2022 VCE VET Laboratory Skills external assessment report

General comments

The 2022 written examination contained questions covering content from the following four units of competency:

* MSL933006 Contribute to the achievement of quality objectives
* MSL973014 Prepare working solutions
* MSL973061 Perform aseptic techniques
* MSL973019 Perform microscopic examination.

Overall, students demonstrated a good understanding of the techniques required when working in a laboratory but were not as competent with practical set-up, cleaning of spills and waste disposal. These tasks are an important part of the laboratory skills course and need to receive as much emphasis as the techniques themselves.

Students would find a knowledge of quality systems in laboratories helpful, including the quality manual, non-conformance identification and equipment calibration procedures. Many students confused a laboratory quality manual with a laboratory work health and safety (WHS) manual.

Students needed to know the difference between the terms ‘accuracy’ and ‘precision’. Accuracy means closeness to the true value and precision refers to how close measurements of the same item are to each other. Precision is independent of accuracy but many students used these terms as one and the same.

Students should review the use of microscopes in the laboratory, in particular the magnifications of objective lenses and their use in identification of cell types.

There is still some confusion about the term ‘SDS’ (safety data sheet). A number of responses referred to an MSDS (material safety data sheet) but this term has been replaced by SDS and so should not still be in use.

Specific information

Note: This report provides sample answers or an indication of what answers may have included. Unless otherwise stated, these are not intended to be exemplary or complete responses.

The statistics in this report may be subject to rounding resulting in a total more or less than 100 per cent.

Section A – Multiple-choice questions

| Question | Correct answer | % A | % B | % C | % D | Comments |
| --- | --- | --- | --- | --- | --- | --- |
| 1 | A | 67 | 11 | 11 | 11 |  |
| 2 | D | 7 | 13 | 3 | 76 |  |
| 3 | A | 58 | 18 | 12 | 11 | The photograph shows the objective lenses placed under the stage which indicates an inverted microscope. |
| 4 | B | 15 | 76 | 4 | 5 |  |
| 5 | A | 60 | 8 | 23 | 8 |  |
| 6 | C | 30 | 33 | 31 | 4 | Students needed to select the most correct answer. Answers students gave were spread across options A, B and C. Option B was not a preferred choice – the results a client expects and the actual results of testing may still differ, even if standard operating procedures (SOPs) are followed correctly. Data transcription errors (Option A) occur when an accidental mistake is made when recording information. Following a SOP will not ensure human error does not happen. If all staff are following the same SOPs, everyone is contributing to a streamlined process. |
| 7 | C | 4 | 1 | 94 | 0 |  |
| 8 | D | 11 | 20 | 33 | 37 | The key to this question was the fact the clients expect same-day results and the practice must be sustainable. A full machine load in Option D was the most sustainable option. Option B did not mention sample numbers so may not be sustainable.  Option C, batching samples and reporting results the next day, did not have the desired outcome of same-day results for the customer. |
| 9 | B | 6 | 68 | 5 | 20 | Option D was incorrect as SDS are only required for hazardous products and food samples are made of ingredients generally regarded as safe. |
| 10 | C | 15 | 10 | 54 | 20 | While most students understood having a particle inside the pipette bulb would take up volume so the amount delivered by the pipette would be less, there was confusion between the words ‘accuracy’ and ‘precision’. Accuracy is how close the volume is to the true value, while precision is the closeness of two or more measurements to each other. The stem of the question noted the pipette had been used several times, which indicates precision is the term required. |
| 11 | B | 3 | 93 | 2 | 0 |  |
| 12 | B | 5 | 26 | 57 | 11 | Many students incorrectly selected Option C, perhaps because it was the only option mentioning heat gloves. Fume cupboards are used to remove volatile and hazardous chemicals from the workspace. As glucose is a non-hazardous material, it is not correct to use a fume cupboard for this experiment. The hazard is the heat from the crucible, not fumes from the combustion of glucose. |
| 13 | A | 81 | 8 | 7 | 3 |  |
| 14 | A | 51 | 24 | 10 | 14 | An acid or base indicator will give a colour change reaction as the pH alters. Option A was the most correct answer as it referred to identification of the reaction end-point, which is a key part of a titration experiment. A common application of indicators is for the detection of end points in titrations. |
| 15 | D | 1 | 2 | 1 | 95 |  |
| 16 | D | 12 | 1 | 2 | 84 |  |
| 17 | D | 9 | 11 | 22 | 58 | A 0.5 M solution has a concentration of 0.5 M per litre. This gives a concentration of 0.1 M in 200 mL. 0.1 M × 56.11 (MW) = mass. Mass = 5.6 g. |
| 18 | C | 13 | 10 | 61 | 15 | The correct answer was calculated by dividing the original concentration by 2 and then by 2 again for the second dilution. |
| 19 | B | 6 | 34 | 27 | 33 | An agar slope is used for maintaining reference cultures as it has a smaller surface area to volume ratio than an agar plate and also a firm lid. These factors allow for longer-term storage by reducing potential contamination. Option C was not correct as the small surface area of the slope would not allow isolation of single colonies. Inoculation of the slope was from the base upwards and this results in a gradual decrease in bacteria over the slope surface during inoculation, ruling out Option D. |
| 20 | D | 1 | 14 | 11 | 73 |  |

