

STUDENT NUMBER Letter

VCE VET LABORATORY SKILLS

Written examination

Wednesday 16 November 2016

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	20	20	20
B	17	17	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 correction fluid/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

While a laboratory technician is checking some microscopes, she notices the tags on the electrical leads are out of date.

What should she do?

- A. Inform the laboratory supervisor.
- B. Replace the microscopes with new ones.
- C. Test the electrical leads herself with a multimeter.
- D. Clean the electrical leads with ethanol to remove any oil.

Question 2

Which one of the following pieces of equipment in a laboratory does **not** regularly require a calibration of temperature check?

- A. drying oven
- B. microwave oven
- C. refrigeration units
- D. autoclave for sterilising

Question 3

When performing an aseptic sampling technique on a dairy food production line, aside from a laboratory coat, what would be the most appropriate protective clothing to use?

- A. a cap for the hair, closed footwear and safety glasses
- B. a cap for the hair, gloves, closed footwear and safety glasses
- C. latex gloves, a face mask, a cap for the hair and safety glasses
- D. a face mask, a cap for the hair, closed footwear, gloves and safety glasses

Question 4

To prepare a solution of approximately 0.1 M sodium hydroxide (NaOH), the relevant standard method is to weigh 2.00 g of NaOH pellets, then

- A. place a 500 mL standard flask in an ice bath, add 200 mL of distilled water and the NaOH pellets, agitate to dissolve, and make up to the mark with distilled water.
- B. add 200 mL of distilled water to a 500 mL standard flask, add the NaOH pellets, dissolve and then make up to the mark with distilled water.
- C. place a 500 mL standard flask in an ice bath, add the NaOH pellets to the flask, then add distilled water and make up to the mark.
- D. place the NaOH pellets in a 500 mL standard flask, dissolve in distilled water and then make up to the mark.

Question 5

The best way to clean and disinfect an inoculating loop before returning it to the equipment store is to

- A. hold the loop in the blue flame of a Bunsen burner until it turns orange.
- B. hold the loop in the yellow part of a Bunsen burner flame for three seconds.
- C. soak the loop in detergent and water before allowing it to dry naturally.
- D. wash the loop in detergent and water, and dry it with a paper towel.

Question 6

What does SOP stand for?

- A. safe operating protocol
- B. safe operating procedure
- C. standard operating protocol
- D. standard operating procedures

Question 7

When performing an aseptic sampling technique on a food sample, the **most** appropriate equipment to use would be a laminar flow cabinet as well as

- A. a Bunsen burner, an inoculant loop, sterile glassware and a growing medium.
- B. ethanol, an inoculant loop, sterile clean glassware and a growing medium.
- C. a Bunsen burner, an inoculant loop, glassware and a growing medium.
- D. a Bunsen burner, an inoculant loop and sterile clean glassware.

Question 8

It is necessary to keep the working area near a microscope clean in order to

- A. create a pleasant work environment.
- B. prevent contamination by oil or dust.
- C. stop a mess being made.
- D. help organise the area.

Question 9

Which of the following organelles are included in a basic animal cell?

- A. cell membrane, chloroplast and mitochondria
- B. cell membrane, nucleus and mitochondria
- C. large vacuole, nucleus and mitochondria
- D. cell wall, nucleus and mitochondria

Question 10

Which of the following would be **least** likely to be included in an employee's company handbook for servicing customer requirements?

- A. making test results readily available when requested, before being approved by a supervisor
- B. following enterprise policy and procedures
- C. working diligently and responsibly
- D. behaving honestly and openly

Question 11

Sterilised saline solutions are used as an emergency eyewash in a laboratory. A sterilised saline solution is made by adding 9.5 g of sodium chloride, NaCl(s), to water and then making the volume up to 100 mL with water.

In addition to the chemical name 'sodium chloride, NaCl(aq)', which one of the following concentrations will the label display?

- A. 0.95% m/v
- B. 9.5% v/v
- C. 9.5% m/v
- D. 95% m/v

Question 12

What is the purpose of swabbing a work surface immediately after cleaning with ethanol?

- A. to maintain sterility
- B. to prevent cross-infection
- C. to prevent cross-contamination
- D. to check for microbiological growth

Question 13

What is the most appropriate way to clean up a microscope immersion oil spill on a laboratory bench?

- A. Wet down with water and wipe up the spill with a paper towel.
- B. Put an acid solution on the oil and wipe up the spill with a paper towel.
- C. Put a strong base solution on the oil and wipe up the spill with a paper towel.
- D. Wet down with a detergent solution and then wipe up the spill with a paper towel.

Question 14

Pyrex glassware would **not** be suitable for which one of the following procedures?

