2013 Examination Report

VICTORIAN CURRICULUM AND ASSESSMENT AUTHORITY

2013 VCE VET Laboratory Skills GA 2: Examination

GENERAL COMMENTS

Students' overall performance on the 2013 VCE VET Laboratory Skills examination was good. It was evident from responses that students had read the questions carefully and their answers demonstrated a clear understanding of the units of competency. However, VCE VET Laboratory Skills is a small study and it is difficult to comment accurately on overall trends.

The multiple-choice section of the examination was particularly well done, with only three questions causing students difficulty. Questions in this section required students to demonstrate practical understanding of laboratory equipment and problem-solving. The emphasis is on the student's ability to give a solution or method for a given situation.

The short-answer questions were generally well done, although some areas of the unit of competency 'Prepare working solutions' and the calculations involved in chemistry caused students some difficulty.

'Contribute to the achievement of quality objectives' questions were also poorly answered by some students. Understanding the protocols and standards for a routine analysis is an important part of quality control. What controls are needed and how to interpret the data provided are all essential skills in a laboratory.

SPECIFIC INFORMATION

This report provides sample answers or an indication of what answers may have included. Unless otherwise stated, these are not intended to be exemplary or complete responses.

The statistics in this report may be subject to rounding errors resulting in a total less than 100 per cent.

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	9	70	14	7	This question seemed to confuse students. Basic laboratory practical skills are the foundation for workplace training.
2	65	0	23	12	
3	2	7	7	84	
4	2	98	0	0	
5	0	93	0	7	
6	53	16	21	9	
7	5	19	58	19	
8	72	28	0	0	
9	5	16	16	63	Some specialist knowledge of tissue culture and laboratory routines was required. Examining tissue culture cells inside the flask eliminates the possibility of contamination and also gives an immediate indication to the trained observer of possible contamination. The need for quick solutions in laboratories must be emphasised.
10	2	2	0	95	
11	47	51	0	2	This question related to another basic laboratory skill and one important for safety in the workplace. Students need these practical skills to be able to protect themselves in laboratories.
12	35	12	21	33	
13	0	19	21	60	
14	60	12	0	28	Knowledge of common problems when using a microscope will help students in a laboratory setting. Students need to know how the parts of a microscope function.

Question	% A	% B	% C	% D	Comments
15	9	60	12	19	
16	5	2	88	5	
17	74	9	0	16	
18	7	88	2	0	
19	86	5	7	2	
20	0	0	9	91	

Section B – Short-answer questions

Question 1

Marks	0	1	2	3	4	5	6	7	8	Average
%	0	2	11	7	6	11	21	20	22	**5.7**

	Step
1	Collect all equipment and place close to work area around the Bunsen burner.
2	Sterilise the inoculation loop by flaming in Bunsen burner flame.
3	Open sample/culture broth and flame mouth of container.
4	Immerse the loop in the broth to collect a loop of culture.
5	Flame the mouth and close culture broth container, and pick up sterile broth container, open and flame the mouth.
6	Insert and stir carefully the inoculation loop in the sterile broth container.
7	Flame inoculation loop to resterilise.
8	Flame mouth of inoculated broth container and close (recap).

Students could answer this question in a variety of ways. Using a pipette (manual or auto) was an accepted way of transferring the inoculum as well as the loop. The procedure needed to cover the basics of aseptic technique, including working close to and using the flame to maintain an aseptic environment. Adding extra details that might assist or improve the procedure was also acceptable.

Question 2a.

Marks	0	1	Average
%	18	82	**0.8**

Any of

- log book
- lab manual
- standard operating procedure
- method
- quality manual.

Question 2b.

Marks	0	1	2	Average
%	10	17	72	**1.7**

Tap water contains ions or contaminants such as fluoride and chloride, which may affect results in an experiment.

'pH of the water' was not accepted as it is not something that would affect the work if the glass was used when dry (which is standard practice).

Question 2c.

Marks	0	1	2	Average
%	8	16	76	**1.7**

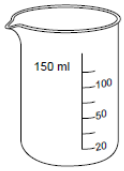
Either of

- many chemicals are aqua toxic, which means that if these are disposed of down the sink they can be fatal to marine and sea life
- chemicals can be volatile or corrosive and cause damage to pipes or cause explosions if they react.

Two marks were given for a reason with some detail.

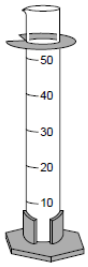
Question 3

Marks	0	1	2	3	4	Average
%	0	0	2	11	86	**3.9**

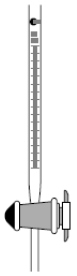


beaker

funnel



measuring cylinder



burette

Most students found this question straightforward.

Question 4

Marks	0	1	2	3	4	5	Average
%	6	18	26	26	21	2	**2.5**

Appropriate disposal methods

- scalpel, razor blades and syringe needles

Should be placed into a sharps container then disposed of through a specially licensed commercial disposal organisation.