Section B

Question 1a.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Mark | 0 | 1 | 2 | 3 | Average |
| % | 0 | 0 | 0 | 100 | 3 |

The intention of this question was to assess if students could interpret a balanced equation and calculate a mass given the values for concentration M (moles/litre) and molar mass.

The concentration of glycolic acid (M) was missing from the question stem. To avoid disadvantage, all students were given three marks for this question as no answer was possible with the given information.

Question 1b.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mark | 0 | 1 | 2 | Average |
| % | 40 | 50 | 10 | 0.7 |

Correct answers included any two of:

* locate and use the laboratory spill kit
* dilute with water, mop up with paper towel, dispose in general waste bin
* neutralise with another powdered base (for example, sodium bicarbonate, potassium carbonate)
* cover with paper towel, mop up and collect material in a bag for disposal.

It is important for students to familiarise themselves with waste disposal and spill clean-up techniques in a laboratory. Students need to have ‘hands-on’ practice cleaning up after laboratory tasks to become familiar with the process.

Question 2

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Mark | 0 | 1 | 2 | 3 | 4 | Average |
| % | 2 | 17 | 36 | 35 | 10 | 2.4 |

In the stem of the question the missing steps were to include preparation and completion of the transfer. Two marks were awarded for sample preparation and two marks for completion of transfer.

* Step 1: Given in question
* Step 2: Label plates before starting work with relevant information such as sample ID, analyst and date.
* Step 3: Collect the required materials, loops, agar plates, samples.
* Step 4: Light Bunsen burner (blue flame) and sterilise loops.
* Step 5: Dip loops into sample and inoculate agar plates using streak dilution.

In any microbiological transfer, it is important to label the agar plates prior to commencing the task. Many students missed the preparation steps and went straight into describing the transfer in more detail.

Question 3a.

|  |  |  |  |
| --- | --- | --- | --- |
| Mark | 0 | 1 | Average |
| % | 23 | 77 | 0.8 |

Most students successfully identified the plant cell.

Question 3b.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Mark | 0 | 1 | 2 | 3 | 4 | Average |
| % | 3 | 23 | 24 | 16 | 34 | 2.6 |

An example of a correct response is:

* Label A Mitochondria
* Label B Vacuole
* Label C Chloroplast
* Label D Cell wall.

Most students could identify the cell wall but found the organelles more difficult to name.

Question 4a.

|  |  |  |  |
| --- | --- | --- | --- |
| Mark | 0 | 1 | Average |
| % | 49 | 51 | 0.5 |

The correct answer was serial dilution. Not all students were familiar with this term. It is important that students are aware that serial dilution is the stepwise dilution of a substance in a solution in which the concentration decreases by the same factor each time.

