VICTORIAN CURRICULUM AND ASSESSMENT AUTHORITY

Victorian Certificate of Education 2012

SUPERVISOR TO ATTACH PROCESSING LABEL HERE

STUDENT NUMBER

									Letter
Figures									
Words									

VCE VET LABORATORY SKILLS

Written examination

Monday 5 November 2012

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 18 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

The best way to dispose of microscope slides containing bacterial cultures would be to

A. discard them in the broken-glass bin.
B. place them in the biohazard, sharps waste bin.
C. soak them in detergent before discarding them.
D. autoclave them, then discard in the normal waste.

Question 2

Quality-control procedures applicable to your workplace should

A. be controlled by other organisations.
B. have checklists that monitor processes.
C. be used to evaluate the profit of your organisation.
D. consist of standards imposed by non-regulatory bodies.

Question 3

If a standard operating procedure specified that 12.005 g of solute be dissolved and brought to 1.00 L, what would be the most appropriate piece of equipment to use?

A. volumetric flask
B. graduated beaker
C. graduated pipette
D. top-loading balance

Question 4

Which one of the following is needed to maintain good customer relationships?

A. quality-control procedures
B. internal and external audit procedures
C. consistent provision of quality products and services
D. relevant health, safety and environmental requirements

Question 5

If you examined a prepared slide of muscle tissue, which of the following structures would you observe?

A. chloroplast, nucleus, cell membrane
B. nucleus, cell membrane, large vacuole
C. mitochondria, nucleus, cell membrane
D. cell wall, mitochondria, endoplasmic reticulum

Question 6

The best practice for laboratory glassware is to

A. store it on shelves above head height.

B. use weak acids to clean dirty glassware.

C. store burettes and glass pipettes in drawers.

D. dispose of broken glassware in normal waste.

Question 7

It is good practice to identify and report nonconformances during laboratory work or fieldwork because nonconformances

A. fall within a specific range of values.

B. demonstrate the efficiency of the staff.

C. let you know that something is not quite right.

D. are an unavoidable part of your organisational structure.

Question 8

Water samples for examination by light microscopy have been received by a laboratory at 4.30 pm.

It is too late to prepare the samples to be processed that evening.

The best way to store them for later examination would be to

A. freeze them at –18 °C.

B. incubate them at 36–38 °C.

C. leave them at room temperature.

D. place them in the refrigerator at 4 °C.

Question 9

5.0 mL of a 10.0 g/L solution is diluted to 100 mL.

What is the concentration of the final solution?

A. 0.5 g/L

B. 0.05 g/L

C. 5.0 g/L

D. 5.0 ml/L

Question 10

Which one of the following indicates that a microscope is not fit for use?

A. The stage is too low.

B. The light is very dim.

C. The eyepieces are too close together.

D. The power cord is frayed at the plug.

Question 11

Where should concentrated H_2O_2 (hydrogen peroxide) be stored?

A. in a dark glass bottle under a sink

B. in a clear glass bottle in a refrigerator

C. in a dark plastic bottle in an oxidiser cabinet

D. in a clear plastic bottle in a flammable cabinet

Question 12

Sam was in the field, testing and recording, when he noticed that the instrument was showing abnormal readings.

Which one of the following is a 'right first time' objective?

A. record the readings as per usual

B. pack up and return to the workplace

C. refer to and follow quality procedures

D. discard the readings and try another location

Question 13

Before discarding wastes containing spore-forming bacteria, the wastes should be

A. treated with 0.01% hypochlorite solution.

B. treated with 80% ethanol for several minutes.

C. exposed to ultraviolet light in a biosafety cabinet.

D. autoclaved at the correct temperature and pressure for the required time.

Question 14

How many moles of C_2H_5OH are contained in 287 g of C_2H_5OH (molar mass 46 g)?

A. 0.16 mol

B. 6.24 mol

C. 0.16 $gmol^{-1}$

D. 6.24 $gmol^{-1}$

Question 15

In testing laboratories, microbiological stock cultures are

A. required for future reference purposes.

B. required so that new staff can repeat tests if unsure of results.

C. used only if the laboratory is modern and uses the latest methods.

D. compulsory for most aseptic techniques as there are specific hazards associated with bacteria.

Question 16

A technician has been asked to count the cells in a solution.