- a beaker of 1% hypochlorite solution containing used microscope slides, cover slips, glass spreaders and an expensive glass cell counter

Should be soaked sufficiently; the items separated and rinsed with tap water. Any broken cover slips should then be placed into glass bins and the rest rinsed in distilled water, dried and re-stored. Any heavily stained slides could be disposed of into a glass bin for proper disposal according to local laws/regulations, the organisation's protocols, etc.

- a plastic biohazard waste bag containing used disposable gloves, blood, and other contaminated plastic tubes and caps, pipette tips, paper tissue and a re-usable glass culture bottle and cap

The re-usable bottle and cap should be carefully re-claimed, soaked in 1% hypochlorite solution and rinsed for autoclaving and re-use. The remaining items should be autoclaved at 121 °C for 15 minutes. Disposal should be according to local laws/regulations, the organisation's protocols, etc.

Students needed to include the principles of segregation of wastes and the correct disposal for each type of waste. If items were reusable they needed to identify those items and remove them from the waste.

Question 5a.

Marks	0	1	Average
%	47	53	**0.6**

It is a measure of the acidity of a solution or a measure of the hydrogen ion concentration. Also accepted was the potential of H or power of H.

This question was not answered well by many students.

Question 5b.

Marks	0	1	2	Average
%	34	9	56	**1.3**

$pH = -\log_{10}[H^+]$ or $[H_3O^+]$

Question 5c.

Marks	0	1	Average
%	40	60	**0.6**

An acid would reduce the pH, so a strong acid (strong enough to overcome the buffering) such as sulfuric or hydrochloric acid would be suitable. Students could be more specific and give a concentration; for example, 1M HCl.

Students did not understand the basics of adjusting the pH of a solution.

Question 5d.

Marks	0	1	2	Average
%	5	36	60	**1.6**

It should be stored at room temperature in a glass or plastic sealed container on the laboratory shelf or open shelf.

Also accepted as additional information was ‘store in a chemical cabinet’, although this was not necessary as this is a buffer or working solution.

Questions 6a–b.

Marks	0	1	2	Average
%	31	39	30	**1.0**

6a.
NATA (National Association of Testing Authorities) or similar body

6b.
Either of

- standard operating procedures
- quality manuals.

Question 6c.

Marks	0	1	2	3	Average
%	39	28	30	3	**1.0**

Students found this question difficult. Analysing data and understanding the design of standards testing and types of controls are important in quality control procedures.

6ci.
The blank is prepared with the same solutions but without the addition of the Fizzy Drink sample.

Students needed to show that they understood that the blank did not contain any sample solution.

6cii.
These are samples of known sucrose levels added to the run to check the accuracy of the results.

6ciii.
Check the SOP for this test and calculate the standard deviation.

Students could have added more detail but it was not required.

Question 6d.

Marks	0	1	Average
%	15	85	**0.9**

Any of

- complain to the Quality Manager
- ask for the samples to be retested using another method
- send the samples to another laboratory.

Question 7a.

Marks	0	1	2	3	Average
%	5	9	10	76	**2.6**

- A: obligate aerobes
- C or D: facultative aerobes
- B: obligate anaerobes

Question 7b.

Marks	0	1	2	Average
%	25	33	41	**1.2**

Selective media allows some bacteria to grow and restricts the growth of others. Enrichment media contains components that enhance the growth of some fastidious bacteria but don't prevent the growth of any.

Question 7c.

Marks	0	1	2	Average
%	18	56	25	**1.1**

Pure cultures are required to identify specific bacteria, to test antibiotic sensitivity and to subculture and maintain cultures for use in further work.

Question 8

Marks	0	1	2	Average
%	2	33	64	**1.6**

Any two of the following or similar

- by not attending the technician is not working as a team member
- the technician is missing out on the opportunity to exchange ideas and improve knowledge of the role and any changes in the workplace
- if the supervisor uses these meetings as training sessions on new machines/techniques the technician is not updating their knowledge in these areas.

Question 9

Marks	0	1	2	3	Average
%	0	6	24	70	**2.7**

Any three of

- nucleus
- mitochondria
- endoplasmic reticulum
- cell membrane
- ribosomes
- Golgi apparatus
- vacuole
- nucleolus.

Questions 10a–b.

Marks	0	1	2	Average
%	20	32	48	**1.3**

10a.
It is when the reactants have the same number of moles and react in equal quantities – a 1:1 ratio.

10b.
NaOH absorbs water and CO_2 from the atmosphere, changing the concentration; therefore it needs to be measured each time before it is used. It is hygroscopic and cannot be obtained in a high enough purity.

Question 10c.

Marks	0	1	2	3	Average
%	2	0	7	91	**2.9**

17.35, 17.30 and 17.40 mL

Question 10d.

Marks	0	1	Average
%	66	34	**0.4**

It is when an indicator changes colour indicating the end of the reaction.

Students need to understand what happens when the end point of a titration has been achieved. This is not the same as an equivalence point (which is when the number of moles of the reactants are equal – the neutralisation of the reaction).

Question 10e.

