



# Victorian Certificate of Education 2010

SUPERVISOR TO ATTACH PROCESSING LABEL HERE

## STUDENT NUMBER

Figures

Words


Letter

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# VCE VET LABORATORY SKILLS

## Written examination

Thursday 18 November 2010

Reading time: 9.00 am to 9.15 am (15 minutes)

Writing time: 9.15 am to 10.45 am (1 hour 30 minutes)

## QUESTION AND ANSWER BOOK

### Structure of book

<i>Section</i>	<i>Number of questions</i>	<i>Number of questions to be answered</i>	<i>Number of marks</i>
A – Core – multiple choice	20	20	20
B – Core – short answer	7	7	40
	<i>Number of electives</i>	<i>Number of electives to be answered</i>	
C – Electives	3	2	40
			Total 100

- Students are permitted to bring into the examination room: pens, pencils, highlighters, erasers, sharpeners, rulers and one scientific calculator.
- Students are NOT permitted to bring into the examination room: blank sheets of paper and/or white out liquid/tape.

### Materials supplied

- Question and answer book of 19 pages.
- Answer sheet for multiple-choice questions.

### Instructions

- Write your **student number** in the space provided above on this page.
- Check that your **name** and **student number** as printed on your answer sheet for multiple-choice questions are correct, **and** sign your name in the space provided to verify this.
- All written responses must be in English.

### At the end of the examination

- Place the answer sheet for multiple-choice questions inside the front cover of this book.

**Students are NOT permitted to bring mobile phones and/or any other unauthorised electronic devices into the examination room.**

**SECTION A – Core units – Multiple-choice questions****Instructions for Section A**

Answer **all** questions in pencil on the answer sheet provided for multiple-choice questions.

Choose the response that is **correct** for the question.

A correct answer scores 1, an incorrect answer scores 0.

Marks will **not** be deducted for incorrect answers.

No marks will be given if more than one answer is completed for any question.

**Question 1**

Employers favour employees working in teams because

- A. it saves management time and effort.
- B. it impresses the public and shareholders.
- C. teams achieve successful outcomes and timelines.
- D. most employees prefer to work in a team environment.

**Question 2**

A basic maintenance procedure for an analytical balance includes

- A. washing thoroughly in soapy water.
- B. changing the water in the outer jacket.
- C. removing the balance pan and cleaning the interior.
- D. maintaining the probe using a cleaning process described in the instrument manual.

**Question 3**

A standard operating procedure states that the bacterial count in a milk sample before processing must be less than  $0.99 \times 10^3$ .

Which of these results is a nonconformance?

- A.  $0.95 \times 10^2$
- B.  $0.95 \times 10^3$
- C.  $0.98 \times 10^3$
- D.  $0.98 \times 10^4$

**Question 4**

Blood testing reagents have a shelf life of one hour after dilution. Customers require results on the day of submission.

What is the best sustainable practice to achieve customer satisfaction?

- A. test samples at another laboratory
- B. test samples in a batch late each afternoon
- C. test samples in a batch early each morning
- D. test each sample as soon as possible after arrival

**Question 5**

A technician wastes time waiting for a piece of equipment to become available. She knows a similar piece of equipment is available in another department where it is seldom used.

What should she do?

- A. leave the problem for her supervisor to sort out
- B. go and use the other equipment without telling anyone
- C. take a break while she waits for the equipment to become available
- D. report the problem and tell her supervisor about the other equipment

**Question 6**

When culturing bacteria in a biohazard cabinet

- A. the fan and the ultraviolet light should be on.
- B. the fan and the ultraviolet light should be off.
- C. the fan should be on and the ultraviolet light should be off.
- D. the fan should be off and the ultraviolet light should be on.

**Question 7**

Which of the following equipment is used to decontaminate instruments?

- A. autoclave
- B. centrifuge
- C. fume hood
- D. microscope

**Question 8**

Which of the following practices may produce bacterial aerosols?

- A. dispensing solvents
- B. autoclaving culture media
- C. disinfecting a biohazard cabinet
- D. resterilising an inoculating loop in a Bunsen burner flame

**Question 9**

You are required to prepare samples of bacterial colonies.

What must you do to prevent cross-contamination?

- A. clean the hood between preparing samples
- B. get another person to prepare the other sample
- C. prepare the samples at different times of the day
- D. sterilise the inoculating equipment between samples

**Question 10**

If there is a blood spill in a laminar flow hood, what chemical should be used to treat it?

- A. bleach
- B. detergent
- C. 70% ethanol
- D. 100% ethanol

**Question 11**

A technician discovers that the autoclave tape did not change colour during sterilisation.

What should the technician do?

