VICTORIAN CURRICULUM AND ASSESSMENT AUTHORITY

Victorian Certificate of Education 2002

SUPERVISOR TO ATTACH PROCESSING LABEL HERE

STUDENT NUMBER

									Letter
Figures									
Words									

VCE VET LABORATORY SKILLS

Written examination

Friday 1 November 2002

Reading time: 3.00 pm to 3.15 pm (15 minutes)
Writing time: 3.15 pm to 4.45 pm (1 hour 30 minutes)

QUESTION AND ANSWER BOOK

Structure of book

Section	*Number of questions*	*Number of questions to be answered*	*Number of marks*
1 – Core	16	16	30
Section	*Number of electives*	*Number of electives to be answered*	
2 – Electives	3	2	60
			Total 90

- Students are permitted to bring into the examination room: pens, pencils, highlighters, erasers, sharpeners, rulers, an approved graphics calculator (memory cleared) and/or 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 29 pages.

Instructions
- Write your **student number** in the space provided above on this page.
- All written responses must be in English.

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

SECTION 1 – Core units

Instructions for Section 1

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

For Questions 1–10, write the letter of the correct alternative in the box provided.

Question 1

In laboratory testing, quality control

A. is the sole responsibility of the quality officer.

B. means that the same test is carried out on a sample many times.

C. ensures that the final product is consistently of the right standard.

D. refers to tests that are calculated with many decimal places in the result.

1 mark

Question 2

An example of a systematic error would be when a

A. thermometer always reads 1ºC too low.

B. wrong ingredient is added to the test solution.

C. result is incorrectly recorded by the technician.

D. number 9 cannot be read on the digital output on a machine.

1 mark

Question 3

A run chart

A. groups data and displays results as a series of rectangles.

B. records data in order from highest value to lowest value.

C. records data in order from lowest value to highest value.

D. depicts data in chronological order.

1 mark

Question 4

Work team conflict

A. always diminishes the achievements of the group.

B. is a sign of a non-functioning team.

C. can bring positive outcomes.

D. should not be tolerated.

1 mark

Question 5

Work teams are formed because

A. members need each other's skills, knowledge and talents to achieve a goal.

B. members need to showcase their individual achievements.

C. they always save the company money.

D. the members are friendly.

1 mark

Question 6

Which of the following documents would be associated with an instrument's set-up and pre-use checks?

A. manufacturer's sales booklet

B. calibration log

C. results log

D. data log

1 mark

Question 7

When setting up a microscope for use the technician must

A. clean all surfaces with 10% acid.

B. sterilise all parts of the instrument.

C. wash the instrument in warm soapy water.

D. align all parts to ensure a clear pathway for the light.

1 mark

Question 8

A water bath is calibrated using a

A. solution of 10% acid.

B. calibrated thermometer.

C. standard set of weights.

D. standard set of solutions.

1 mark

Question 9

To calibrate a balance correctly a technician must

A. use two different specially prepared weights.

B. make sure the balance was zeroed before use.

C. use a reference balance to check the accuracy.

D. check readings by weighing a set of standard masses.

1 mark

Question 10

Basic maintenance of a pH meter includes

A. washing the pH probe with distilled water.

B. wiping the pH probe with a damp cloth.

C. polishing the outside of the pH meter.

D. sterilising the pH probe.

1 mark

Question 11

The laboratory in which you are working is investigating ways to reduce the amount of energy used. Technicians have been asked to submit two suggestions on how energy can be saved. List two possible suggestions.

i. _____

_____

ii. _____

_____

2 marks

Question 12

A laboratory technician is required to measure the % oxygen concentration of a solution each hour and record the % concentration on a control chart. The % concentration is recorded over a 16-hour period, starting at 6.00 am. The results are shown in Figure 1.

