



**2007 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.

Some students did not read the questions carefully and their answers did not demonstrate a clear understanding of the topic. When definitions are required it is not appropriate to use the term being defined in the answer. If a response did not address the subject of the question it could not be awarded any marks

In some areas there was a lack of understanding of technical terms and, as in previous years, questions involving calculations were poorly answered. It is essential for students at this level to be able to determine the molarity and concentration of chemical solutions, perform dilutions and balance chemical equations.

**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**

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	0	100	0	0	
2	14	0	86	0	
3	29	71	0	0	
4	14	0	14	71	
5	86	0	0	14	
6	0	86	14	0	
7	0	14	29	57	
8	0	0	100	0	
9	0	0	0	100	
10	14	43	14	29	A number of students suggested that blood should be filtered with a membrane filter (option B); however, this cannot be used for whole blood as the pores of the membrane used to exclude bacteria would also exclude the larger blood cells. Students may have been thinking of serum when they chose this answer.
11	100	0	0	0	
12	14	57	29	0	A number of students answered that ultra violet light sterilises the work surfaces of biohazard cabinets (option B). This is incorrect as some bacteria, especially spores, are not killed and light needs to come in direct contact to kill the organism. Although the number of organisms is reduced, the cabinet cannot be assumed to be sterile.
13	100	0	0	0	
14	0	0	100	0	
15	29	29	14	29	When preparing standard solutions a graduated pipette of the correct size is the most accurate piece of equipment (option B). If large volumes are being prepared a measuring cylinder could be used, but these are less accurate than pipettes due to the larger bore and greater difficulty in determining the meniscus.
16	57	0	29	14	
17	14	0	29	57	
18	0	100	0	0	
19	0	0	100	0	
20	0	0	0	100	

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Students generally did well in the multiple-choice section of the paper; however, Questions 7, 10, 12, 15, 16 and 17 presented problems for a number of students. Questions 10, 12 and 15 were particularly poorly answered, and are commented on in the table above.

## Section B – Short answer questions

### Core Units

#### Question 1a.

Marks	0	1	2	Average
%	14	71	14	1.0

Any two of:

- prepare a message system so customers can record issues and they can be followed up
- train lab technicians to receive and respond to personal calls
- install a buzzer that connects the reception area to the lab.

The students were asked specifically what **the technicians** could do. A number of student responses made suggestions outside the control of the technicians (for example, employ more staff) which could not be awarded any marks.

#### Question 1b.

Marks	0	1	2	3	Average
%	0	7	57	36	2.3

Any three of:

- assign a mentor
- form work teams
- provide a medium for open conversation
- provide training with a senior staff member
- hold regular meetings
- read relevant written material.

#### Question 2

Marks	0	1	2	3	Average
%	0	36	57	7	1.7

Any three of:

- get someone to check the calculation for the buffer preparation
- ensure that the pH meter is working correctly
- redo the calibration on the pH meter
- check that the water sample looks alright
- check the electrode
- use an alternate pH meter if there is one available
- take a second sample as the glassware may have been contaminated
- check the filter unit maintenance records.

#### Question 3

Marks	0	1	2	Average
%	21	43	36	1.2

Any two of:

- conforms to requirements
- fit for the purpose
- satisfies the customer
- dependable
- uniform
- cost effective.

The term quality was not defined in some cases, and a number of students used the term in their answer; for example, 'It is aiming for the highest quality and condition of both service and product. It may not be "right" but it is of highest quality and procedures are done properly' and 'Quality service is the quality in which you treat customers and or workers'.

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## Questions 4a–b.

Marks	0	1	2	3	4	Average
%	21	21	14	43	0	1.8

### Question 4a.

Any three of:

- Bunsen burner
- water bath
- autoclave/steamer/microwave (anything that can melt agar)
- tubes or bottles/racks
- sterile pipettes
- pipette fillers.

### Question 4b.

Either of:

- pour an agar deep into a sterile Petrie dish without adding water and incubate as a negative control
- test incubate agar deeps.

### Question 4c.

Marks	0	1	2	Average
%	86	14	0	0.2

Number of dilutions  $\times$  number of plates poured (in this case in duplicate) = number of deeps required  
 $= 5 \times 2$   
 $= 10$

Few calculations or explanations were given and most students appeared to have a poor understanding of the concept of serial dilutions and pour plates.

### Question 4d.

Marks	0	1	2	3	4	5	Average
%	14	36	0	29	14	7	2.2

Any five of (in a logical sequence):

- clean/disinfect the work area
- melt the agar and cool to the required temperature
- open the water container and flame mouth to prevent contamination
- pipette one ml of sample
- remove the cap from the agar and flame mouth of container
- add water and mix without causing bubbles
- pipette into a labelled Petri dish.

Many answers did not demonstrate knowledge of aseptic techniques, the requirement for sterile equipment, negative controls or test incubation.