Question 4b.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mark | 0 | 1 | 2 | Average |
| % | 46 | 28 | 26 | 0.8 |

Correct responses mentioned why replicates were recommended and the effect on the test results from the following:

* to estimate precision or repeatability – by repeating an experiment the reliability of the results are increased as the variability of results can be observed
* replicate results make it easier to identify and remove any outliers, giving a more accurate result.

It is important for students to understand the application of precision and accuracy in laboratories.

‘Precision’/‘repeatability’ were the preferred quality terms to be used in this question as the tests were assayed in duplicate or triplicate. It was important for the students to be able to discriminate between the terms ‘precision’ and ‘accuracy’ and not use the words interchangeably. No marks were given when accuracy and precision were used in an answer with no distinction.

Question 4c.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mark | 0 | 1 | 2 | Average |
| % | 58 | 40 | 2 | 0.5 |

An example of a correct response is:

* Dilute the sample with deionised water.
* Give an example of the dilution required (for example, 1 to 3 or 1 to 4 dilution).

Many students were not able to determine that a sample with a reading that was too high for the range of standards would need to be diluted, and many who did suggest dilution did not give an example.

Question 4d.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mark | 0 | 1 | 2 | Average |
| % | 22 | 30 | 48 | 1.3 |

Correct responses mentioned a source of error and how that error would affect the test results from the following:

* Pipetting techniques – incorrect sample volumes lead to inaccurate results.
* Imprecise volumes of Reagent A and B – colour change variation – inaccurate results.
* Foaming occurring in well due to poor technique – bubbles affect reading in spectrophotometer – accuracy is affected.
* Did not follow SOP correctly/missed step – accuracy affected.
* Incubation at 37 degrees Celsius for 30 minutes was not maintained. Reaction may be incomplete, which will result in inaccurate readings.

Question 4e.

|  |  |  |  |
| --- | --- | --- | --- |
| Mark | 0 | 1 | Average |
| % | 72 | 28 | 0.3 |

The correct answer was one of:

* Neutralise the pH with a base and flush down the laboratory sink with copious tap water. NH4CL is weakly acidic so neutralisation with an acid was not correct.
* Dilute with copious water and flush down laboratory sink.

NH4CL is not a harmful chemical and is not toxic or corrosive. In addition it was used in small quantities and already dilute so hazardous waste disposal techniques were not accepted. Students should be aware that it is expensive to dispose of chemical waste products using an external provider and if the chemicals are only a low grade of hazard, it is not warranted commercially.

Some students confused the chemical assay for a microbiological assay and incorrectly suggested biohazard waste disposal procedures.

Question 5a.

|  |  |  |  |
| --- | --- | --- | --- |
| Mark | 0 | 1 | Average |
| % | 38 | 62 | 0.6 |

The correct answer was streak dilution or streak plate.

Question 5bi.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mark | 0 | 1 | 2 | Average |
| % | 44 | 22 | 34 | 0.9 |

The correct answer was any two of:

* correct streak pattern
* parallel sets of streaks
* prime inoculum at the start of the streak
* single colonies at the end of the streak pattern.

Question 5bii.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Mark | 0 | 1 | 2 | 3 | Average |
| % | 23 | 24 | 32 | 21 | 1.5 |

The correct answer was any three of:

* primary inoculum
* parallel streaks
* single isolated colonies
* no contamination
* no streaking back into prime inoculum or other sets of streaks
* no dredging of agar
* plate labelled with initials, date and sample identification.

A close-up of a petri dish

Description automatically generatedStudents needed to label the diagram as instructed in the question with a line/arrow pointing to the feature, as per the following example.

Question 5c.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mark | 0 | 1 | 2 | Average |
| % | 48 | 16 | 36 | 0.9 |

Correct responses mentioned the modification and explanation of how this reduced the bacteria levels.

