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Write your **student number** in the boxes above. **Letter**

VET Laboratory Skills

Question and Answer Book

VCE Examination – Thursday 13 November 2025

- Reading time is **15 minutes**: 9.00 am to 9.15 am
- Writing time is **1 hour 30 minutes**: 9.15 am to 10.45 am

Approved materials

- One scientific calculator

Materials supplied

- Question and Answer Book of 24 pages
- Multiple-Choice Answer Sheet

Instructions

- Follow the instructions on your Multiple-Choice Answer Sheet.
- At the end of the examination, place your Multiple-Choice Answer Sheet inside the front cover of this Question and Answer Book.

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

Contents

VICTORIAN CURRICULUM AND ASSESSMENT AUTHORITY

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Section A – Multiple-choice questions

Instructions

- Answer **all** questions on your Multiple-Choice Answer Sheet.
- Choose the response that is **correct** or that **best answers** 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

In microbiology, a pure culture can be defined as

A. a laboratory culture that contains a single microbial species.

B. a culture that has not been exposed to the environment.

C. culture media that has been treated so it is completely sterile.

D. a culture that has been transferred aseptically so contamination is minimised.

Question 2

What volume of 4.0 M hydrochloric acid, HCl, solution is required to make 300 mL of 0.25 M HCl?

A. 0.01875 mL

B. 18.75 mL

C. 18.75 L

D. 0.0018 L

Question 3

When sterilising inoculating loops using the flaming technique, which one of the following practices should be avoided?

A. heating the loop until it glows red-hot

B. holding the loop in the flame at a 45° angle

C. quickly placing the loop on the bench within the sterile field

D. touching the loop to the agar media to check if the loop is cool enough

Question 4

Which one of the following actions reduces the chances of a bacterial spill in a laboratory?

A. keeping the work area clean by using paper towel and 70% ethanol

B. working alone to avoid being distracted

C. organising the work area so that all required materials are nearby

D. making sure that the lids of broths are on half circle open when not in use

Question 5

Which one of the following actions usually increases the solubility of a solute in a solvent?

A. increasing the temperature of the solvent

B. adding more solute to the solvent

C. decreasing the temperature of the solvent

D. decreasing the surface area of the solute

Question 6

The most effective way to practise continuous improvement is to

A. focus only on customer satisfaction.

B. make sure materials are never wasted.

C. focus only on the quality of the product.

D. record and report in quality control documents properly.

Question 7

Which one of the following 0.1 M solutions would have the **lowest** pH?

A. H_2SO_4

B. HCOOH

C. $Ba(NO_3)_2$

D. NaOH

Question 8

A laboratory technician is recording temperature readings of a water bath in a logbook.

Which steps should be taken if an error is made while writing down the temperature data?

A. Erase the error and write in the correct information.

B. Ignore the error; it is not likely to matter.

C. Draw a line through the error and write the correct information next to it.

D. Tear the page out and start over.

Question 9

Different types of microorganisms thrive at specific temperature ranges.

Which one of the following statements about microbial temperature preferences is **incorrect**?

A. Mesophiles, including many human pathogens, grow best in moderate temperatures ranging from 20 °C to 45 °C.

B. Psychrophiles always live in environments such as glaciers and sea ice, typically growing in frozen conditions.

C. Hyperthermophiles thrive at extreme temperatures above 80 °C but can also grow and reproduce at temperatures as low as 30 °C.

D. Thermophiles show optimal growth between 45 °C and 80 °C, and are commonly found in hot springs and near deep-sea hydrothermal vents.

Question 10

Which one of the following is **not** a method of sterilisation in a microbiology laboratory?

A. autoclaving at temperatures above 121 °C for 15 to 20 minutes

B. handwashing with soap and water

C. 0.2µ membrane filtration

D. UV radiation for 12 to 24 hours

Question 11

Which one of the following techniques would be used to accurately prepare a working solution of sodium hydroxide of known concentration?

A. evaporation to the required volume

B. filtration to remove contaminants

C. distillation to the required volume

D. titration against a known standard solution

Question 12

Which one of the following statements about microscopy artefacts is correct?

