VICTORIAN CURRICULUM AND ASSESSMENT AUTHORITY

Victorian Certificate of Education 2014

SUPERVISOR TO ATTACH PROCESSING LABEL HERE

STUDENT NUMBER | | | | | | | | | Letter |

VCE VET LABORATORY SKILLS

Written examination

Wednesday 19 November 2014

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

Section	*Number of questions*	*Number of questions to be answered*	*Number of marks*
A	20	20	20
B	18	18	80
			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 – 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

MSDS is an acronym for

A. medical safety data sheet.
B. material safety data sheet.
C. material scientific data sheet.
D. material safety data specifications.

Question 2

What are 'non-conformances' in laboratory testing procedures?

A. indications that the staff are not competent in applying a procedure
B. wrong results that should never happen in any laboratory
C. test results that occur occasionally and are just accepted
D. test results that need to be noted and re-examined

Question 3

'Flaming' of inoculant loops **must** be done

A. in the biohazard or biosafety cabinet.
B. in a yellow, cool flame to reduce aerosols.
C. from the near end of the wire progressively towards the loop.
D. only after the loop has been dipped in 80% v/v ethanol solution.

Question 4

Laboratory audit systems

A. are rarely conducted as staff may feel threatened.
B. are complex and rigid to ensure they are effective.
C. should be conducted frequently as staff cannot be trusted.
D. can result in improved laboratory performance and operation.

Question 5

Microbiological sampling

A. should always be conducted in the same way to be consistent.
B. will always provide a true and representative assessment of a sample.
C. can be conducted randomly, by judgment, by cluster or systematically.
D. will hardly ever provide a true and representative assessment of a sample.

Question 6

Which glassware should be used to accurately and repeatedly add 6 mL of a solution to a conical flask?

A. a burette
B. a measuring cylinder
C. a 10 mL graduated pipette
D. a 5 mL pipette plus a 1 mL pipette

Question 7

When preparing slides of bacterial culture from patients' samples, a technician should

A. wear a face mask, gloves and goggles.
B. swab all surfaces with 70% w/v ethanol.
C. wash their hands before they open any sample containers.
D. turn on the laminar flow hood and leave it running for five minutes.

Question 8

70% w/v ethanol solution is used in microbiological procedures because

A. modern disinfectants are not as suitable.
B. 95% w/v ethanol does not work as a disinfectant.
C. it is flammable and will help destroy microorganisms.
D. well-established procedures often refer to its use.

Question 9

When preparing a label for a 2 L bottle containing 1 M HCl, what would need to be added?

A. the use-by date
B. the potential uses of the solution
C. the safety alert, 'Do not drink'
D. the manufacturer's name and address

Question 10

Recording data on results sheets

A. eliminates all errors.
B. should be done in pencil so any mistakes can be corrected.
C. assists in the quick and consistent collection of all necessary information.
D. should be done by administrative staff.

Question 11

Resolution of an observed image on a microscope slide refers to the

A. point when the object comes into focus.
B. best lighting achieved by correct alignment of the lenses.
C. highest magnification achieved without loss of focus.
D. minimum distance between two objects that are distinctly separate.

Question 12

When working with hazardous biomaterials, a technician should

A. use a Class II or III biosafety cabinet where possible.

B. use only a Class III biosafety cabinet.

C. work in a laminar flow hood.

D. use a fume cupboard.

Question 13

When should the 'dry' cycle and not the 'wet' cycle on an autoclave be used?

A. according to personal preference

B. if the load contains only glassware

C. if a specific minimum time is required

D. if the load includes some paper-wrapped items

Question 14

A solution with a pH of 7.2 is

A. strongly basic.

B. weakly basic.

C. strongly acidic.

D. weakly acidic.

Question 15

10.0 mL of a 25.0 g/L solution is diluted to 50.0 mL.

What is the concentration of the final solution?

A. 0.5 g/L

B. 5.0 g/L

C. 5.0 mg/L

D. 50.0 mg/L

Question 16

At what temperature should samples of patients' blood be stored, if testing cannot occur immediately?