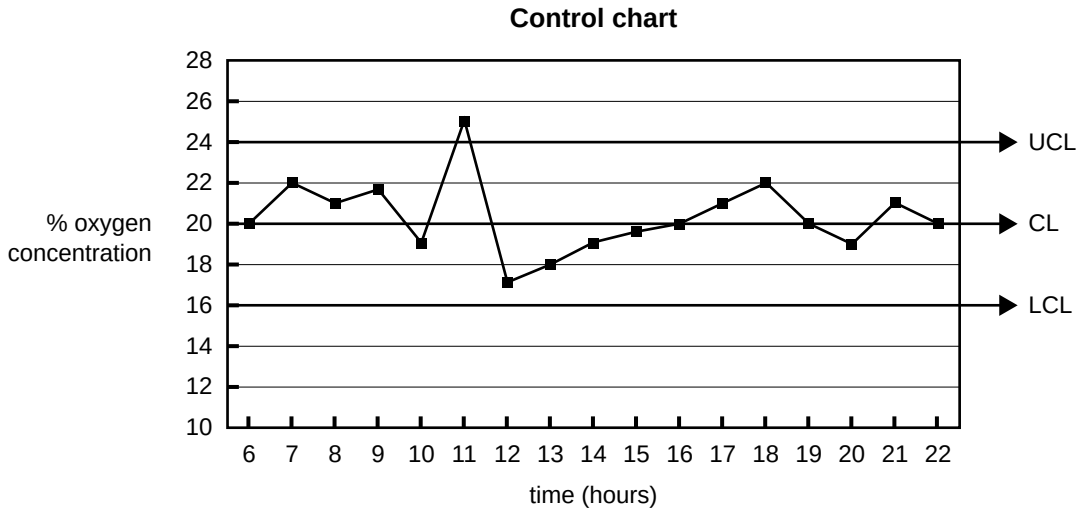


Figure 1

a. Consider the first 8 hours in which the % oxygen concentration was recorded.

Indicate any time(s) when an individual result would have to be rejected.

_____

1 mark

b. **i.** Identify the period from 12.00 midday where the results from the test samples might not be valid.

_____

ii. Give a reason for your answer to part **i.**

_____

iii. Describe one step that could be taken to test the validity of the results for the time period(s).

_____

3 marks

Question 13

When working in teams it is important to respect all individuals, maintain everyone's self esteem and still be able to make a point.

List **two** other communication skills that help team processes.

i. _____

_____

ii. _____

_____

2 marks

Question 14

Negotiation skills are required to resolve conflict within teams and to help reach solutions to problems. Listening without judging is one of these skills.

List **two** other negotiation skills successful team members have.

i. _____

_____

ii. _____

_____

2 marks

Question 15

Laboratories operating quality systems maintain service and calibration schedules for instruments used within the laboratory. The calibration schedule below is for a laboratory operating five days per week in a petrochemical plant. As part of her duties, Sally, the laboratory technician, is responsible for calibration of the instruments. It is Monday 1 July and Sally has commenced her shift.

Calibration schedule

Instrument	Calibration period	Date calibrated			
electronic balance	monthly	16/4	16/5	14/6	
oven	bi-monthly	31/5	14/6	28/6	
thermometer	weekly	10/6	17/6	24/6	

Calendar

June / July						
S	**M**	**T**	**W**	**T**	**F**	**S**
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

a. What is meant by the term calibration?

_____

_____

2 marks

b. Using the information given, consider the month of July.

i. Which instrument would Sally need to calibrate first?

_____

ii. What is the next calibration date for the electronic balance?

_____

iii. How many times would Sally calibrate the thermometer?

_____

3 marks

Question 16

A technician is required to use a benchtop centrifuge.

a. Give **two** examples of start-up procedures for a benchtop centrifuge.

i. _____

_____

ii. _____

_____

2 marks

b. Give **one** example of what might happen if a technician fails to follow a start-up procedure when using equipment.