In addition to a microscope, what piece of equipment might be used for this task?

A. an eyepiece pointer

B. a welled microscope slide

C. a horizontal scale graticule

D. a haemocytometer or counting chamber

Question 17

The true concentration of a secondary standard solution, such as sodium hydroxide, can be determined by

A. using a pH meter.

B. gravimetric analysis.

C. weighing the sample.

D. titrating against a primary standard.

Question 18

What safety-control measure should a pathology technician take if asked to prepare slides of fresh blood?

A. work in a fume cupboard

B. use gloves and a face shield

C. flame microscope slides in a Bunsen burner

D. wear closed-toe shoes and a leather apron

Question 19

When preparing a sample of marine algae for microscopy, what would happen if distilled water were used instead of sea water?

A. No change would be observed.

B. The cell would swell up and eventually burst.

C. The cell wall would collapse and the cell would fold in on itself.

D. The cell membrane would pull away from the cell wall and the cell would sink internally.

Question 20

Sterilisation of glassware before use is achieved by

A. washing with soap and water.

B. rinsing with an ethanol solution.

C. scrubbing with a brush and detergent.

D. autoclaving at the correct temperature and pressure for the required time.

END OF SECTION A
TURN OVER

SECTION B – Short answer questions

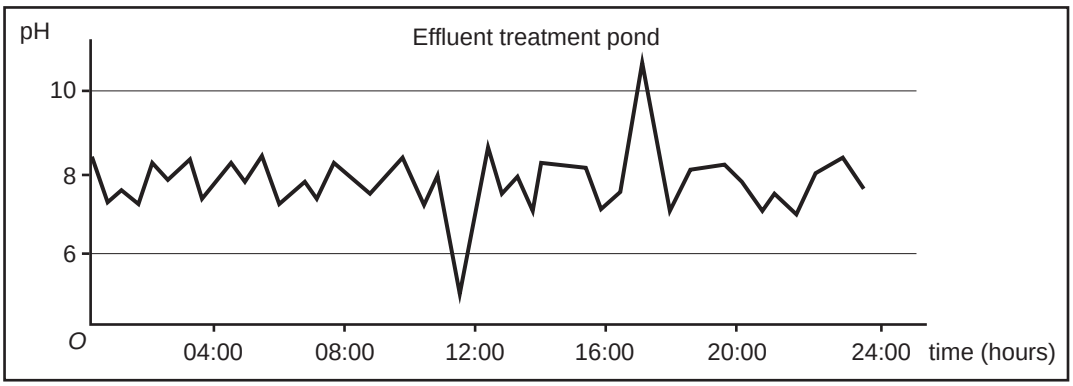
Instructions for Section B

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

Question 1

Process charts are often used in quality systems. Examine the chart below, which includes both upper and lower limits.

Chart 1



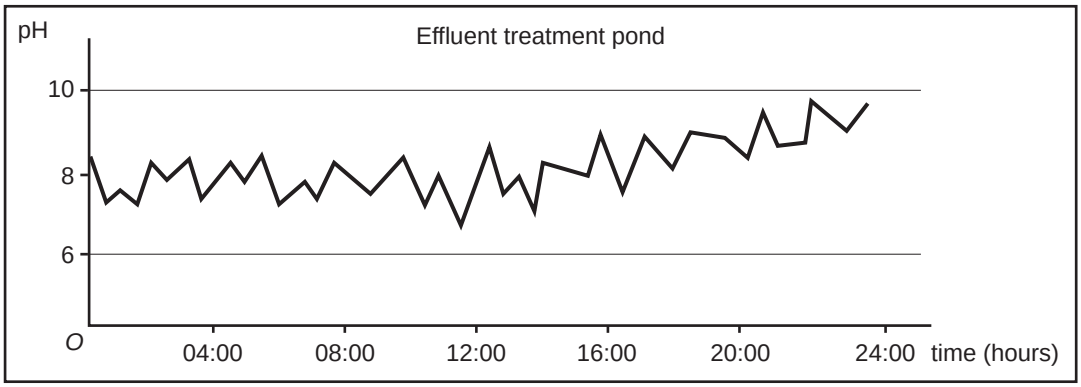
a. What type of process is shown on chart 1?