A. 20 °C

B. –20 °C

C. 4 °C

D. –4 °C

Question 17

Laboratory customers should be assured that

A. results are rarely out of specification.

B. to reduce costs, only the cheapest testing kits are used.

C. the most qualified and experienced staff will perform testing.

D. timely testing of samples will detect out-of-specification results.

Question 18

What mass, in grams, of $MgCl_2$ (molar mass of 95.3 g/mol) is needed to prepare 750 mL of a 2 M solution?

A. 14.30

B. 71.48

C. 142.95

D. 190.60

Question 19

If a technician were examining a slide of sputum at ×1000 (oil) and noticed a small cell that did not contain a nucleus, they might assume the cell was a

A. leucocyte.

B. bacterium.

C. protozoan.

D. fungus.

Question 20

What is one safety check that might be performed before using a microscope?

A. Clean all the lenses with non-scratch lens tissue.

B. Examine the power cord for defects or damage.

C. Swab the benches with 70% w/v ethanol.

D. Ensure all naked flames are turned off.

END OF SECTION A
TURN OVER

SECTION B – Short-answer questions

Instructions for Section B

Answer **all** questions in the spaces provided.

Question 1 (8 marks)

A laboratory technician has recently commenced work at a food-testing laboratory and is required to attend an induction program.

a. What are **three** reasons why a laboratory would conduct an induction program for its new employees? 3 marks

b. During the induction, the term 'right first time' is mentioned.

What does the term 'right first time' mean in a laboratory setting? 1 mark

c. Identify **two** ways in which a technician could reduce the amount of laboratory waste they produce. 2 marks

d. It is a hot day and the air-conditioning is not working. There are a number of distilled-water spray bottles on the bench that are used to make up solutions. A laboratory worker sprays the new technician using one of these bottles.

Suggest **two** actions the new technician should take in this situation. 2 marks

Question 2 (6 marks)

The following signs can be found in and around a laboratory.

a. What does each sign indicate? 3 marks

b. Suggest where in the laboratory each sign could be found. 3 marks

1.

What it indicates _____

Where it is located _____

2.

What it indicates _____

Where it is located _____

3.

What it indicates _____

Where it is located _____

Question 3 (2 marks)

The following is a Standard Operating Procedure (SOP) in a laboratory manual.

> 'To make up 1.0 L of a 1.0 M KCl standard solution, add 1.0 L of distilled water to 74.5 g of KCl.'

a. Why is this procedure incorrect? 1 mark

_____

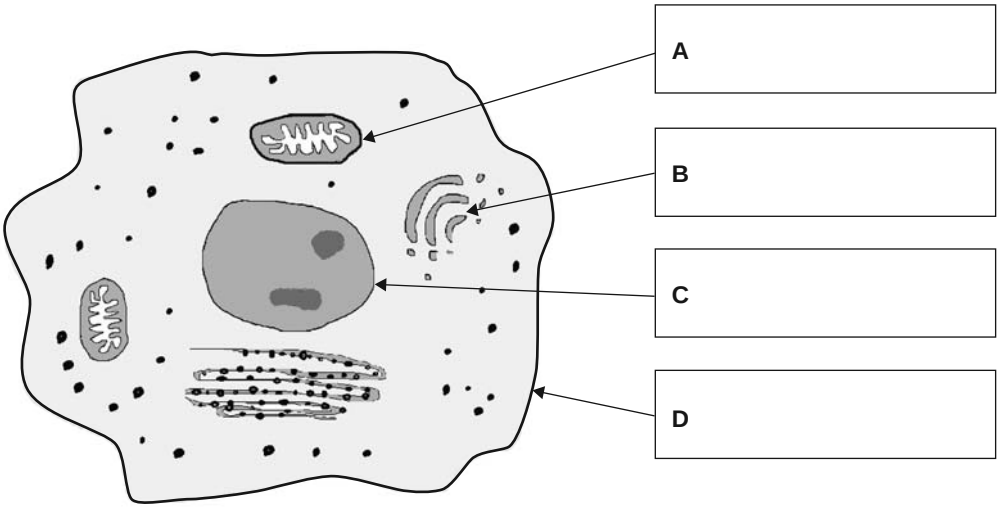
b. Rewrite this procedure so that the solution can be prepared with more accuracy. 1 mark

_____

_____

Question 4 (5 marks)

Label the four structures shown in the diagram below and identify the cell type.