_____

_____

1 mark

c. An electronic balance is shut down at the end of the day. Give **two** examples of shut-down instructions you should follow for an electronic balance.

i. _____

_____

ii. _____

_____

2 marks

Total 30 marks

END OF SECTION 1

SECTION 2 – Electives

Instructions for Section 2

Section 2 consists of three electives. Complete **two** electives **only**.
Answer **all** questions within the two electives chosen in the spaces provided.

ELECTIVE 1 PMLTEST 300A Perform basic tests

For Questions 1–10, write the letter of the correct alternative in the box provided.

Question 1

Standard personal protective clothing found in general-purpose laboratories would include _____ coats.

A. laboratory

B. plastic

C. lead

1 mark

Question 2

Standard personal protective clothing should include _____ glasses.

A. reading

B. safety

C. magnifying

1 mark

Question 3

An electronic balance is used to measure the _____ of a chemical.

A. mass

B. volume

C. density

1 mark

Question 4

Chemicals should not be added directly to the balance pan because a chemical may _____ the pan.

A. clean

B. colour

C. corrode

1 mark

Question 5

A calculated test result differs greatly from the expected. The technician should firstly _____.

A. collect another sample

B. re-check the calculations

C. repeat the test

1 mark

Question 6

_____ is used to divide a sample into sub samples that are representative of the original material.

A. Quartering

B. Centrifugation

C. Sieving

1 mark

Question 7

Filtration is used to separate an insoluble solid from a liquid. The separated solid is called the _____.

A. filtrate

B. residue

C. mixture

1 mark

Question 8

Volatile liquids should be used in fume hoods to minimise the inhalation of vapours. The use of fume hoods also _____.

A. increases the risk of explosions

B. prevents skin allergies

C. reduces the potential of fires

1 mark

Question 9

Gravimetric tests involve calculating the _____ of a particular substance.

A. colour

B. weight

C. viscosity

1 mark

Question 10

The pH of a solution is a measure of the _____ ion concentration.

A. sodium

B. hydroxyl

C. hydrogen

1 mark

Question 11

Tests involving heating often require the temperature to be recorded. Glass thermometers containing mercury are used in some tests while glass thermometers containing alcohol are used in other tests.

a. What is the advantage of having glass thermometers containing different liquids?

2 marks

A glass thermometer containing mercury is broken and lying on the laboratory bench.

b. What special precautions would you take when disposing of this broken thermometer?

2 marks

c. Name **one** other device that can be used to measure temperature.

1 mark

Question 12

Betty Davis works for Super Safe Laboratories. Betty has been requested to work on the specimen reception desk. She receives six liquid samples from the Going Green Company. The company has requested that the liquid samples be tested for nitrate ion concentration and viscosity. On receipt of the samples, Betty notices that one of the samples has a lid that has not been properly closed and half of the liquid sample has been spilt. She also notices that another sample does not have a label attached to the container holding the liquid. Betty is in a hurry to go on her lunch break and places a label on the unlabelled container. As she collects her lunch from the staffroom fridge she places the six samples in this fridge.

After lunch Betty collects the six samples and takes them to the laboratory for testing. She tests all six samples. After completing both the nitrate ion concentration and viscosity tests she records her results and reports to her supervisor.

a. Betty made at least two mistakes when completing her day's work. Describe two mistakes that Betty made.

i.

ii.

2 marks

b. Consider one of the mistakes that you have mentioned in part **a.** and explain the correct procedure that Betty should have followed at that point.

1 mark

c. What was Betty measuring when completing the viscosity test?

1 mark

Question 13

Cleaning laboratory equipment and the correct disposal of wastes are important tasks. Your supervisor has been called away to a meeting and you are required to clean glassware with which you are unfamiliar.

a. Where could you confirm the laboratory's correct procedure for cleaning the glassware?

1 mark

b. Glassware is usually rinsed in distilled water rather than tap water. Why may this be necessary?

1 mark

c. Chemicals such as strong acids are not to be disposed of via the sink. Give **one** reason why it would be dangerous to pour a concentrated solution of a strong acid down the laboratory sink.

