VICTORIAN CURRICULUM AND ASSESSMENT AUTHORITY

2009 VCE 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 topic. However, a small number of students completed all three electives and some students did not complete 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 molarities and concentration of chemical solutions, perform dilutions and balance chemical equations. Students also had difficulty in all units with the definitions of relevant terms.

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 – Core units – Multiple-choice questions

The table below indicates the percentage of students who chose each option. The correct answer is indicated by shading.

Question	% A	% B	% C	% D	Comments
1	93	0	0	7	
2	7	0	50	43	Students need to understand the meaning of basic chemical terms and apply them in practical situations.
3	93	0	0	7	
4	93	0	7	0	
5	100	0	0	0	
6	29	50	7	14	The quality questions continue to give students problems. Students need to understand the meaning of the terms 'readable', 'relevant', 'reliable' and 'representative' in this context as this is a basic requirement for this unit.
7	14	29	43	14	One of the basic properties of agar is that it melts at 100°C but sets at between 50°C and 60°C, allowing heat-labile products to be added.
8	50	14	14	21	Chlorine is the most suitable disinfectant for blood spills as it kills the viruses which cause AIDS and hepatitis.
9	71	0	7	21	
10	0	86	14	0	
11	14	7	21	57	
12	0	0	0	100	
13	0	14	7	79	
14	7	86	0	7	
15	7	14	79	0	
16	0	7	93	0	
17	93	0	7	0	
18	21	7	71	0	
19	7	86	0	7	
20	0	29	7	64	

In general, the multiple-choice questions were answered well.

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Section B – Short answer questions
Core units

Question 1a.

Marks	0	1	2	Average
%	43	39	18	**0.8**

Two of:

- being responsible
- being flexible
- being involved
- being safety aware
- considering the needs of others
- being helpful to colleagues
- putting the customer first
- following procedures
- being positive
- planning ahead
- predicting problems
- communicating well
- showing initiative.

As in previous years, students had difficulty in demonstrating an understanding of relevant industry terms.

Question 1b.

Marks	0	1	2	Average
%	11	50	39	**1.3**

- involvement of all levels of management in the running of the laboratory
- helping others
- involving others in the process
- giving and taking responsibility
- planning as a group
- giving everybody a say

Question 2a.

Marks	0	1	2	Average
%	14	29	57	**1.5**

Two of:

- errors associated with sampling or testing
- quality of the product
- incorrect or no calibration of equipment
- equipment failure
- incorrect procedure.

Question 2b.

Marks	0	1	2	3	Average
%	11	7	29	54	**2.2**

Three of:

- date
- identification
- results
- faults/problems
- data.

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Question 3

Marks	0	1	2	3	Average
%	7	14	36	43	**2.1**

Three of:

- all safety information
- essential sample preservation details
- container specifications
- location of sampling points/sampling plan
- storage information
- correct labelling and sample codes
- sample condition
- equipment calibration.

Question 4a.

Marks	0	1	2	3	4	5	6	7	8	9	10	Average
%	14	4	4	0	4	7	11	7	36	7	7	**5.8**

Ten of the following or equivalent (in a logical sequence):

- organise equipment
- flame the loop, including the shaft
- ensure the loop is cool by touching an area of the plate where there is no bacteria growing
- with the sterile loop, remove one isolated colony of bacteria
- using your left hand (or if you are left-handed, using your right hand), hold the tube at an angle so that airborne contamination is minimised
- while holding the loop, remove the top with the little finger of your right hand
- flame the neck of the tube
- carefully insert a sample of culture by rubbing the loop on the glass with the loop just below the surface of the broth
- flame the neck of the tube again
- bring the tube towards the plug, replace the top and put the tube back in the rack
- flame the loop to sterilise it.

A number of students had difficulty with this question. The ability to aseptically transfer bacteria from one batch of culture medium to another is a fundamental requirement and students need to be able to describe this process. They are also required to be familiar with Standard Operating Procedures (SOP) and how they are written.

Question 4b–c.

Marks	0	1	2	Average
%	32	54	14	**0.8**

Question 4b.

One of:

- the culture may be mixed or contaminated
- to ensure that all the bacteria in the sample are the same.

Question 4c.

One of:

- do not use a hot loop near the bacteria
- to cool the loop, use an area of the plate which is free of bacteria
- do not shake the loop or the containers of bacteria.

Question 5a–b.