Cell type _____

Question 5 (3 marks)

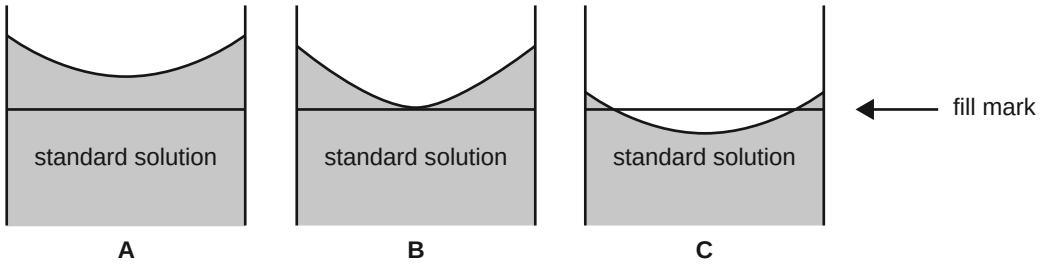
Describe **three** types of information about hazardous chemicals that an MSDS should contain.

Question 6 (2 marks)

How many grams (to one decimal place) of salt (NaCl, molar mass 58.5 g/mol) would you get if you evaporated all of the water from 68.3 mL of a 2.6 M solution? Show all calculations.

Question 7 (3 marks)

A laboratory technician prepares a standard solution in a volumetric flask. The following diagrams show three possible positions for the meniscus.



a. Which diagram shows the correct position of the meniscus? 1 mark

b. For **each** of the diagrams showing the **incorrect** position of the meniscus, what could be done to achieve a correct reading? 2 marks

Question 8 (4 marks)

In a busy haematology laboratory, many samples are prepared each day for testing.

a. Outline **three** types of hazards associated with blood samples and the materials that are used to prepare the samples for testing. 3 marks

_____

_____

_____

b. Choose one type of hazard given in **part a.** and describe an appropriate control measure that should be used to address it. 1 mark

Type of hazard _____

Control measure _____

_____

Question 9 (4 marks)

A laboratory technician is to follow the SOP for testing a food sample.

Describe four key steps that are likely to be listed in the SOP.

1. _____

_____

2. _____

_____

3. _____

_____

4. _____

_____

Question 10 (2 marks)

Sampling for microbiological testing is commonly performed using either of two basic methods:

- swabbing
- press plate or contact plate

Provide a description for each method.

Swabbing _____

_____

_____

Press plate or contact plate _____

_____

_____

Question 11 (4 marks)

A laboratory technician in a chemical testing laboratory is asked to prepare a working solution of a particular buffer A.

a. What is meant by the term 'working solution'? 1 mark

_____

b. Buffer A is usually prepared from the more concentrated solution B.

What term would be used to describe solution B? 1 mark

_____

c. The label on the bottle containing solution B has '×10' printed on it.

What does this indicate? 1 mark

_____

d. How many millilitres of solution B would be required to prepare 250 mL of a working solution of buffer A? 1 mark

_____

Question 12 (8 marks)

A stool sample has arrived at the pathology laboratory and the request slip asks for microscopic examination for parasites or ova to be conducted using a specific staining technique.

The request slip states the following.

Patient name: David Bull	**Age:** 24
Date of birth: 12/3/1990	**Gender:** Male
Type of sample: Stool	**Doctor:** Sally Dodger
Tests requested: Gram stain, modified acid-fast stain	
Collection point: St Able's Hospital	
Laboratory accession number: 132465	

a. What would the first step be when beginning the testing of the stool sample and why? 1 mark

b. The aseptic procedure used to prepare slides for staining has seven essential steps.