- A. turn off the autoclave, attach defect tag and report the fault
- B. use the equipment and report the fault in the equipment log
- C. turn off the autoclave, leave it, and hope that somebody else fixes it
- D. discard the autoclave contents and report the fault in the equipment log

**Question 12**

To sterilise inoculating loops they should be heated in

- A. a blue flame before and after each use.
- B. a yellow flame before and after each use.
- C. a yellow flame before and a blue flame after each use.
- D. a blue flame before and a yellow flame after each use.

**Question 13**

Before handling a new hazardous substance the first thing a laboratory worker should do is

- A. wear a mask and work in a fume hood.
- B. read the Material Safety Data Sheet (MSDS).
- C. wear safety glasses and work in a biohazard cabinet.
- D. put on their Personal Protective Equipment (PPE) and wash their hands.

**Question 14**

What type of stopper should be used with a glass container to store a 6 M stock solution of alkalis?

- A. a cork stopper
- B. a glass stopper
- C. a plastic stopper
- D. a rubber stopper

**Question 15**

Volatile liquids should be used in fume hoods to minimise the inhalation of vapours.

The use of fume hoods also

- A. reduces the risk of fires.
- B. keeps work surfaces sterile.
- C. prevents the spread of bacteria.
- D. increases the risk of explosions.

**Question 16**

Which item of glassware is commonly used in a laboratory to achieve the highest degree of accuracy?

- A. beaker
- B. conical flask
- C. volumetric flask
- D. measuring cylinder

**Question 17**

Which of the following is the most important label on a stock solution of acid?

- A. preparation date
- B. safety label(s)
- C. chemical manufacturer and contact details
- D. name of the person who prepared the solution

**Question 18**

What volume of a 5.0 M stock solution is required to prepare 5.0 L of a 0.2 M solution?

- A. 0.2 L
- B. 0.5 L
- C. 20 mL
- D. 50 mL

**Question 19**

What mass is needed to prepare 250 mL of a 0.2 M KI (molecular mass 165 g/mol) solution?

- A. 0.83 g
- B. 8.3 g
- C. 0.83 mg
- D. 83 mg

**Question 20**

What approximate volume of 1 M NaOH is needed to neutralise a 10 mL aliquot of 2 M H<sub>2</sub>SO<sub>4</sub>?

- A. 10 mL
- B. 20 mL
- C. 40 mL
- D. 80 mL

**SECTION B – Core units – Short answer questions**

**Instructions for Section B**  
Answer **all** questions in the spaces provided.

**Question 1**

a. Define the term ‘quality’ in relation to the production of goods and services.

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1 mark

b. How does an organisation ensure it consistently meets quality objectives?

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1 mark

c. Provide two reasons for collecting quality control data.

1. 

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2. 

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2 marks

**Question 2**

List three sustainable work practices that can be implemented in a laboratory environment.

1. 

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2. 

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3. 

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3 marks

**Question 3**

Provide three reasons why laboratory staff need to undertake training and update their skills.

1. \_\_\_\_\_

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2. \_\_\_\_\_

\_\_\_\_\_

3. \_\_\_\_\_

\_\_\_\_\_

3 marks

**Question 4**

Susan is going to subculture infectious organisms in a Class II biohazard cabinet.

a. What are the two most important items of PPE she will require?

1. \_\_\_\_\_

\_\_\_\_\_

2. \_\_\_\_\_

\_\_\_\_\_

2 marks

b. List three things that Susan needs to consider before she begins to handle the bacteria.

1. \_\_\_\_\_

\_\_\_\_\_

2. \_\_\_\_\_

\_\_\_\_\_

3. \_\_\_\_\_

\_\_\_\_\_

3 marks

c. What should Susan do with any contaminated equipment or materials she has used?

\_\_\_\_\_

\_\_\_\_\_

1 mark

**Question 5**

Kymahn is required to transfer 0.1 mL of salmonella species from an overnight broth culture into a number of fresh broths.

- a. Other than a Bunsen burner, what equipment would Kymahn use to accurately transfer 0.1 mL of culture?

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1 mark

- b. Kymahn prepares for the transfer by sterilising the bench and putting on his PPE. After lighting the Bunsen burner, explain how he would perform the actual transfer.