Marks	0	1	2	3	Average
%	14	21	54	11	**1.6**

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Question 5a.
The time a disinfectant needs to be in contact with the bacteria to kill them

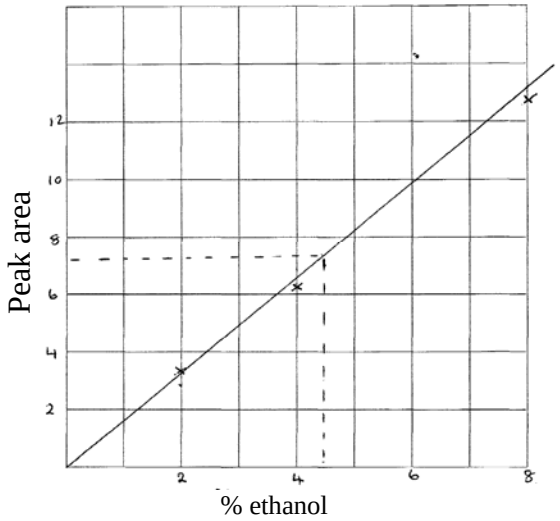
Question 5b.
Two of:

- pH
- heat
- contamination
- bodily fluids
- protein
- detergents
- incorrect dilution/concentration
- the age of the solution.

Question 6a.

Marks	0	1	2	3	4	Average
%	14	14	7	36	29	**2.5**

Peak area versus % ethanol



Question 6b–c.

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

Question 6b.
Answers between 4.5 and 5.0 were accepted.

Question 6c.
Yes

Question 6d.

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

Two of:

- dilution error
- calibration error
- inaccurate plot
- sample error
- poor technique.

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Question 6e–f.

Marks	0	1	2	3	Average
%	7	0	4	89	**2.8**

Question 6e.
Logbook

Question 6f.
Two of:

- laboratory coat
- safety glasses
- gloves
- enclosed shoes.

Question 7a–b.

Marks	0	1	2	Average
%	64	32	4	**0.4**

Students had difficulty defining the two common chemical terms: volumetric analysis and reagent.

Question 7a.
Testing of an unknown sample against a primary standard

Question 7b.
A chemical agent used in a chemical reaction to produce a product

Section C – Electives

Elective 1 – PMLTEST308A Perform microscopic examinations

Most students had a good understanding of this elective.

Question 1a–b.

Marks	0	1	2	3	4	Average
%	0	14	21	46	18	**2.6**

Question 1a.
Three of:

- date
- time
- tester
- client
- analyst
- sample type
- location
- storage conditions
- tests to be performed.

Question 1b.
No

Question 1ci–iii.

Marks	0	1	2	3	4	Average
%	4	7	29	43	18	**2.7**

Question 1ci.
One of:

- record in a sample receipt register or logbook
- ensure they are wearing the correct PPE
- inform their supervisor.

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Question 1cii.
Standard Operating Procedure (SOP)

Material Safety Data Sheet (MSDS) or emergency/spill procedure was also acceptable.

Question 1ciii.
One of:

- refer to supervisor
- refer to other appropriate personnel.

Question 1d.

Marks	0	1	2	Average
%	11	36	54	**1.5**

Two of:

- chemical
- ergonomic
- electricity
- biological
- physical.

Question 2a.

Marks	0	1	2	Average
%	14	32	54	**1.4**

Two of:

- reagents
- equipment
- safety requirements
- sample type
- priority.

Question 2b.

Marks	0	1	2	Average
%	7	21	71	**1.6**

Two of:

- the work area is too cluttered
- the disposal unit is on the bench
- the microscope is too far forward (ergonomics).

Question 2c.

Marks	0	1	2	Average
%	25	29	46	**1.2**

Two of:

- expiry date(s)
- check colour
- discolouration
- precipitates/particulates
- leakage
- storage conditions
- evaporation
- change in state
- oxidisation
- ask the supervisor
- check the SOP.

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Question 2d–e.

Marks	0	1	2	3	4	Average
%	14	7	4	32	43	**2.7**

Question 2d.

One of:

- spreadsheets
- sample log
- receipt book
- laboratory information management system (LIMS).

Question 2e.

Sample type	Pre-treatment
Whole blood samples	2
Biological type samples that decay or change quickly	3
Water samples taken from a creek or river	1

Elective 2 – PMLTEST409A Capture and manage scientific images

The students who attempted this elective showed a good understanding of the unit.

Question 1a.

Marks	0	1	2	3	Average
%	0	13	38	50	**2.3**

Three of

- digital imaging
- computer emailing
- scanning.

Question 1b.

Marks	0	1	2	Average
%	0	13	88	**1.8**

Two of:

- save time
- less exposure to chemicals
- labelling
- highlighting important areas.

Question 1c.

Marks	0	1	2	Average
%	13	50	38	**1.2**

Two of:

- ultraviolet visible (light)
- phosphorescence
- autoradiography
- micrographs
- x-rays
- fluorescence.

Question 1d.

Marks	0	1	2	Average
%	0	25	75	**1.8**

Two of:

- Jayne and the technician could work together
- the supervisor could assist Jayne or the technician
- the technician could do them now and show Jayne.