Complete the following procedure for preparing a slide for staining by adding the missing five steps. 5 marks

Step 1 *Prepare the work area by collecting all necessary equipment and swabbing the bench with ethanol. Label the slide with the accession number.*

Step 2

Step 3

Step 4

Step 5

Step 6

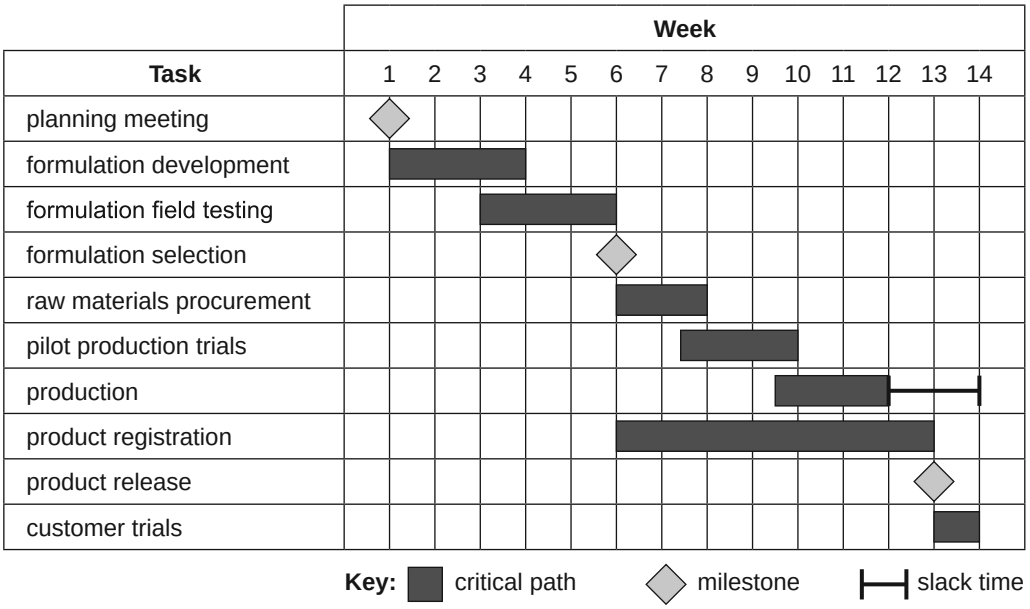
Step 7 *Slowly dry the slide over a Bunsen burner flame then, when dry, heat fix by passing through the flame three times.*

c. The slide is then stained and examined under a light microscope.

Under what magnification should the slide initially be examined? Why would this be the best magnification to use? 2 marks

Question 13 (6 marks)

Consider the following simple Gantt chart used to schedule the development of a new medical treatment product, then answer the questions below.



a. What is the task for the first milestone and when does it occur? 1 mark

b. How many weeks are there between the planning meeting and the start of customer trials? 1 mark

c. How much time has been allocated to critical path tasks? 1 mark

d. Why has slack time been factored into the production task? 1 mark

e. Give **two** reasons why all of the tasks listed in the Gantt chart do not begin at the same time. 2 marks

Question 14 (5 marks)

A technician is required to make 500 mL of 0.05 M glucose (molar mass 180.16 g/mol) solution from a 0.5 M solution.

a. Calculate the volume of 0.5 M glucose needed. Show your working. 2 marks

b. How much distilled water should be added to make the required dilution? 1 mark

c. Identify the glassware needed to prepare the solution. 1 mark

d. After the glucose solution has been prepared, how should the used glassware be cleaned and stored? 1 mark

Question 15 (2 marks)

Identify two main differences between a brightfield microscope and a stereo microscope.

Brightfield microscope	**Stereo microscope**

Question 16 (5 marks)

An important procedure for sterilising equipment and waste from the laboratory involves the use of an autoclave.

a. Identify **three** factors that might determine the effectiveness of sterilisation using an autoclave. 3 marks

_____

_____

_____

b. Outline **two** quality-control checks that could be performed to ensure sterilisation is completed correctly. 2 marks