### Question 4e.

Marks	0	1	2	3	Average
%	0	14	43	43	2.3

All of:

- sample name or number (unique identifier)
- date
- dilution of sample.

### Questions 5a–b.

Marks	0	1	2	3	Average
%	0	21	29	50	2.3

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## Question 5a.

Either of:

- a substance that is **not** hydrated
- a substance that does not contain water molecules.

## Question 5b.

Both of:

- a lab coat
- safety glasses.

## Questions 5c–d.

Marks	0	1	2	3	Average
%	7	50	14	29	1.7

## Question 5c.

MSDS (Material Safety Data Sheet)

## Question 5d.

$$\begin{aligned}n &= \frac{m}{M} \\ &= \frac{1.29}{10620} \\ &= 0.0121 \text{ mol}\end{aligned}$$

## Question 5e.

Marks	0	1	2	Average
%	71	0	29	0.6

$$\begin{aligned}c &= \frac{n}{v} \\ &= \frac{0.012}{0.25} \\ &= 0.0484 \text{ M}\end{aligned}$$

Many students had problems calculating the concentration of the solution.

## Question 5f.

Marks	0	1	2	3	4	Average
%	0	14	64	21	0	2.1

Any four of:

- manufacturer
- date of manufacture
- contact details
- formula/formula weight
- safety procedures
- first aid
- storage
- hazardous substance information
- dangerous goods information.

Many students did not appear to have had access to chemical bottles or understand what is on a chemical labels.

Answers reflected the labelling commonly found on prepared solutions. Students demonstrated knowledge of dangerous goods but not hazardous substances regulations.

## Questions 6a–c.

Marks	0	1	2	3	4	Average
%	0	50	21	14	14	2.0

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**Question 6a.**

The mass of solute in grams per 100g of solution.

A number of students interpreted the symbols instead of giving the meaning of the terms. The meaning should have included the term **mass**.

**Question 6b.**

3 g → 500 g

x g → 100 g

$x = 0.6\%$  w/w

It is the percentage weight divided by the weight in grams.

**Question 6c.**

Logbook

## Section C – Electives

### Elective 1 – PMLTEST308A – Perform microscopic examination

**Questions 1a–b.**

Marks	0	1	2	3	Average
%	0	0	38	63	2.7

**Question 1a.**

Any two of:

- MSDS
- standard operating procedure(s)
- media container, label or pamphlet
- manufacturer's or other website(s)
- relevant textbook(s)
- personal or verbal communication from a reliable source(s).

**Question 1b.**

Any of:

- use the alternative substance
- test the alternative first before using it
- research the effectiveness of the alternative
- make an enquiry to supplier/manufacturer/friends/colleagues.

**Questions 1c–d.**

Marks	0	1	2	Average
%	0	25	75	1.8

**Question 1c.**

Any of the following answers were acceptable:

- should not proceed because the media may not be sterile or 'right'
- should not proceed because the cabinet may be defective in some way and possibly damaged
- should proceed if the check is only just overdue, because time will not be wasted, and the prepared media could be simply checked afterwards to determine that it is safe/satisfactory to use.

**Question 1d.**

Either of:

- to count or measure the number/type/size of the cells
- to measure/determine/find out the viability/quality of the cells.

**Question 2a.**

Marks	0	1	2	Average
%	0	25	75	1.8

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Special stain or a differential stain

And either of:

- differentiates between gram positive and gram negative bacteria
- stains gram positive bacteria purple/blue and gram negative bacteria pink/red.

### Questions 2b–c.

Marks	0	1	2	3	Average
%	0	13	38	50	2.4

### Question 2b.

Any two of:

- set up and align the light path
- add oil and place the sample correctly on the stage
- focus using low power
- adjust for oil immersion lens.

### Question 2c.

×40

### Question 3a.

Marks	0	1	2	3	4	5	Average
%	0	0	0	0	0	100	5.0

Microscope part	Function
Condenser	B
Stage	C
Objective lens	A
Ocular lens	D
Focus controls	E

### Question 3b.

Marks	0	1	2	3	4	5	Average
%	0	0	13	25	13	50	4.0

### 3bi.

Total magnification = objective magnification × ocular magnification  
 = 10 × 40  
 = 400

### 3bii.

×100

### 3biii.

Any three of:

- lower the stage
- remove any slides from the stage
- clean all lenses (carefully)
- ensure the lamp and/or microscope is switched off
- place the lowest power/shortest objective lens in centre stage position
- remove the ocular lenses to holder(s)
- cover the instrument or place in cupboard
- clean the microscope work area
- remove waste to appropriate containers (infected materials to autoclave waste, sharps to sharps container, non-infected glass to glass container, etc.)
- record in logbook.

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## Elective 2 – PMLTEST409A – Capture and manage scientific images

### Question 1a.

Marks	0	1	2	Average
%	0	0	100	2.0

The correct answers were:

- ii. forensic crime scene evidence
- iii. a river environmental monitoring site.