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7 marks



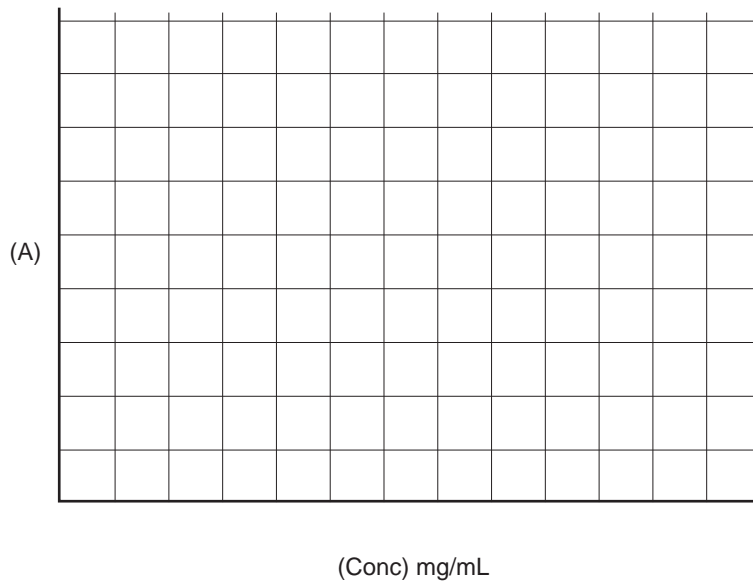
**Question 6**

A series of copper standard solutions is made up and the absorbance is measured at the optimum wavelength of 580 nm in a previously calibrated visible spectrophotometer.

**Results**

Copper concentration (mg/mL)	Absorbance
0.000	0.000
0.004	0.110
0.010	0.301
0.020	0.600

- a. Plot a graph of absorbance (A) versus concentration (Conc) on the axes provided below.



2 marks

- b. You are given an unknown sample with an absorbance reading of 0.450.  
What is the copper concentration (mg/mL) of the unknown sample?

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2 marks

- c. If the unknown sample in **part b.** was taken from a 5000 litre water tank, calculate the total mass of copper in the tank in grams. Show all your calculations.

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3 marks

d. What would you check if you were not sure about the correct calibration of the spectrophotometer?

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1 mark

e. List two pieces of PPE that you should be using during this analysis.

1. \_\_\_\_\_

2. \_\_\_\_\_

2 marks

f. Where would you record the result for the unknown sample?

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1 mark

g. What information should you include when recording your result?

1. \_\_\_\_\_

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2. \_\_\_\_\_

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2 marks

### Question 7

Freda needs to prepare a series of standards from a stock solution for an urgent instrumental calibration. She discovers that a milky suspension has developed throughout the body of the standard stock solution.

Explain what Freda should do and give reasons to support your answer.

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3 marks

Total 40 marks

**END OF SECTION B**

**SECTION C – Electives****Instructions for Section C**

Complete **two** electives **only**. Answer **all** questions within the **two** chosen electives in the spaces provided.

**Elective 1 – PMLTEST308A – Perform microscopic examination****Question 1**

Light microscopes are commonly used when examining samples.

Samples visible under a light microscope include

1. algae
2. bacteria
3. protozoa
4. effects of viruses on tissue cells

Complete the table below by placing the number of the sample description next to the appropriate microscope objective lens.

Microscope objective lens	Sample number
40×	
4×	
20×	
Oil immersion	

4 marks

**Question 2**

Some technicians use a microscope to count and assess the viability of mammalian cells in suspension.

- a. What additional item of manual equipment is used to count these cells?

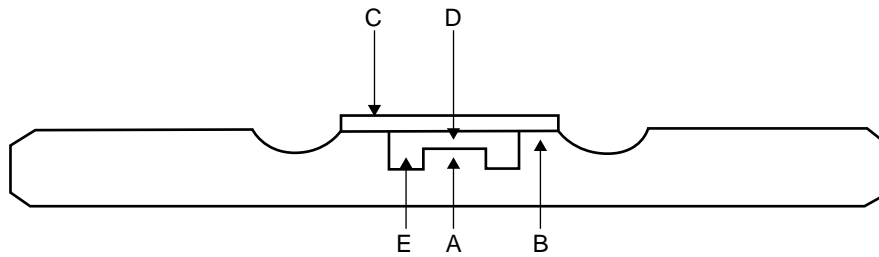
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1 mark

A side or profile view is shown of this cell counting equipment.



- b. List the appropriate term for each part indicated by the letter in the table provided.

A	
B	
C	
D	
E	

5 marks

- c. A technician uses the equipment shown above to count a sample of cell suspension and obtains a value of  $0.15 \times 10^5$  viable (live) cells/ $\mu\text{L}$ . Calculate how many live cells there are in 75 mL of cell suspension if it has been stored correctly.

Show all calculations.

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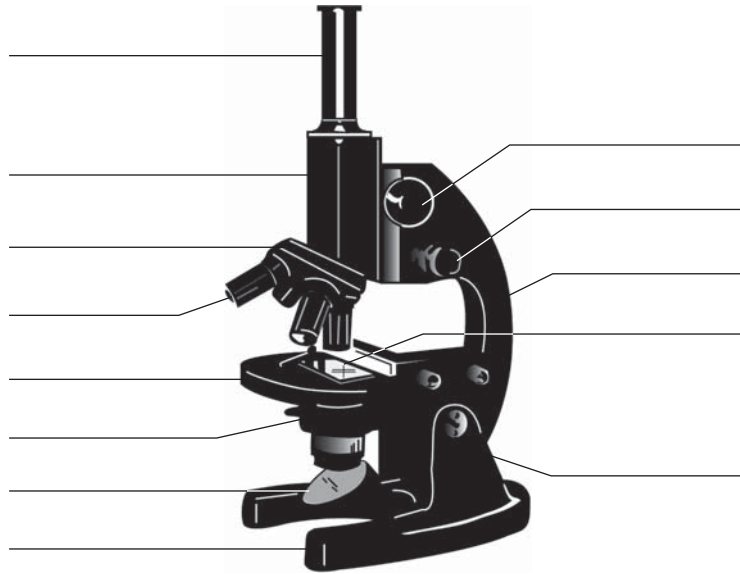
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2 marks