- A. for storing culture media in a cupboard
- B. when heating solutions above a Bunsen burner
- C. for storing strong caustic solutions in a cupboard
- D. when heating solutions by placing them straight onto a hotplate

Question 15

Sustainable energy work practices would **not** include

- A. examining work practices that use excessive electricity.
- B. lifting manually instead of using machines.
- C. switching off equipment when not in use.
- D. minimising process waste.

Question 16

The safest and most appropriate method of handling cool glassware, including flasks, bottles and beakers, is to hold it

- A. by the sides only.
- B. by the sides and the bottom only and not by the top or the rim.
- C. at the top around the rim, while using the other hand to support the bottom.
- D. at the top around the rim of a beaker and around the neck of a bottle and flask.

Question 17

A laboratory technician has the task of cleaning out the chemical storeroom. During this task, he finds a small, sealed bottle. The label on the bottle is hard to read and the technician can understand only a small part of it.

What should he do?

- A. Place the bottle in the chemical rubbish bin.
- B. Tip the contents down the sink so the bottle can be re-used.
- C. Inform the laboratory supervisor and place the bottle in a designated area for safe disposal later.
- D. Obtain a new label, include the information that can be understood and make a logical guess about the rest of the information.

Question 18

Ethanol solution is very useful in the laboratory as a solvent and for cleaning surfaces. A solution of ethanol has a concentration of 10% v/v, but a working solution of 2% v/v is required.

How much water needs to be added to 50 mL of the 10% v/v to make the concentration 2% v/v?

- A. 5 mL
- B. 50 mL
- C. 200 mL
- D. 250 mL

Question 19

A client calls and asks a technician to change some test results as the client believes them to be incorrect. On checking the test results, the technician discovers a transfer error.

What action should the technician take?

- A. Change the test results and reissue the report after checking with the laboratory manager.
- B. Change the test results and reissue the report before checking with the laboratory manager.
- C. Change the test results and reissue the report after checking with a colleague.
- D. Change the test results, reissue the report and apologise to the client.

Question 20

When using glassware, which one of the following factors affects the accuracy of the results?

- A. a chip on the rim of a beaker
- B. a hairline crack on the side of a beaker
- C. a texta mark on the outside of a beaker
- D. a label placed on the outside of a beaker

SECTION B – Short-answer questions**Instructions for Section B**

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

Question 1 (6 marks)

Identify the hazard warning indicated for each of the safety signs below. List the associated personal protective equipment (PPE) that would be required when working with solutions and materials involving each hazard in a laboratory setting.

1.



Hazard warning _____

PPE required _____

2.



Hazard warning _____

PPE required _____

3.



Hazard warning _____

PPE required _____

Question 2 (3 marks)

List three good practices that support a sustainable energy approach in the workplace.

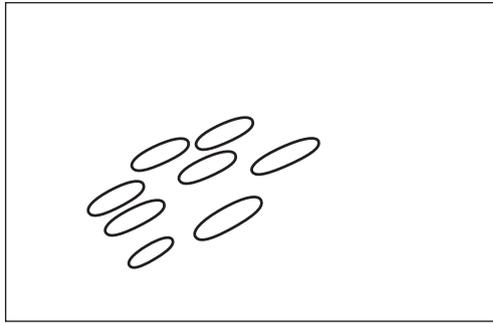
1. _____

2. _____

3. _____

Question 3 (7 marks)

A technician working in a pathology laboratory has been asked to carry out a Gram stain test on a sample suspected to be *Salmonella enterica*. The results seen on the slide are shown below. The results appear pink in colour.



- a. Describe the test results that would be recorded for this slide. 1 mark

- b. Give **two** reasons that explain the test results described in **part a**. 2 marks

- c. There are two colours that indicate the results of a Gram stain test. One of the results is indicated by the colour pink.

Identify the colour of the other result.

1 mark

- d. Explain how the test causes the differences in colour. 3 marks

Question 4 (6 marks)

- a. Explain the difference between cross-infection and cross-contamination. 2 marks

- b. Several samples were accepted by a laboratory for microbiological testing.

Give two techniques that should be used to transfer the samples aseptically in order to prevent cross-contamination. Provide an example for each technique. 4 marks

Technique 1 _____

Example _____

Technique 2 _____

Example _____

Question 5 (3 marks)

- a. Give two reasons for a laboratory technician to have an understanding of the business goals, products and services of the company they work for. 2 marks

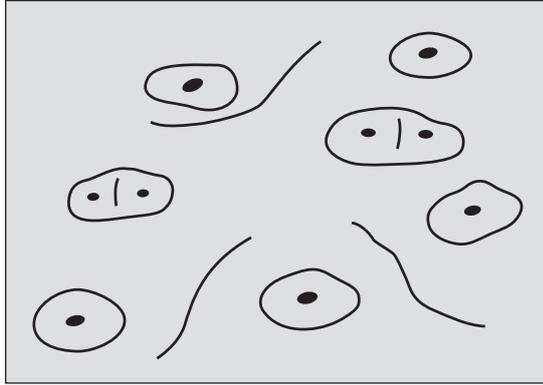
1. _____

2. _____

- b. Give **one** example of how a laboratory technician's suggestions to improve products and services could assist in supporting the company's goals. 1 mark

Question 6 (5 marks)

A laboratory technician has been asked to examine a slide under a microscope. An image of the slide is shown below. The slide shows a sample of animal cells.