Marks	0	1	2	3	4	Average
%	16	18	16	10	39	**2.4**

An example calculation is shown below. Other approaches to the calculation were also acceptable, as long as student's workings were clearly shown.

n(HCl)
$n = c \times V$
$n = 0.150 \times [(17.35 + 17.30 + 17.40) \div 3 \div 1000]$ (students needed to find the average of the 3 titres and convert to litres)
$n = 0.002595$ mol
1:1 reaction (equimolar), so n(NaOH) the same.
n(NaOH) = 0.002595 mol
$n = c \times V$
$c = n \div V$
$c = 0.002595 \div 20 \times 10^{-3}$ (volume in litres)
$c = 0.12975$
$c = 0.130$ molL^{-1}

Many students understood which formula to use but weren't able to demonstrate the correct application of it. Students were not penalised if significant figures were not used; however, this is an important concept that students should be able to demonstrate.

Question 11a.

Marks	0	1	2	Average
%	8	24	68	**1.6**

Letter	Name of part
A	eye piece or ocular lens
B	objective lens

Question 11b.

Marks	0	1	Average
%	22	78	**0.8**

It is the coarse focus, used to focus the specimen at low power.

Question 11c.

Marks	0	1	2	Average
%	24	39	37	**1.2**

Part C, the iris diaphragm. It

- alters the contrast or resolution of the specimen
- is used for light alignment in the Kohler illumination technique
- increases the sharpness of the image.

If students chose to name part C as the condenser then the description of the function would be 'used to focus light onto the stage or specimen'.

Question 12a.

Marks	0	1	Average
%	7	93	**1.0**

Run 20 and run 11

Question 12b.

Marks	0	1	2	Average
%	10	21	69	**1.6**

From run 15 to 16 onwards the results fall away. This could be a machine error or the reagent missing. Also, runs 5 to 15 are all high (although not technically outside the acceptable range). This could indicate a machine error.

Question 12c.

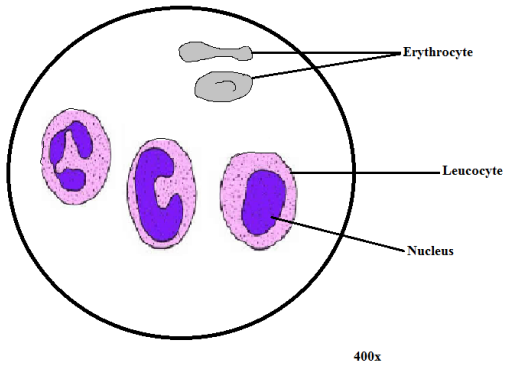
Marks	0	1	Average
%	11	89	**0.9**

By adding darker lines for upper and lower acceptable values, at 19.75 and 20.05.

Vertical or horizontal grid lines were also accepted.

Question 13a.

Marks	0	1	2	3	4	Average
%	16	28	36	20	1	**1.7**



- erythrocyte (red blood cell) and one type of leucocyte (could be a generalised white blood cell)
- leucocyte larger than erythrocyte and a definite nucleus in the leucocyte
- labels red blood cell or erythrocyte, white blood cell or leucocyte, nucleus
- correct magnification (400 ×) given

Students needed to demonstrate skill at drawing cells accurately with some detail of cell features such as the nuclei of the leucocytes shown. Labelling was poorly done, and some students did not give a magnification despite it being clearly stated as a requirement in the question. Some students were not aware that platelets are not cells but fragments of cells.

Question 13b.

Marks	0	1	2	Average
%	6	41	53	**1.5**

Any two of

- wear PPE (gloves, lab coat or gown, safety glasses)
- dispose of all waste in a biohazard bin
- work using appropriate aseptic technique
- work using good laboratory practices.

Trying not to spill or break things is not a safety precaution.

Question 14a.

Marks	0	1	2	3	Average
%	3	9	20	68	**2.5**

Any three of

- the source of the sample (that is, the company or requestor)
- what time and who was responsible for registration
- samples and/or codes that have come into the lab
- how many samples were accepted, processed and completed
- who was the analyst responsible for examination/testing.

Question 14b.

Marks	0	1	Average
%	86	14	**0.2**

Use a simple wet mount, with a small amount of the sample in a drop of distilled water placed on a slide and covered with a cover slip.

This question was not answered well. Students should have an understanding of basic slide preparation techniques and be able to apply an appropriate procedure to a given example.

Question 14c.

Marks	0	1	2	Average
%	11	51	38	**1.3**

The sample has grains of various sizes (large, medium, small) and different appearances (three shades black, grey and white); the grains appear angular, not smooth. There are three atypical structures: a long thread-like structure, a star and a very smooth ovoid shape.

Students needed to mention the shape, colour and size of particles and comment on the atypical results shown.

Question 15

Marks	0	1	2	3	Average
%	22	9	13	56	**2.1**

Answers included, but were not limited to

- turn off machinery and lights when you are finished with them
- recycle materials such as waste paper, metals and chemicals
- reduce the quantities of materials used in processes and testing.