1 mark

Question 14

Albert Johnston is a laboratory technician. One of his tasks is to measure the pH of a large number of samples.

a. Albert must calibrate the pH meter every week. When completing the calibration he must collect buffers.

i. What is a buffer?

ii. What other equipment would Albert need to collect before completing his calibration of the pH meter?

2 + 2 = 4 marks

b. Describe the steps that Albert would take when carrying out pH tests on samples brought into the laboratory.

4 marks

Total 30 marks

ELECTIVE 2 PMLTEST 301A Perform biological laboratory procedures

For Questions 1–10, write the letter of the correct alternative in the box provided.

Question 1

Before microtoming, tissues are embedded in _____ .

A. glass

B. gel

C. wax

1 mark

Question 2

Bacterial cells are classified prokaryotic as they lack a _____ .

A. cell wall

B. nucleus

C. cytosol

1 mark

Question 3

The correct fixative to use on a blood smear would be _____ .

A. water

B. alcohol

C. bleach

1 mark

Question 4

A blood smear is fixed by dipping in fixative for _____ .

A. 30 seconds

B. 5 minutes

C. 30 minutes

1 mark

Question 5

A haematologist would identify a leucocyte by observation of the _____ .

A. chloroplast

B. nucleus

C. starch granules

1 mark

Question 6

A haemocytometer is a chamber regularly used by cell biologists to count different cell types. It consists of _____ counting chambers.

A. one

B. two

C. three

1 mark

Question 7

When using a haemocytometer a small sample is added with a pipette _____ placement of a special coverslip.

A. before

B. during

C. after

1 mark

Question 8

When preparing specimens for microscopic examination it is important to ensure microscope slides are clean and scratch free to reduce the presence of _____ .

A. artefacts

B. monolayers

C. aerosols

1 mark

Question 9

A microscope slide should always be held by the _____ when being cleaned.

A. top

B. bottom

C. edges

1 mark

Question 10

Equipment used in routine preparation of histological samples includes a/an _____ .

A. microtome

B. spectrophotometer

C. electron microscope

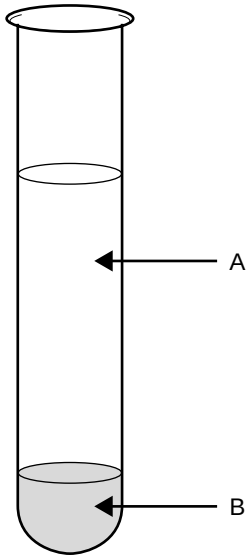
1 mark

CONTINUED OVER PAGE

Question 11

A suspension is spun in a centrifuge and separates as shown in the diagram below.

Name the labelled parts.



A _____

B _____

2 marks

Question 12

Stains are often used on cell and tissue samples before examination under a light microscope.

List **two** reasons for the use of a stain in the preparation of a sample.