* Flame loop between each set of streaks, which would reduce the amount of inoculum applied to the plate.
* Use less inoculum for primary inoculation, which would reduce the number of bacteria on the plate surface.
* Ensuring parallel streaks do not cross over, which reduces the number of bacteria picked up by the loop and transferred across the plate.
* Plate not dried before procedure, causing bacteria to spread over the liquid surface of the plate.

Question 5d.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mark | 0 | 1 | 2 | Average |
| % | 29 | 46 | 25 | 1.0 |

Correct responses included the following.

Method 1

Advantage

* Waste can be dealt with onsite and can be regularly removed as it is generated.
* Once waste is sterilised, it reduces the risk of biohazardous waste storage.
* A number of culture plates can be handled at once.

Method 2

Advantage

* Biohazardous waste is taken offsite so reduces risks to staff.
* Less staff handling and time spent removing waste.
* Do not need to maintain specialised autoclave equipment.

Answers describing external biological waste disposal companies as more cost-effective could not be accepted as this is a subjective opinion.

Question 6a.

|  |  |  |  |
| --- | --- | --- | --- |
| Mark | 0 | 1 | Average |
| % | 37 | 63 | 0.7 |

The correct answer was solvent.

Question 6b.

|  |  |  |  |
| --- | --- | --- | --- |
| Mark | 0 | 1 | Average |
| % | 88 | 12 | 0.1 |

CuSO4 is an inorganic compound so it is highly soluble in water and not organic solutions. Ethanol has covalent bonds and does not dissolve ionic compounds like CuSO4 well.

Many students incorrectly suggested that ethanol is non-polar and CuSO4 is polar. Ethanol is a polar molecule due to its hydroxyl group −(OH). Students had difficulties with the theory of chemicals dissolving in liquids.

Question 6c.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mark | 0 | 1 | 2 | Average |
| % | 83 | 5 | 12 | 0.3 |

The correct answer was calculated using the knowledge that ppm = mg/L. The question gave the concentration in g/L. So 15.906 g × 1000/L = 15906 mg/L = 15906 ppm.

Parts per million (ppm) is an important abbreviation in solution preparation and students should be aware that it is also expressed as mg/L.

Question 6d.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mark | 0 | 1 | 2 | Average |
| % | 47 | 16 | 37 | 0.9 |

Correct responses mentioned how to increase solubility and explained why increasing the temperature of the solution / stirring the solution would increase the movement of the particles in the solution and break down the bonds more readily.

Question 6e.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mark | 0 | 1 | 2 | Average |
| % | 3 | 13 | 84 | 1.8 |

Correct responses mentioned the name of the document and the information provided.

* SDS (safety data sheet) and any of safe handling, storage, hazard information, disposal information.
* SOP and any of safe handling, disposal information, method of preparation, hazard control.

The term MSDS (material safety data sheet) has been changed to SDS. It is important that MSDS is no longer used, to reflect current industry standards.

Question 6f.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mark | 0 | 1 | 2 | Average |
| % | 37 | 28 | 35 | 1.0 |

Correct responses mentioned a safety precaution and why this precaution should be applied.

* Wear a laboratory coat to protect the technician from irritation due to splashes on the skin.
* Wear safety glasses / eye protection to protect the technician from splashing CuSO4 in the eye.
* Dispose of waste CuSO4 solution in a closed container for collection to prevent damage to the environment due to the toxicity of this chemical.

Safety precautions taken with the use of ethanol were accepted as ethanol was in the stem of the question.

Question 7a.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Mark | 0 | 1 | 2 | 3 | Average |
| % | 14 | 32 | 35 | 18 | 1.6 |

Any three of the following:

* Plates have been contaminated due to poor aseptic technique.
* Agar too hot when plates prepared reducing the bacterial count.
* SOP not followed.
* Counting technique incorrect.
* Pipetting technique inaccurate − plates not inoculated with the same volume of sample.

Overall, students had a good understanding of the pour plate technique and the sources of non-conformance that could occur.