1 mark

b. State the time(s) when a nonconformance occurred.

1 mark

Chart 2



c. A laboratory technician sometimes needs to add chemicals to the pond.
Examine chart 2 and explain what the response action, if any, would be.

2 marks

Question 2

Kyle is a laboratory assistant. He uses materials, chemicals and laboratory equipment in his job. He also consumes energy and produces waste.

Provide three examples of how he can minimise consumption and/or waste.

1. _____

_____

2. _____

_____

3. _____

_____

3 marks

Question 3

As a laboratory assistant, suggest two ways to further develop workplace skills and job knowledge.

1. _____

_____

2. _____

_____

2 marks

Question 4

A customer complaint has been received regarding the amount of time it takes for a laboratory test result to be processed and results to be provided to the customer.

Discuss **three** approaches that would improve this situation.

_____

_____

_____

_____

_____

_____

_____

_____

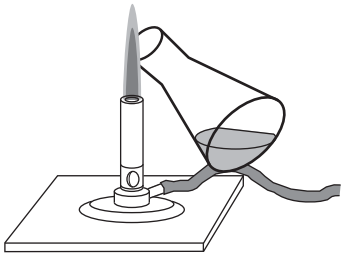
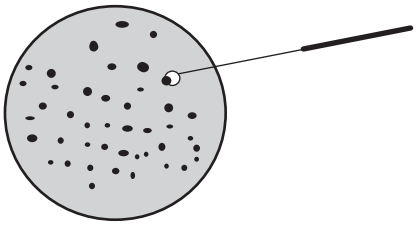
_____

6 marks

Question 5

Aseptic techniques/equipment can involve a range of basic procedures.

Describe the procedures used for each aseptic technique/equipment shown in the table below.

Aseptic technique/equipment	Procedures
	
	
	
	
	

5 marks

Question 6

Explain when each of the following techniques would be applied in a laboratory.

sterilisation

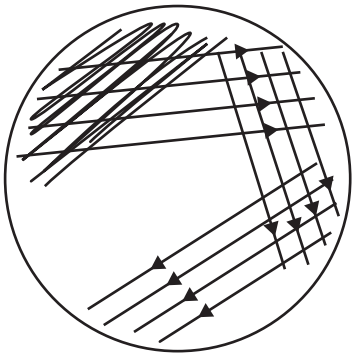
disinfection

sanitation

6 marks

Question 7

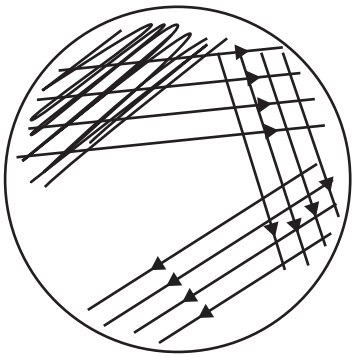
Examine the microbiological agar plate below.



a. Name the common procedure shown in the diagram and explain its purpose.

2 marks

b. Complete the final step in the procedure by drawing on the diagram below.



2 marks

Question 8

Ming is a technician working in a food production routine-testing facility. She has just completed testing production samples. Her supervisor has been called off-site when Ming notices odd results on her previous day's test bacterial agar plates.

Evaluate and comment on the following two separate scenarios.

Scenario 1: Ming cannot contact her supervisor on his mobile phone, so she decides to leave the previous day's samples for her supervisor to see the following day.

Scenario 2: After speaking to her supervisor, Ming decides to dispose of the previous day's samples and records the results. She ensures that the laboratory is left in a clean and tidy state to reduce possible cross-contamination and infection.

6 marks

Question 9

A laboratory technician in a food quality-testing company has received samples of flour for testing. One of the tests requested is 'starch analysis', for which the following standard operating procedure (SOP) is to be followed.

> Prepare a suspension of the wheat flour sample, 1.0 g/25.0 mL distilled water, in a test tube, add a drop or two of iodine stain (0.05 M) and mix thoroughly before observing by light microscope at 400× magnification.
>
> Suspensions should be sampled immediately after mixing, using a dropper, and then smeared on microscope slides before being covered with a cover slip.

a. List two items of equipment (not solutions) that the technician will need to carry out the SOP.