- a. Two of these cells look very different from the other five.

Give an explanation of what might be happening to these two cells.

2 marks

- b. What is the biological term for this process?

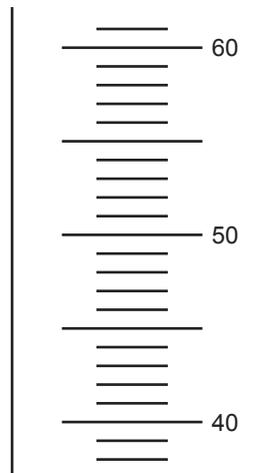
1 mark

- c. Has this slide been contaminated? Give **one** reason for your answer.

2 marks

Question 7 (2 marks)

The diagram below shows a close-up of a section of the side of a 100 mL measuring cylinder. The scale shown on the side of the measuring cylinder is labelled in increments of 10 mL, with smaller increments in between.



- a. A technician uses a measuring cylinder to measure 50 mL of a solution.

On the measuring cylinder above, indicate the position of the meniscus that would give the most accurate reading for 50 mL of a solution.

1 mark

- b. Another technician in the same laboratory has assisted in measuring 50 mL of the same solution in each of four other measuring cylinders. These have been left on the bench, ready to be used in a laboratory procedure.

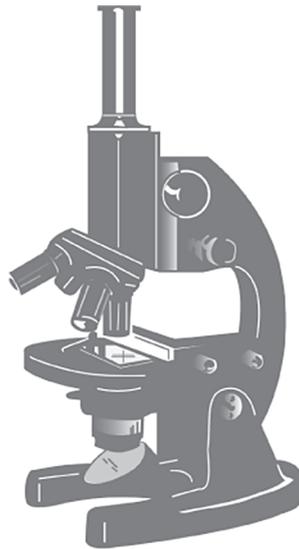
The technician checks these measures before continuing with the procedure and finds that one of the cylinders has 52 mL of the solution.

What should the technician do next?

1 mark

Question 8 (6 marks)

A typical light microscope is shown below.



a. Label the following parts of the light microscope on the diagram above:

- stage
- eyepiece lens
- objective lens
- condenser

4 marks

b. What is the purpose of each of the following parts of the light microscope?

2 marks

- Objective lens _____

- Condenser _____

Question 9 (2 marks)

Describe how the environmental impact of waste generated in a laboratory or production line could be minimised in the workplace. Give **two** examples to support your answer.

Question 10 (5 marks)

The following questions refer to making a primary standard solution of sodium carbonate, Na_2CO_3 .

- a. Give **two** reasons why $\text{Na}_2\text{CO}_3(\text{s})$ is an excellent primary standard. 2 marks

- b. As part of the procedure when making a primary Na_2CO_3 standard solution, the chemical is dried.