Question 7b.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Mark | 0 | 1 | 2 | 3 | 4 | Average |
| % | 36 | 25 | 27 | 5 | 7 | 1.3 |

Correct responses mentioned the general type of check and explained how this could identify a non-conformance.

Correct responses included any two of the following:

* Check log book entries for operator errors recorded.
* Quality control tests − failure of standards / control materials during a sample run can indicate non-conformance.
* Internal/external audits would highlight any issues in the testing process.

Some students answered this question using the example from Question 7a. In this case, correct responses included:

* Size/colour of colonies differs between plates indicating potential contamination.
* Damaged petri dish could increase the chance of contamination during the process.

Question 7c.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mark | 0 | 1 | 2 | Average |
| % | 18 | 31 | 51 | 1.4 |

Correct responses suggested an action and explained how this would improve the results.

* Check the SOP is being followed to the letter and ensure correct procedures are used.
* Consult with peers/supervisor to get advice on what may be causing the issue.
* Staff training in the pour plate technique to ensure aseptic technique is consistent between technicians.
* Repeat the tests to understand if the error is systematic or random and act on these findings.

Question 8a.

|  |  |  |  |
| --- | --- | --- | --- |
| Mark | 0 | 1 | Average |
| % | 44 | 56 | 0.6 |

The correct answer was stereo or dissecting microscope.

Question 8b.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mark | 0 | 1 | 2 | Average |
| % | 34 | 40 | 26 | 0.9 |

Correct responses included any two of the following:

* Specimen size would not require high powered magnification.
* The large sample would not fit under the objective lens of a light microscope.
* Creates a 3D view of the specimen.
* Sample not fine/sectioned enough to have a light pass through from underneath the sample – as with a light microscope.
* No preparation of the specimen is required before viewing.

Question 8c.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mark | 0 | 1 | 2 | Average |
| % | 3 | 13 | 84 | 1.8 |

Correct responses included any two of the following:

* Clean the stage.
* Clean the microscope lenses.
* Turn off the microscope.
* Wind up the cord.
* Place dust cover over microscope.
* Store in cupboard, carrying to position using both hands.

Students were familiar with the correct procedures for packing up a microscope after use.

Question 9a.

|  |  |  |  |
| --- | --- | --- | --- |
| Mark | 0 | 1 | Average |
| % | 45 | 55 | 0.6 |

Correct responses included any of the following:

* sample ID number
* sample description (source/batch number)
* client (company)
* date of sample collection
* time of sample collection
* test required
* sample type.

Question 9b.

|  |  |  |  |
| --- | --- | --- | --- |
| Mark | 0 | 1 | Average |
| % | 64 | 36 | 0.4 |

The correct answer was Gram stain. Gram stain classifies bacteria into two groups based on the cell wall structure. It is a common microscopic technique used in microbiology laboratories.

Question 9c.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mark | 0 | 1 | 2 | Average |
| % | 75 | 4 | 21 | 0.5 |

Correct responses suggested a magnification and an explanation on why this was chosen. The following is a possible answer:

1000× magnification or 100× objective with oil because bacteria are very small (approximate size 2 to 8 micrometre) so need the highest magnification possible.

Students’ responses suggest limited exposure to the 100× objective lens and oil immersion microscopy. It is important that students have experience working under high-power magnification.

Question 9d.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mark | 0 | 1 | 2 | Average |
| % | 75 | 4 | 21 | 0.5 |

The correct response was:

* cell type A Gram negative cocci
* cell type B Gram positive rod or bacilli.

Many students could identify the Gram stain but did not include the shape, which is a standard identifier in Gram stain. Both stain and shape were required for correct scientific terminology.

Question 10a.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Mark | 0 | 1 | 2 | 3 | Average |
| % | 35 | 33 | 24 | 8 | 1.1 |

Correct responses included any three of the following:

* staff training procedures
* procedure for the performance of audits
* document control procedures
* quality policy statement
* quality system processes and procedures
* company details and organisational structure
* customer service/complaints
* non-conformance procedures.

