks	0	1	2	3	4	5	Average
%	0	33	8	33	0	25	**2.8**

Microscopic component	Function
Graticule	D
Fine focus control	C
Condenser	E
Oil immersion lens	A
Iris Diaphragm	B

A number of students still do not understand the functions of the components of a microscope, which is a fundamental requirement for this unit and for using a microscope in the workplace.

Question 1bi–ii.

Marks	0	1	2	3	4	5	Average
%	0	8	29	38	25	0	**2.8**

Question 1bi.

- ensure the stage is in a lowered position
- ensure the low magnification objective lens is positioned directly above the stage

Question 1bii.
Possible answers included:

- ensure the light intensity is turned down
- ensure the stage is clean
- ensure the lenses are clean
- record/note the magnification power of the eye-piece and the objective lens used.

Question 1c.

Marks	0	1	2	Average
%	8	46	46	**1.4**

- x20 eyepiece lens
- oil immersion lens (x100 lens was also acceptable)

Question 2

Marks	0	1	2	3	Average
%	42	33	0	25	**1.1**

Method	Image
20x and oil	3
electron microscope	1
10x eyepiece 4x objective lenses	2

Students had trouble identifying the equipment used to produce these images.

Question 3

Marks	0	1	2	3	4	5	Average
%	0	17	33	42	0	8	**2.5**

- Place the sample on the microscope stage 3
- Set up and align the light path 2
- Examine the sample 5
- Select and adjust the appropriate objectives 4
- Ensure the lens is clean 1

Elective 2 – PMLTEST409A – Capture and manage scientific images

Question 1a.

Marks	0	1	2	3	Average
%	40	40	20	0	**0.8**

- visible light
- ultra-violet light
- fluorescent light

A number of students were able to identify one or two types of light sources, but not three.

Question 1b.

Marks	0	1	2	3	Average
%	20	20	20	40	**1.8**

Any three of the following:

- discuss with her supervisor which demand has the higher priority
- if the experiment can be left, place the cells back in the incubator and return when the seminar is over
- ask another experienced colleague to complete the experiment
- if the timing of the experiment is critical, tell her supervisor she will complete experiment then attend as soon as possible
- ask someone to attend the seminar and take notes/record information for her.

A number of students were able suggest one or two steps, but not three.

Question 1c.

Marks	0	1	2	3	Average
%	20	40	0	40	**1.6**

- yellow
- red
- green

Question 2a.

Marks	0	1	2	3	Average
%	30	40	20	10	**1.1**

Any three of the following:

- assists in identifying the samples
- images can be conveniently downloaded to a computer/database
- assists in record-keeping
- images could be imported into reports
- assists in confirming sampling site(s), dates and conditions.

A number of students were able to identify one or two reasons, but not three.

Question 2bi–ii.

Marks	0	1	2	3	4	5	Average
%	0	0	10	30	50	10	**3.6**

Question 2bi.

Any three of the following:

- date
- time
- location
- weather conditions
- sample characteristics
- job number/client details
- sampler/tester.

Question 2bii.

- samples are intact
- samples are stored correctly
- samples are correctly identified
- samples are tested in appropriate time
- client/job brief is followed
- SOP is followed
- results/data are recorded properly

Many students did not seem to understand the term ‘reliable’.

Question 2biii.

Marks	0	1	2	3	Average
%	10	50	20	20	**1.5**

Any three of the following:

- enlarged or reduced
- contrast altered
- cropped
- text/data added
- symbols/arrows/circles/etc. added
- colour enhanced.

Elective 3 – PMLTEST304B – Prepare culture media

Question 1ai–ii.

Marks	0	1	2	Average
%	18	18	64	**1.5**

Question 1ai.

500 mL (450 – 600 mL was also accepted)

Question 1aii.
Either of:

- some extra medium is required for quality control
- volumes of greater than 600 mL would be wasteful.

Quality control or test incubation or equivalent needed to be mentioned in this answer. Students needed to show that they understood that just because the procedure gives the recipe for 1 litre, this amount does not need to be prepared every time.

Question 1b.

Marks	0	1	Average
%	73	27	**0.3**

Boil the agar to dissolve it. (Autoclave the agar was also accepted, but is not the best response as excess heating should be avoided.)

A number of students did not seem to understand that agar needs to be heated/boiled to dissolve before dispensing.

Question 1c.

Marks	0	1	2	3	Average
%	23	9	14	55	**2.0**

Question 1ci.
20 – 30 mL

Question 1cii.

- Agar needs room for expansion during autoclaving.
- You need to get a slope with room for bacteria to grow large, as a bottle would make the medium too thin and prone to dehydration.

Questions 1d–e.

Marks	0	1	2	Average
%	50	41	9	**0.6**

Question 1d.
Michael should test incubate a proportion of the medium.

Responding that he should test incubate all of the medium was accepted, but this was not the best answer as any additional heating would reduce the nutritional value of some media components and increase the risk of dehydration of the medium, resulting in poor bacterial growth.

Question 1e.
Use the test organisms and see if expected growth occurs.

Students did not seem to understand that culture medium after production need to be tested for sterility or that it must be tested with reference strains to check that it grows bacteria and produces the expected results.

Questions 2a–b.

Marks	0	1	2	3	Average
%	27	18	36	18	**1.5**

Question 2a.
Students needed to provide a logical answer that included both:

- pressure
- heat steam.

For example, they heat steam under pressure to reach a sterilisation temperature.

Question 2b.
Any of the following or equivalent:

- autoclave tape
- autoclave monitors
- spore strips
- data loggers
- thermocouples.

Question 3a.

Marks	0	1	2	Average
%	41	59	0	**0.6**

Any two of:

- blood
- serum
- sugars
- vitamins
- antibiotics.

Other answers could be acceptable. Many students were unable to answer this question, possibly showing a lack of understanding of the term 'heat labile'.

Question 3bi–ii.

Marks	0	1	2	3	Average
%	23	18	23	36	**1.8**

Question 3bi.
50 °C

Other answers were not acceptable.

Question 3bii.
This is the only temperature that is high enough for the agar to be molten but not hot enough to destroy heat labile ingredients.

Or:

- At 20 °C the agar is set and ingredients cannot be added.
- 100 °C and 121 °C are too hot; the components would be denatured or destroyed.

Students' answers needed to explain why the lower and higher temperatures were not acceptable. A number of students found this question difficult, probably because they did not understand the term 'heat labile'.

Question 3c.

Marks	0	1	Average
%	55	45	**0.6**

The finished media should be stored in the refrigerator.

Many students did not answer this question correctly or did not answer it at all.

Question 4

Marks	0	1	2	3	Average
%	0	41	23	36	**2.0**

Any three of the following, or equivalent, responses were accepted:

- stock levels meet requirements
- stock is within use by date
- stock is rotated correctly
- media are not dehydrated
- media are not contaminated

- visual inspection to ensure media conforms to specification
- storage temperature.