A. It is acceptable to have some air bubbles under the coverslip while observing a sample prepared as a wet mount.

B. Deposits or crystals in some stains should not affect the outcome of microscopic observation.

C. Heat fixing a bacterial sample is recommended to keep the bacteria alive for staining.

D. Incorrect storage of samples will not cause contamination.

Question 13

Which safety label would be required on a bottle of organic waste containing petroleum spirit?

A. flammable

B. radioactive

C. corrosive

D. oxidiser

Question 14

In aseptic workflow, step-by-step procedures are designed to prevent contamination by microorganisms.

What is the last step of an aseptic microbial transfer?

A. recording observations in a logbook or on a computer

B. removing and disposing of contaminated gloves and then washing hands

C. disposing of contaminated media and materials in designated biohazard bins or liquid containers for autoclaving

D. leaving the area immediately to avoid contamination after removing personal protective equipment (PPE)

Question 15

In the context of managing quality in laboratory practice, a SMART objective is one that is

A. Specific, Measurable, Achievable, Realistic, Time-bound.

B. Specific, Measurable, Accurate, Realistic, Time-bound.

C. Specific, Measurable, Accurate, Relevant, Time-bound.

D. Specific, Measurable, Achievable, Relevant, Time-bound.

Question 16

Which one of the following statements regarding samples that are to be examined microscopically with a compound light microscope is correct?

A. Samples should always be diluted before microscopic examination.

B. All types of samples can be examined using a standard compound light microscope.

C. Only living specimens can be viewed using a standard compound light microscope.

D. Type, size and number of cells and presence of contamination can be assessed.

Question 17

When measuring a volume, which one of the following types of laboratory glassware is the most accurate?

A. volumetric flask

B. measuring cylinder

C. conical flask

D. beaker

Question 18

Proper labelling is crucial in aseptic technique to maintain accuracy, safety and traceability.

When labelling microbial samples, it is important to

A. label the lid of the container so it can be identified from above.

B. include the temperature and incubation time on each label.

C. include the sample type, date and initials of the laboratory technician.

D. write the label with a washable marker so it can be removed after the procedure.

Question 19

Which of the numbers below has three significant figures?

A. 0.002223

B. 0.234

C. 27.890

D. 112.3

Question 20

Which one of the following statements is correct when observing yeast cells microscopically with a haemocytometer at a total magnification of 100×?

A. A haemocytometer has one counting chamber only.

B. The total magnification of 100× requires the use of immersion oil.

C. Only one corner square of a haemocytometer chamber is ever counted.

D. If the total magnification is increased to 400×, the yeast cells would appear four times larger.

End of Section A

Section B

Instructions

- Answer **all** questions in the spaces provided.
- Write your responses in English.
- Unless otherwise indicated, the diagrams in this book are **not** drawn to scale.

Question 1 (4 marks)

A laboratory technician is performing chemical tests on water samples following standard operating procedures (SOPs) to ensure consistency and accuracy in all testing. However, the technician uses an expired reagent in error.

a. Why is it important that the technician promptly reports the error? 2 marks

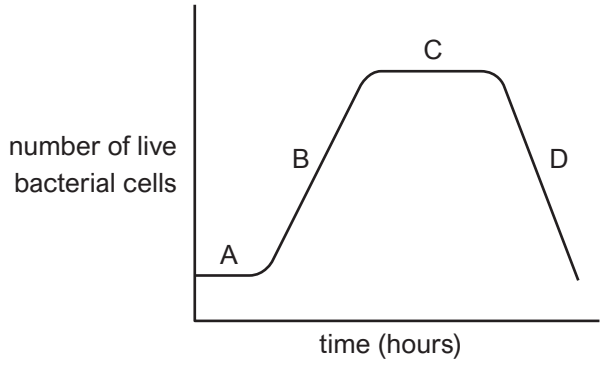
b. After reporting the error, what further corrective action could the laboratory technician take regarding the reagent? 2 marks

Question 2 (2 marks)

Explain the difference between precision and accuracy in the context of a laboratory workplace.

Question 3 (8 marks)

In a closed system such as a laboratory environment, where nutrients are limited and wastes are not removed, bacterial populations typically grow in four phases. The labelled growth curve below shows the number of live bacterial cells in each of the four phases.



a. During the first phase (A) there is no increase in cell numbers.

What is happening to the cells during this phase? 2 marks

b. Describe what is occurring during the second phase (B). 2 marks

c. The third phase (C) appears to show no new cell growth.