### Questions 1b–c.

Marks	0	1	2	3	Average
%	10	40	50	0	1.4

### Question 1b.

Any two of:

- video or moving based images (mpeg files, etc.)
- autoradiograph
- micrographs
- electron micrographs
- website creation
- blog site creation
- images created directly in specialised computer software in various file formats.

### Question 1c.

Any one of:

- ultraviolet/ultraviolet light/UV/UV light
- fluorescence/fluorescent/phosphorescence/phosphorescent
- infra-red/IR/IR radiation.

### Question 2a.

Marks	0	1	2	Average
%	0	60	40	1.4

Either of:

- because DNA/band(s)/sample(s)/image(s) will breakdown/degrade/disappear/not be visible.
- because there is no/insufficient image remaining to record.

Although students understood that DNA degrades, many did not give specific reasons for why it was important to record the images quickly.

### Question 2b.

Marks	0	1	2	Average
%	0	30	70	1.7

Any two of:

- a hazard/harmful chemical/substance has been eliminated or reduced
- a hazardous/harmful light source has been eliminated or removed
- the laboratory/workplace will be safer/less dangerous to the technician/scientists/workers
- the company/manager/supervisor is following safety laws/regulations and is doing the right thing for employees.

### Questions 3a–b.

Marks	0	1	2	3	Average
%	0	10	20	70	2.6

### Question 3a.

Any one of:

- many records can be kept on computer/in a small space/conveniently
- storing of images is quicker/more convenient/efficient
- images should not break/degrade/change with time

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- images will/may be less hazardous than slides.

### Question 3b.

Any two of:

- images can be manipulated for contrast/clarity/colour/resolution/size
- images can be labelled with text/numbers/overlay images/symbols
- images can be cropped or cut to remove sections of no interest.

### Question 3c.

Marks	0	1	2	Average
%	0	0	100	2.0

3ci.

Susan

3cii.

Maalek

### Question 4a.

Marks	0	1	2	Average
%	20	50	30	1.1

Any two of:

- when the images are required
- what type of images are required
- what is the nature of the subject(s) to be imaged
- what equipment/facilities are required to capture the image(s)
- will he/she require assistance with the tasks
- will any software be required to manipulate the images
- where will the images and/or original samples be stored?

### Question 4b.

Marks	0	1	2	3	4	Average
%	0	0	40	0	60	3.2

Procedural steps	Order of steps
Remove cells from incubator to microscope for recording images	4
Check with student on important aspects of the cells to record	1
Become familiar with camera operation	2
Become familiar with software operation	3

## Elective 3 – PMLTEST304B – Prepare culture media

### Question 1

Marks	0	1	2	3	Average
%	0	70	20	10	1.4

All of:

- face shield safety
- long padded/heat resistant gloves
- laboratory gown.

Students did not seem to appreciate the need for a gown rather than a laboratory coat in microbiology, or that a face shield rather than goggles or safety glasses is required when removing liquids from the autoclave. This protects the face from splashes of hot liquid.



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## Question 2a.

Marks	0	1	2	Average
%	0	20	80	1.8

Any two of:

- medium name
- batch number
- date.

## Question 2b.

Marks	0	1	2	Average
%	40	20	40	1.0

On the bottom to prevent labelling being lost if the lid is removed and/or accidentally mixed up.

## Question 3a.

Marks	0	1	2	3	4	5	6	Average
%	0	30	20	30	10	10	0	2.5

Any six of the following (in a logical sequence):

- allow the agar to cool in a water bath
- disinfect the work area
- flame the mouth of the bottle and aseptically add 25ml sheep blood
- mix thoroughly, taking care not to create bubbles
- label the Petri dishes
- aseptically pour medium
- allow to set
- clean/disinfect the work area
- place disposable and reusable equipment in relevant receptacles for cleaning/disinfection.

This question was not well answered. Students were asked to write a procedure in six steps, which is a task often required of technicians; however, a number of students wrote a descriptive paragraph.

## Questions 3b–c.

Marks	0	1	2	Average
%	0	40	60	1.6

## Question 3b.

In a refrigerator.

## Question 3c.

To check for contamination.

## Question 4a.

Marks	0	1	2	Average
%	0	0	100	2.0

They should be loose to prevent pressure build up and bottles exploding.

## Questions 4b–c.

Marks	0	1	2	3	Average
%	0	20	80	0	1.8

## Question 4b.

The indicator should be placed in the centre of the load.

## Question 4 c.

Any two of:

- not use the items as they may not be sterile
- record the problem in the instrument log
- report the problem to a supervisor

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- investigate possible reasons for the failure.

## Queries/comments:

- Section B, Core Units, Question 3: The question asks for a definition of two terms. Which bullet points relate to which term? I