1. _____

2. _____

2 marks

b. The SOP states that the flour sample should be diluted to 1.0 g/25.0 mL.
What is the percentage (w/v%) concentration of the final suspension? Show all calculations.

_____

_____

1 mark

c. The technician is having difficulty focusing at 400× magnification.
Give two possible solutions to obtain a sharper image at 400× magnification.

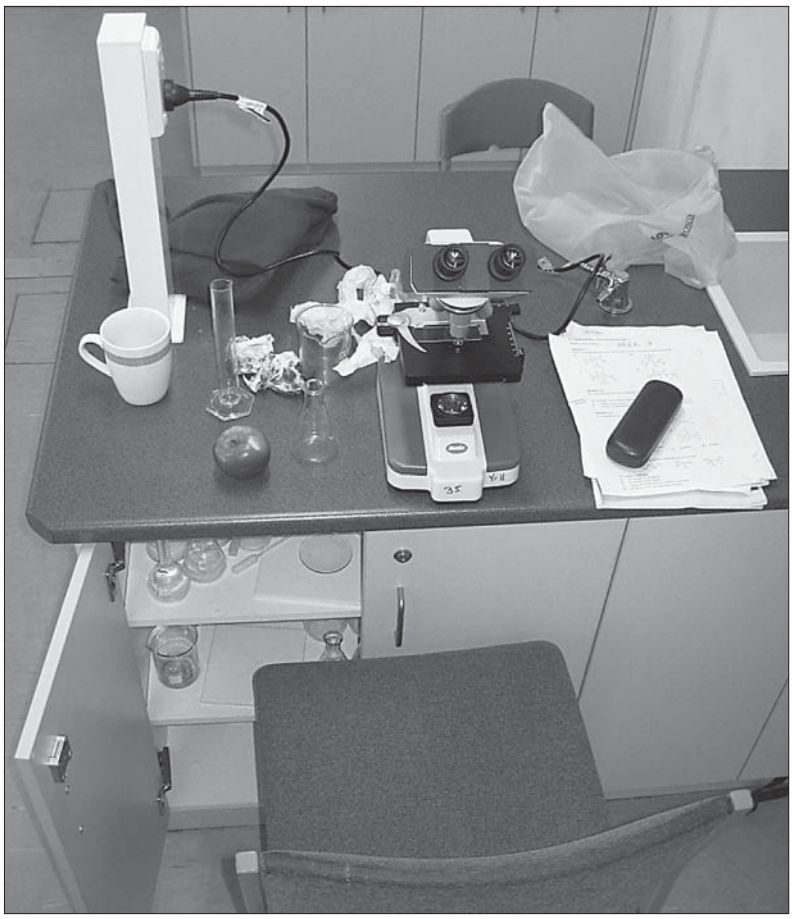
1. _____

2. _____

2 marks

Question 10

Examine the following photograph of a microscope workstation.



List two hazards and explain why each hazard poses a risk to the operator of the microscope.

hazard 1 _____

explanation _____

_____

_____

hazard 2 _____

explanation _____

_____

_____

4 marks

Question 11

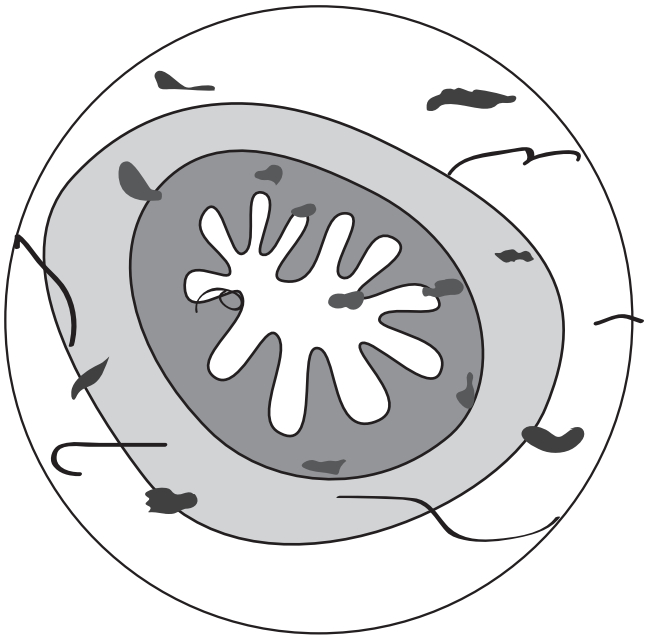
The following samples have been prepared. Suggest the type of microscope and the method of specimen preparation, including the total magnification, that you would use for each.