Explain what is happening to the bacterial population in this phase. 2 marks

d. During the fourth phase (D) live bacterial cell numbers show a sharp decline.

Describe **two** reasons why this decline occurs. 2 marks

Question 4 (19 marks)

Ash is a new technician in a school laboratory. They have been asked to prepare a 1.00 M solution of zinc sulphate ($ZnSO_4$, molar mass 161.47 g/mol) for a science class, but the senior technician has not arrived yet.

a. List **two** things Ash should do before setting up their work area. 2 marks

b. What mass of $ZnSO_4$ is needed to prepare 2.00 L of the 1.00 M $ZnSO_4$ solution? Show all working including the correct significant figures. 4 marks

c. Convert 1.00 M $ZnSO_4$ into the following alternate concentrations. 2 marks

% w/v _____

ppm (mg/L) _____

Question 4 continues on the next page.

d. When Ash looked in the storage cupboard, they could only find a bottle with the label shown below.

HAZARDS: H302, H318, H410
PRECAUTION: P273, P280, P305 + P351 + P338 + P501

CAS NO: 7446-20-0 FORMULA: $ZnSO_4.7H_2O$

ZINC SULPHATE HEPTAHYDRATE
99.0–102.0%

Source: Adapted from PONG AL.66/Shutterstock.com

Explain what **two** of the safety pictogram symbols on this label indicate. 2 marks

e. What kind of bottle would be used to store a solution of $ZnSO_4.7H_2O$? Give **one** reason for your response. 2 marks

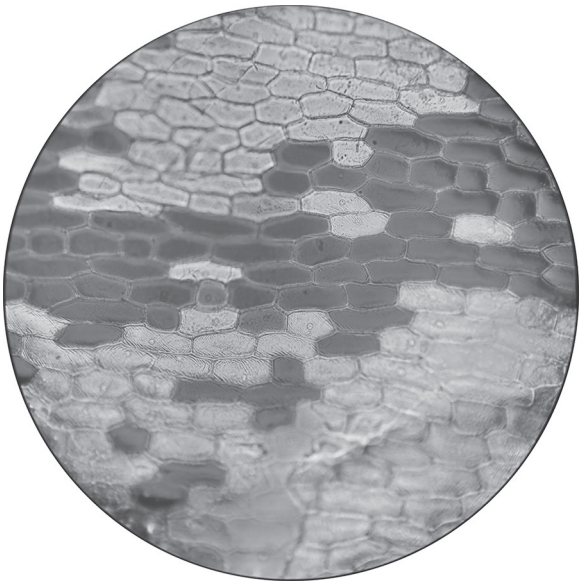
Do not write in this area.

f. Explain whether $ZnSO_4.7H_2O$ can be used to prepare 1.00 M $ZnSO_4$ solution. 3 marks

g. Ash noticed a leak in the $ZnSO_4.7H_2O$ container when they lifted it off the shelf.
Outline **four** steps that they should undertake to clean up the spill. 4 marks

Question 5 (10 marks)

A laboratory technician has prepared a wet mount slide of red onion cells to measure the estimated cell lengths using a compound light microscope. The technician observes the following field of view (FOV) using a total magnification of 100×.



a. Explain why each of the three examples of personal protective equipment (PPE) listed below should be worn when performing this procedure. 3 marks

Laboratory coat _____

_____

Safety glasses _____

_____

Gloves _____

_____

b. If the eyepiece has a 10× magnification, what is the magnification of the microscope's objective lens? 1 mark

_____

c. The diameter of the FOV for total magnifications of 40×, 100× and 400× are shown in the table below.

Total magnification	Diameter of FOV (µm)
40×	4500
100×	2000
400×	500

Going from left to right, calculate the estimated length of one cell in the FOV on page 12 using the formula below. 2 marks

$$\text{cell length} = \frac{\textit{diameter of field of view}}{\textit{number of cells across diameter}}$$

d. Complete the table below by listing two structures of the plant cells observed in the FOV on page 12 and describing their function. 4 marks

Name of structure	Function

Question 6 (11 marks)

Molecular techniques are advanced laboratory methods used to analyse the genetic material of microorganisms. They are used by technicians to rapidly identify specific microorganisms.

a. What are **two** main differences between molecular analysis techniques and traditional microbial techniques? 2 marks

b. Molecular techniques require the use of specialised chemicals.