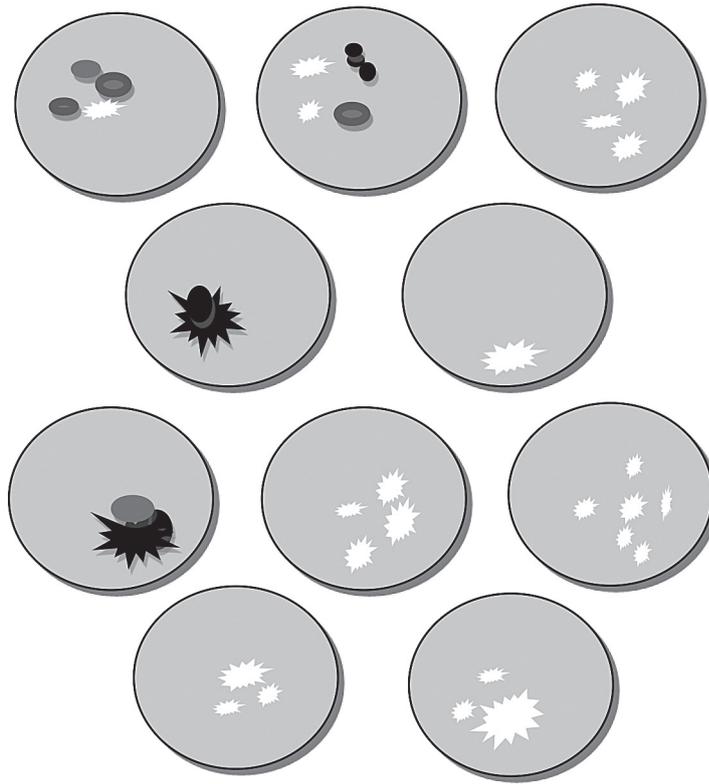
- i. Why is the Na_2CO_3 dried? 1 mark

- ii. What is the optimum temperature at which to dry $\text{Na}_2\text{CO}_3(\text{s})$? 1 mark

- iii. After drying, how would the $\text{Na}_2\text{CO}_3(\text{s})$ be stored to keep it dry? 1 mark

Question 11 (4 marks)

The results on the agar plates below indicate that four out of 10 plates are contaminated.



a. Identify two possible causes of contamination. 2 marks

1. _____

2. _____

b. Apart from swabbing the work surface, suggest **two** ways of applying laboratory practices that would assist in eliminating the causes of contamination identified in **part a.** 2 marks

Question 12 (4 marks)

- a. What is meant by the term ‘sampling plan’ in aseptic analysis? 1 mark

- b. Why is it important to follow a sampling plan? 1 mark

- c. With regard to collecting samples, suggest two places where detailed sampling information can be recorded. 2 marks

1. _____

2. _____

Question 13 (4 marks)

A new logbook needs to be set up for a laboratory’s working solutions. Information about all the solutions must be included in the laboratory logbook.

- a. List two components that must be included in the laboratory logbook for a working solution. 2 marks

1. _____

2. _____

- b. A stock solution of 10 M hydrochloric acid was purchased from the local hardware store.

- i. Where should the container be stored? 1 mark

- ii. What other piece of information from the label must be recorded in the laboratory logbook? (You may **not** use answers from **part a.**) 1 mark

Question 14 (7 marks)

- a. What is a 'control blank' in microbiological analysis and why is it required? 2 marks

- b. Where could the criteria for acceptance of the results from a control blank be found? 1 mark

- c. Some results obtained from a control blank were at the outer limit of the acceptable guidelines.

Suggest two factors that may have resulted in this happening. Explain how each factor would cause the results that were observed. 4 marks

Factor 1 _____

Explanation _____

Factor 2 _____

Explanation _____

Question 15 (4 marks)

Suggest what is commonly treated by each of the following disposal methods.

- Add 0.5% hypochlorite solution.

- Soak in 80% ethanol for five minutes.

- Expose to ultraviolet light in a biosafety cabinet.

- Autoclave at the correct temperature and pressure for the recommended time.

Question 16 (3 marks)

Max is a laboratory assistant who has just returned to work after being on sick leave for a cold. He assumed he would be well enough to return to work, despite his occasional bouts of sneezing. Max has been asked to transfer a client's throat swab samples onto microscope slides.

Max has the working area set up correctly with the appropriate equipment for the procedure. He is also wearing safety clothing, but has forgotten to wear a face mask.

- a. What could happen to the samples on the slides when Max prepares them? 1 mark

- b. Given Max's procedural technique, would the slides still be viable samples? Why? 1 mark

- c. If the samples were not viable, what should be done? 1 mark

Question 17 (9 marks)

During a scheduled check of the laboratory solutions, it is found that the stock solution of 1.00 M sodium hydroxide (NaOH) used for preparing the secondary standard solutions is about to expire.

a. What is meant by the term 'stock solution'?

1 mark

A 1.00 M NaOH solution has been prepared and a technician standardises the solution by titrating 4×20 mL aliquots of 1.00 M potassium hydrogen phthalate ($\text{KC}_8\text{H}_5\text{O}_4$), a primary standard, with the NaOH. NaOH reacts with $\text{KC}_8\text{H}_5\text{O}_4$ in a 1:1 ratio.

The table below shows the results obtained from the titration of the 1.00 M $\text{KC}_8\text{H}_5\text{O}_4$ with the 1.00 M NaOH solution.

Titre number	Titre volume (mL)
1	19.45
2	19.35
3	19.60
4	19.40

b. Calculate the average titre value using concordant titre values. Show your working.

2 marks

- c.** Using the value calculated in **part b.**, determine the concentration, in mol/L, of the NaOH stock solution to three significant figures. Show your working. 3 marks

- d.** The laboratory specifications state that the standard stock solution should be within a range of 5% of the expected value of 1.00 M NaOH.

Would the standard stock solution of NaOH made up by the technician be accepted? Justify your answer using your response to **part c.** 3 marks