**Question 3**

A schematic diagram of a typical laboratory light microscope is shown below. Label the following components on the diagram.

1. objective
2. mirror
3. coarse focus knob
4. iris diaphragm



4 marks

**Question 4**

Kristie is a laboratory technician in an animal cell culture facility where mammalian cells are incubated in 50 mL flat flasks of sterile liquid media in a 37°C carbon dioxide incubator. If the cell cultures are healthy their media has a clear orange-red appearance and they stick firmly to the bottom of the plastic flasks.

- a. What type of microscope should Kristie use to examine her cell cultures?

\_\_\_\_\_

1 mark

One morning, when Kristie checks the incubator, she notices the outer and the inner glass doors are slightly ajar, some of the flasks have a distinct red cloudy appearance, and some of the cells are floating in the media.

- b. Why should Kristie not proceed with an experiment requiring these cells?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

2 marks

- c. Name the type of microscope and lens Kristie should use to quickly check for any bacterial contamination.

\_\_\_\_\_

1 mark

Total 20 marks

**END OF ELECTIVE 1  
SECTION C – continued  
TURN OVER**

**Elective 2 – PMLTEST409A – Capture and manage scientific images****Question 1**

- a. SLR is an acronym used for describing certain cameras.  
What does 'SLR' stand for?

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1 mark

- b. List three main differences between a digital compact camera and a digital SLR camera.

1. \_\_\_\_\_

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2. \_\_\_\_\_

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3. \_\_\_\_\_

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3 marks

**Question 2**

What effects do the following settings have when producing photographs?

- a. A small aperture (e.g. f/22)

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1 mark

- b. A fast shutter speed (e.g. 1/500 s)

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1 mark

**Question 3**

Forensic crime scene officers are required to record crime scenes. To capture and reproduce images, particular attention must be paid to a number of things.

- a. List three things a forensic crime scene officer would need to record when recording images from a crime scene.

1. \_\_\_\_\_

\_\_\_\_\_

2. \_\_\_\_\_

\_\_\_\_\_

3. \_\_\_\_\_

\_\_\_\_\_

3 marks

Software such as Adobe Photoshop can be of assistance in keeping and managing records of scientific images.

- b. Explain how such an image software program can assist a forensic crime scene officer.

\_\_\_\_\_

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\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

3 marks

- c. Explain what a forensic crime scene officer would need to be aware of when using this software.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

3 marks

**Question 4**

At the scene of a clandestine drug laboratory an officer uncovers solvents in drums.

- a. Explain what the officer should do to protect themselves and the crime scene.

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4 marks

- b. What should be protected first: the crime scene or the officer?

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1 mark

Total 20 marks



### Elective 3 – PMLTEST304B – Prepare culture media

#### Question 1

Jenny needs to prepare a batch of  $50 \times 10$  mL nutrient agar slopes. The standard operating procedure states to add 40 grams of nutrient agar base to 1 litre of water.

- a. Calculate the weight of nutrient agar base required.

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1 mark

- b. Which of the following temperatures is required to ensure the agar is completely dissolved in solution?

Circle the appropriate temperature.      50 °C      100 °C      115 °C      121 °C

1 mark

- c. Steps from the Standard Operating Procedure (SOP) are listed in the table below. Arrange these steps in the correct order from 1–5 (1 being the first step). Note: not all steps of the procedure are listed.

Order 1–5	Procedural steps
1.	weigh and dissolve all ingredients
	place bottles on a sloping rack
	sterilise bottles in a wire basket
	allow to set completely before moving
	dispense in 10 mL volumes

3 marks

- d. Circle the most appropriate container size for these slopes.

10 mL      25 mL      100 mL

1 mark

- e. List two items that should appear on the label.

1. \_\_\_\_\_

\_\_\_\_\_

2. \_\_\_\_\_

\_\_\_\_\_

2 marks

- f. Explain why representative samples are incubated at 37 °C for 48 hours once the medium preparation is completed.

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2 marks

### Question 2

Sarah needs to sterilise some culture medium.

- a. Name a piece of laboratory equipment used to perform this task.

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1 mark

- b. Where in the load should she place the sterilisation indicator?

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1 mark