What is the purpose of using a buffer solution in molecular techniques? 2 marks

c. Molecular analysis techniques can detect microorganisms without the need to grow bacterial cultures.

Give an example and explain why this might be of benefit. 2 marks

d. Preserving the integrity of the samples during processing is crucial when using molecular analysis techniques.

Explain **one** possible consequence of **not** using appropriate aseptic techniques when amplifying nucleic acids. 2 marks

e. A pathology technician has been asked to prepare nucleic acids for amplification in a diagnostic laboratory.

What are **three** aseptic techniques that the technician will need to perform? 3 marks

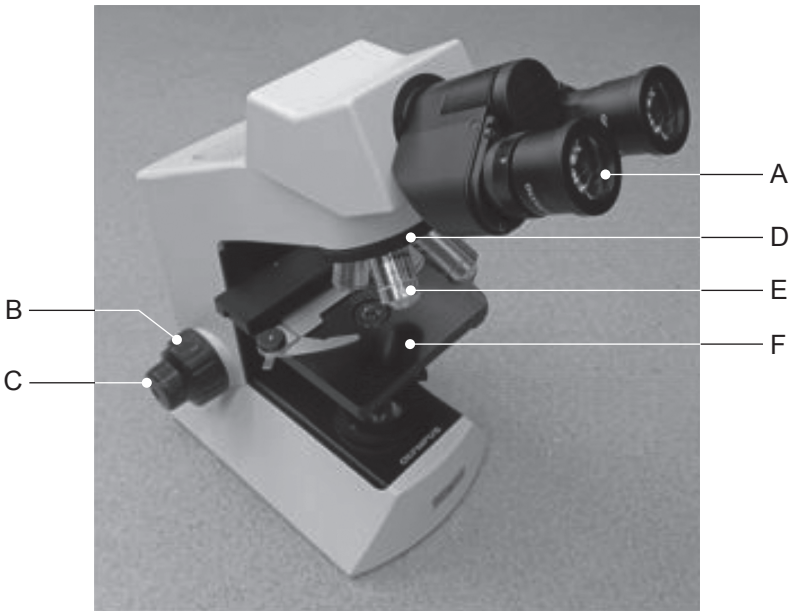
Question 7 (12 marks)

A slide with a smear of pure bacterial culture is Gram stained for examination under a compound light microscope.

a. List three further steps, in addition to the first one shown below, that are required to set up a compound light microscope to observe the Gram-stained slide. 3 marks

Carry the microscope safely to the bench, holding it by the base and stem.

b. A typical compound light microscope is shown below.



Complete the table below by stating the name and function of each part of the compound light microscope labelled A–F in the image. 6 marks

Letter	Name	Function
A		
B		
C		
D		
E		
F		

Question 7 continues on the next page.

c. The Gram-stained slide is examined under the compound light microscope.

i. Explain how the bacterial cells can be viewed with appropriate illumination. 2 marks

ii. How should the slide be positioned on the stage? 1 mark

Question 8 (4 marks)

A laboratory technician has been asked by their supervisor to prepare a batch of 50 nutrient agar plates for a client, to test the agar media for sterility and performance. They must report back to their supervisor after three days.

a. Identify **three** important tasks the laboratory technician should undertake across the course of the three days. 3 marks

b. It is important to maintain the lines of communication in the workplace.

Who is the first person that the laboratory technician should report to when the report has been completed? 1 mark

Question 9 (6 marks)

Match the laboratory terms in the table below with their definitions by writing the correct letter (A.–F.) in the spaces provided. Each letter should be used only once.

A. a solution that is made by diluting a concentrated stock solution for use

B. the substance that is being dissolved

C. the component of a solution present in the largest concentration

D. a very pure substance

E. a substance that has been calibrated against a pure substance

F. a homogenous mixture of two or more substances

Laboratory term	Definition
solvent	
solute	
solution	
primary standard	
working solution	
secondary standard	

Question 10 (4 marks)

SOPs are important documents in laboratory operations.

a. Explain how SOPs are used in a laboratory. 2 marks

b. What are **two** key benefits of implementing SOPs in a laboratory? 2 marks

End of examination questions

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