Correct answers did not include references to laboratory SOP or WHS procedures. These procedures would be in a separate manual.

Question 10b.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mark | 0 | 1 | 2 | Average |
| % | 20 | 46 | 34 | 1.2 |

Correct responses included why thermometers are calibrated and gave an explanation of the positive effect on laboratory quality.

* To ensure thermometers are reading accurately to maintain the required operating temperature of incubators for optimal growth of cultures. This gives reliable results of testing.
* To ensure thermometers are reading accurately so refrigeration equipment used for storage of laboratory samples, cultures or materials are at the required temperature.
* To comply with quality requirements for accreditation of laboratories to ensure all laboratories can produce quality results.

Question 10c.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Mark | 0 | 1 | 2 | 3 | Average |
| % | 43 | 34 | 19 | 4 | 0.9 |

Correct responses included a description of the process including the word reference/control/standard thermometer, gave one of a possible range of temperatures to use for checks – for example, 0 degrees Celsius, 37 degrees Celsius, 100 degrees Celsius – and suggested cross-checking the thermometer against the reference over a range of temperatures to determine the error/accuracy.

The following is a possible answer:

Prepare an ice bath of known temperature (0 degrees Celsius) and place the working thermometers in bath with a reference thermometer of known error. Compare the reading of the working thermometer with the reference thermometer and record the error. Repeat the test at other temperatures the working thermometer is used with, for example, 37 degrees Celsius.

Question 11a.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Mark | 0 | 1 | 2 | 3 | 4 | Average |
| % | 13 | 18 | 17 | 27 | 25 | 2.3 |

Correct responses included any four of the following:

* sterile petri dishes to pour agar into
* flask or Schott bottle to mix the agar powder with the water and contain the solution
* nutrient agar powder to prepare the agar
* balance to weigh out the required mass of agar powder
* distilled water as a solvent to mix with the agar powder
* water bath set at 55 degrees Celsius to maintain the molten agar
* microwave or hot plate to dissolve the agar solution prior to autoclaving
* autoclave to sterilise the media using steam at high pressure
* Bunsen burner to create aseptic zone when pouring plates.

Students needed to list the materials/equipment and describe their use.

Minor materials such as weigh boats, stirring rods, foil and autoclave tape were not included as possible responses as there were more obvious choices.

Agar should not be sterilised by boiling over a Bunsen burner flame due to the unsafe nature of this technique. Agar is a viscous fluid and needs to be constantly stirred while heating – that is why an autoclave is the preferred sterilisation method.

Question 11b.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Mark | 0 | 1 | 2 | Average |
| % | 20 | 35 | 45 | 1.3 |

Correct responses included any two of the following:

* Hot surfaces/liquids could cause burns to the skin.
* Gas flame from the Bunsen burner could cause burns or fire risk.
* Super-heated agar could boil over in microwave and burn skin.
* Fine powder/dust from agar powder is a respiratory irritant.
* Glass flask/bottle could break or be knocked and create hazardous hot liquid spills.

A common misconception was that the preparation of agar plates represented a biohazard risk. The preparation of culture media requires aseptic conditions to ensure a sterile product is available for use.

Question 11c.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Mark | 0 | 1 | 2 | 3 | 4 | Average |
| % | 37 | 7 | 31 | 6 | 19 | 1.6 |

Correct responses included a quality control step and why this step is important (two of the following):

* Prepare a sterility check plate by incubating at 37 degrees Celsius to check for sterility of the agar as contamination can occur when preparing the agar.
* Microbial performance check – streak a sample plate with a reference culture to check for growth. If the media is incorrectly prepared, bacteria may not grow as expected.
* Final pH as bacteria have a narrow range of pH tolerance.
* Appropriately labelled with name, batch number and expiry date so the media can be identified correctly during storage and agar use by date can be monitored.
* Agar is stored in the refrigerator in a sealed container to prevent microbial contamination.
* Plates stored base up (upside down) to prevent condensation dripping onto the agar surface making it unacceptable for use.