Sample	Microscope	Method and total magnification used
mineral samples from a quarry		
bacterial culture for identification		
cell cultures in flasks for contamination checks		

6 marks

Question 12

The figure below shows a sectioned small intestine viewed under a light microscope at 40× magnification.



a. Describe the appearance of the slide.

2 marks

b. Suggest how the appearance of the slide can be improved.

_____

_____

_____

2 marks

Question 13

Calculate the pH of 100 mL of a 0.01 M HNO_3 solution, using the equation below (assume complete dissociation).

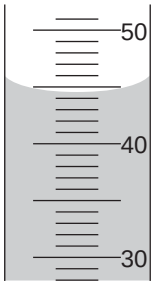
$$pH = -\log_{10} [H_3O^+]$$

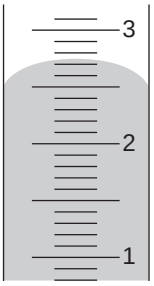
_____

1 mark

Question 14

What are the meniscus readings on the measuring cylinders shown below?





_____ _____

(accurate to one decimal place) (accurate to two decimal places)

2 marks

Question 15

Identify the hazard associated with each safety sign shown below.

_____ _____ _____

3 marks

Question 16

Farid is working as a technical assistant in an industry laboratory. He has to prepare a solution of 0.2 M $KMnO_4$ by diluting a 5.0 M stock solution of $KMnO_4$.

a. Define the term 'stock solution'.

1 mark

b. Farid is required to prepare 500 mL of the 0.2 M solution.
How much of the stock solution is required? Show **all** your calculations.

2 marks

c. Name one piece of glassware that is required to make up the solution.

1 mark

d. Give one piece of information that Farid should add to the label on the solution container.

1 mark

e. How should this solution be stored?

1 mark

Question 17

Thanh is working in the research laboratory of a large manufacturing company. He is asked to perform a titration of 25.00 mL of a sulfuric acid (H_2SO_4) solution of an unknown concentration. He establishes an average end point of 23.20 mL with 0.1031 M NaOH, using a phenolphthalein indicator.

a. List two pieces of equipment that Thanh will need to perform the titration.

1. _____

2. _____

2 marks

b. What is the purpose of the indicator?

_____

1 mark

c. Write a balanced equation for this acid-base reaction.

_____

_____

2 marks

d. Calculate the concentration of the H_2SO_4, showing all calculations.

3 marks

Question 18

MSDS Sodium bicarbonate

Section 1: Product and company identification
MSDS name: sodium bicarbonate solution (1 M)
Synonyms: baking soda, sodium hydrogen carbonate, bicarbonate of soda, monosodium carbonate

Section 9: Physical and chemical properties

Appearance	Clear colourless liquid
pH	14
Specific gravity	1.00 g/mL @ 20 °C
Molecular formula	$NaHCO_3$
Molecular weight	83.995 g/mol

Section 10: Stability and reactivity

Precautions	Avoid heat and moisture
Stability	Stable under normal conditions of use and storage
Incompatibility	Acids, water, carbon dioxide
Shelf life	Fair shelf life, store in a cool, dry environment

Use the Material Safety Data Sheet (MSDS) extract shown above to answer the following questions.

a. Indicate if the solution is acidic or alkaline.

1 mark

b. Calculate the amount of $NaHCO_3$ in 1 L of a 1 M solution. Show all working.

2 marks

c. If a precipitate were discovered in the bottle, should the solution be used? Explain your answer.

2 marks

END OF QUESTION AND ANSWER BOOK