i. _____

_____

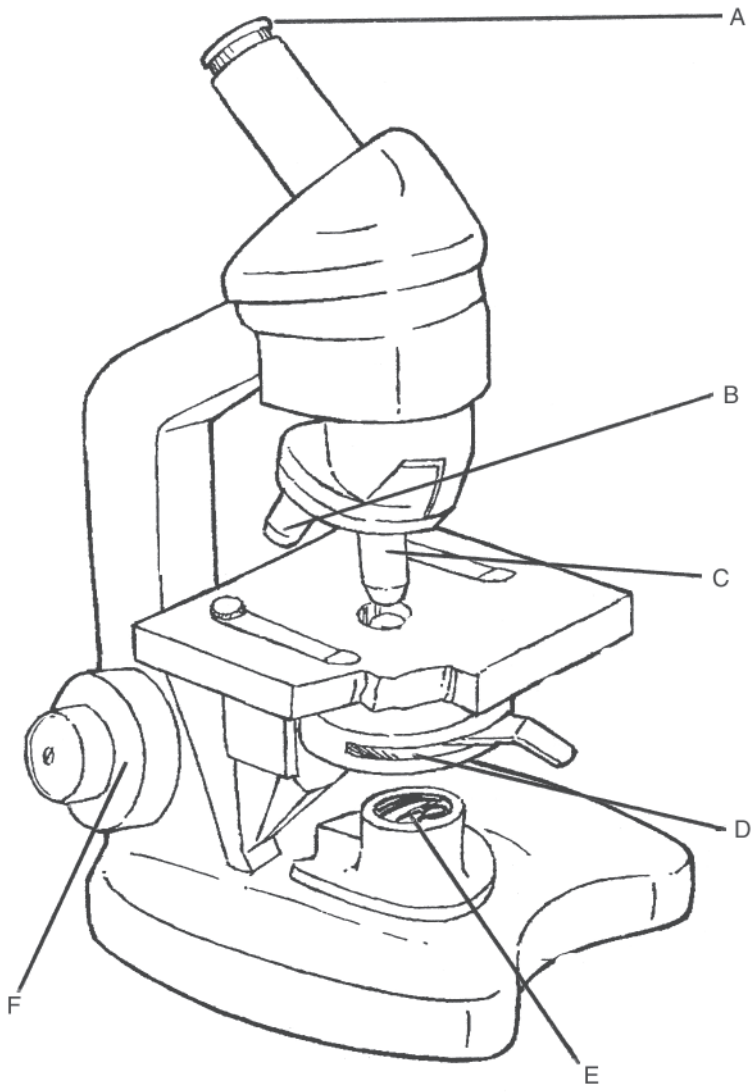
ii. _____

_____

2 marks

Question 13

Name each of the parts of the microscope identified in the diagram.



A _____

B _____

C _____

D _____

E _____

F _____

3 marks

Question 14

Hazardous materials such as formalin, *Staphylococcus aureus*, or concentrated hydrochloric acid, can cause serious injury or illness. The route of exposure is the way such materials enter the body.

a. List **three** common routes of exposure.

i. _____

_____

ii. _____

_____

iii. _____

_____

3 marks

After handling biologically hazardous materials, safety precautions must be followed.

Laura, a technician working in a microbiology laboratory, is plating *E.coli* and it is time to take a lunch break.

b. Name **two** safety precautions she must take before leaving the laboratory.

i. _____

_____

ii. _____

_____

2 marks

Question 15

Anne Doran, the histologist technician in a teaching laboratory, has been asked to prepare some demonstration slides of bacterial cultures for students to examine in a practical class.

a. List the reagents she will use to perform the Gram stain technique for bacteria.

_____

_____

_____

_____

2 marks

b. Describe, with the aid of a diagram, the steps used in the Gram stain technique.

4 marks

Two classifications of bacteria are identified by colour using the Gram stain technique described in **b.** above.

c. Name each of the classification types and state the colour indicated by the Gram stain.

i. Classification type _____

Colour _____

ii. Classification type _____

Colour _____

2 marks

Total 30 marks

End of Elective 2
SECTION 2 – continued
TURN OVER

ELECTIVE 3 PMLTEST 303A Prepare working solutions

For Questions 1–10, write the letter of the correct alternative in the box provided.

Question 1

The amount of solute in a solution is usually measured in _____ .

A. g

B. mL

C. ^{o}C

1 mark

Question 2

The formula _____ is known as the dilution formula because it only applies when a volume of solution is diluted with solvent to make a larger volume of a less concentrated solution.

A. C = Amount of solute ÷ Amount of solution

B. $C_1V_1 = C_2V_2$

C. V = lwd

1 mark

Question 3

Solutions should be discarded _____ .

A. at the end of the year

B. when clear solutions appear cloudy

C. well before the designated storage period

1 mark

Question 4

Secondary standard solutions, such as nitric acid or sodium hydroxide, give an approximate concentration. The true concentration of a secondary standard solution can be determined by accurate _____ .