_____

_____

_____

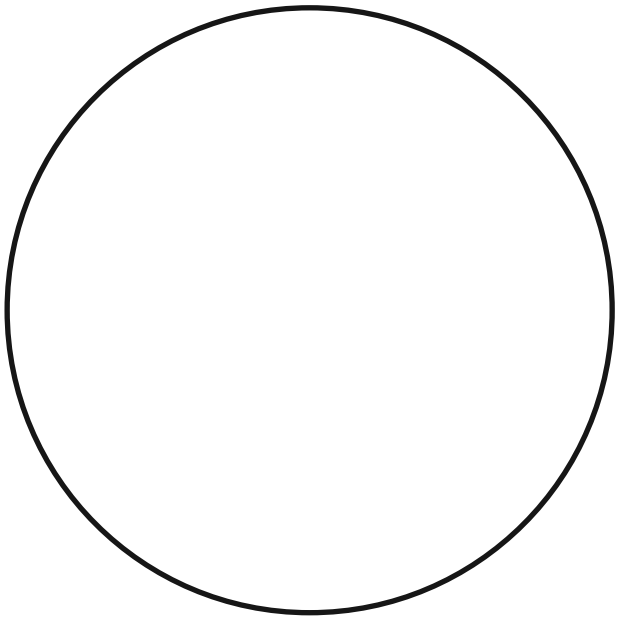
Question 17 (4 marks)

A technician has been asked to subculture a pure bacterial culture from one agar plate to another.

a. Name the procedure used for the isolation of single colonies. 1 mark

_____

b. On the diagram below, draw and label an ideal agar plate and show the location of the culture after 24 hours of incubation time. 2 marks



c. After the incubation period, bacteria had spread all over the plate and no single colonies were visible.

What could be done to improve the technician's technique and results in the future? 1 mark

_____

_____

_____

Question 18 (7 marks)

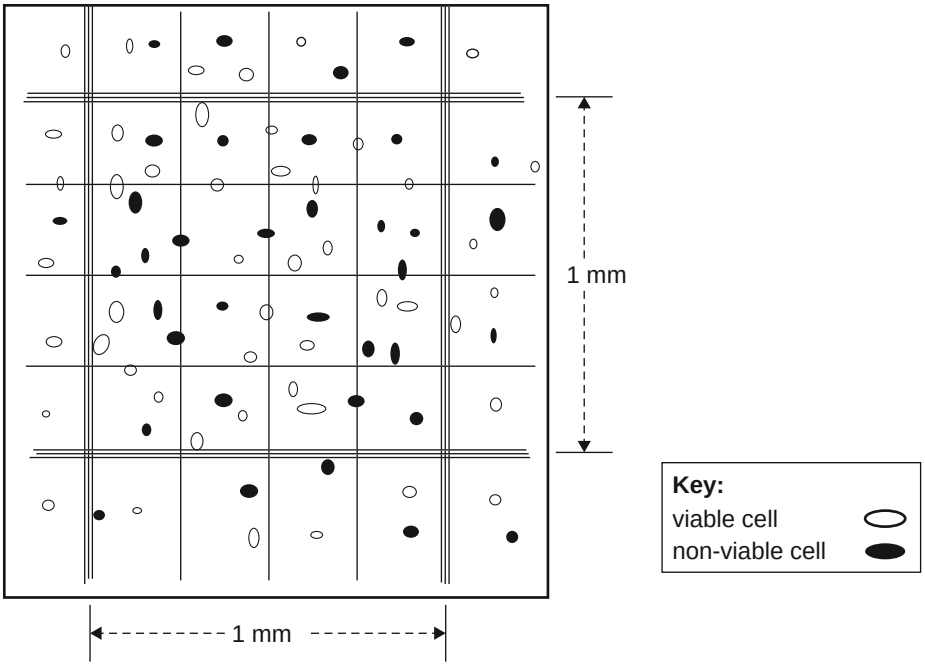
Beer brewers count the density and viability of yeast cells in a culture of yeast to determine if it can be used in the fermentation process. There should be more than 1 million viable cells per millilitre.

a. After a sample has been collected, what **two** pieces of equipment would be needed to conduct such a cell-counting technique? 2 marks

b. What procedure could be used to determine if a yeast cell is viable? 1 mark

c. The diagram below shows the outcome of a viable cell count.

The area of the counting grid is 1 mm × 1 mm and the depth is 0.1 mm. The total volume is 0.0001 mL.



Count the viable cells and estimate the total number of viable cells in 1 mL of cell suspension. Show any calculations and include the units. 2 marks

d. Calculate the percentage of viable yeast cells. Show your working. 1 mark

_____

_____

e. Is it advisable for the brewer to use this culture? Why? 1 mark

_____

END OF QUESTION AND ANSWER BOOK