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Question 1e.

Marks	0	1	2	3	Average
%	0	13	25	63	**2.5**

Three of:

- Jayne reassures the technician by explaining the safety protocols
- use of personal protective equipment (PPE)
- Jayne explains the necessity of the procedure
- teamwork
- provide training
- Jayne reassures technician that radiation levels are low.

Question 2a–b.

Marks	0	1	2	3	Average
%	6	31	38	25	**1.7**

Question 2a.

One of:

- an outline of the task
- a description of industry clients and their particular requirements or demands.

Question 2b.

Two of:

- can use the successful training experiences as examples of good practice
- demonstrate an understanding of the nature of the work
- make recommendations
- provide references.

Question 2c.

Marks	0	1	2	Average
%	19	50	31	**1**

Two of:

- commercial in confidence
- privacy laws
- be diplomatic
- be aware of sensitivities
- avoid the use of logos or other identifying information.

Question 2d.

Marks	0	1	2	3	Average
%	25	56	0	19	**1.2**

Three of:

- PowerPoint displays with images from workplaces
- CDs
- Internet sites
- handouts/brochures.

Question 2d. caused problems for a number of students. Scientific images are commonly used for promotional material and to reach a varied audience a number of different types of materials are used. Modern digital methods allow a much larger audience to be reached as material can be put onto industry websites or CDs and can be distributed to people who did not attend the initial presentation.

Elective 3 – PMLTEST304B Prepare culture media

Many students had difficulty with this elective, in particular with listing the sequential steps required to prepare a batch of culture medium.

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All culture mediums come with instructions for preparing one litre of medium; however, it is often necessary to prepare batches that are much smaller or larger than this.

Serum used in the preparation of some culture medium is heat labile and is usually purchased as a sterile solution. It is easy to contaminate, and sterility can be assured by using an appropriate sterile filtration system.

Question 1a–b.

Marks	0	1	2	3	4	Average
%	33	25	33	8	0	**1.2**

Question 1a.
Three of:

- must contain nutrients that are suitable for the growth of the microbial organisms
- the pH must be adjusted to make sure that the microorganisms can grow properly
- culture media cannot contain substances that would prevent the growth of microbes
- culture media must be sterile before use (medium which is cloudy or is not completely clear should not be used).

Question 1b.
Solid media allows us to grow microbes on a surface where they are easily identified or counted.

Students had difficulty demonstrating an understanding of the properties of culture medium and the advantages of using a solid medium.

Question 2a–b.

Marks	0	1	2	Average
%	0	8	92	**1.9**

Question 2a.
One of (or equivalent):

- the ingredients are weighed separately so that if you add too much of one ingredient, some can be removed to get the right weight
- if you weigh them together and add too much of one ingredient, you will not be able to remove the extra portion without also taking away some of the other ingredient that was already correct
- accuracy.

Question 2b.
Two decimal place balance

Question 2c–d.

Marks	0	1	2	Average
%	0	92	8	**1.1**

Question 2c.
Other water: for example, tap water may contain chemicals which inhibit the growth of bacteria

Some substances or salts present in tap water may inhibit the growth of some bacteria.

Question 2d.
Bacteria already present in the agar would grow, contaminating your samples.

Question 2e.

Marks	0	1	2	3	Average
%	33	0	17	50	**1.9**

Tryptone: 5 x 200/1000 = 1 g
Yeast extract: 2.5 x 200/1000 = 0.5 g
Glucose: 1 x 200/1000 = 0.2 g

Question 3a.

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Marks	0	1	Average
%	100	0	**0**

Substances that may be broken down or degraded by heat

Many bacteria need blood, serum or other cell products to grow. Many of these substances are degraded by heat; the common term used in culture medium production is 'heat labile'. Many of the processes used in the production of culture medium are necessary because substances are heat labile and cannot be sterilised by autoclaving (heat).

Question 3b.

Marks	0	1	2	3	4	5	6	7	8	Average
%	58	8	0	0	25	0	0	8	0	**1.7**

This procedure may be done using either a sterile pipette or a displacement pipette with a sterile disposable tip.

- Work near your Bunsen burner or, if possible, in a laminar flow cabinet.
- Swab the area.
- Flame the 1 ml sterile pipette or pipette tip.
- Using your left hand (or if you are left-handed, using your right hand), hold the serum container at an angle so that airborne contamination is minimised.
- While holding the pipette, remove the top with the little finger of your right hand.
- Flame the neck of the container and carefully remove 1 ml of serum sample with the pipette.
- Flame the neck of the tube again and replace the cap.
- Remove the cap from the nutrient broth and flame the neck of the tube.
- Dispense the serum into the broth, taking care not to create aerosols.
- Flame the neck of the tube and replace the cap.
- Ensure contaminated materials are disposed of correctly.

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