A. weighing

B. gravimetric analysis

C. titration against a primary solution

1 mark

Question 5

Concentration of a solution can be measured as _____ .

A. volume

B. weight

C. molarity

1 mark

Question 6

MSDS stands for _____ data sheet.

A. materials safety

B. materials standard

C. methods standard

1 mark

Question 7

Some chemicals require special handling. _____ is a chemical which should be handled in a fume hood.

A. Glucose

B. Sodium chloride

C. Xylene

1 mark

Question 8

When labelling a stock solution it would be appropriate to include _____ .

A. date of preparation

B. date of opening

C. date of next use

1 mark

Question 9

Concentrated solutions are usually used to routinely prepare the actual solution required in the laboratory. The concentrated solution is known as the _____ .

A. diluent

B. working solution

C. stock solution

1 mark

Question 10

Reagent solutions are of approximate concentration only and include _____ .

A. detergents

B. standard solutions

C. primary standards

1 mark

Question 11

Reaction of a solution of ammonium chloride with a solution of sodium hydroxide releases a gas, ammonia (NH_3).

List **two** ways a gas can be detected in a laboratory or general working environment.

i. _____

_____

ii. _____

_____

2 marks

Question 12

David Frederick is a technician in an environmental testing laboratory. Each Monday he prepares working solutions for fieldwork conducted later in the week. On a particular Monday he was asked to prepare 100 ml of 1 mg/L lead solution from a 1% lead standard solution.

Draw a labelled diagram to show the steps required in a serial dilution to achieve 100 ml of the 1 mg/L final solution.

2 marks

Question 13

In preparing a % (W/V) solution a laboratory technician mixed a 200.0 ml sample containing 14 g NaCl.

a. Calculate the % (W/V) of the solution.

2 marks

Working with a new solution the technician mixed 0.3 g of Vitamin C, in 1 L of solution. The formula mass of Vitamin C is 176 g.

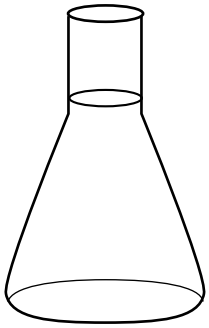
b. What was the final molar concentration of the solution?

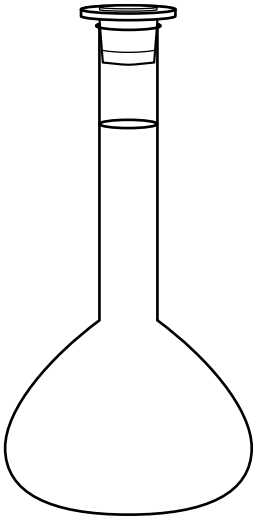
2 marks

Question 14

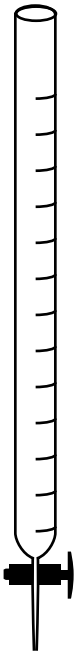
Correct identification, use, cleaning and maintenance of equipment and glassware is important in every laboratory.

Identify each of the following glassware items in the space provided below.





i. _____ **ii.** _____



iii. _____ **iv.** _____

4 marks

Question 15

Than is working in a research laboratory of a large manufacturing company. On a particular day, he is asked to set up a titration of 25 ml of a sulfuric acid (H_2SO_4) solution of unknown concentration.

a. What preparatory steps must be completed before commencing the titration?

2 marks

Than establishes an endpoint of 23.2 mL with 0.1031 M NaOH (sodium hydroxide) using an indicator.

b. What is the function of an indicator?

1 mark

c. Describe the steps required to determine the endpoint, identifying the equipment used.

3 marks

d. Using the chemical equation $H_2SO_4 + 2NaOH \rightarrow Na_2SO_4 + 2H_2O$ and given the number of moles of NaOH is calculated as 2.39×10^{-3} mol

i. calculate the number of moles of H_2SO_4

ii. determine the molar concentration of the H_2SO_4

2 marks

Total 30 marks

END OF QUESTION AND ANSWER BOOK