# Knowledge Assessment

# **Assessment event 1 of 3**

## Criteria

### Unit code, name and release number

MSS024016 - Process and present environmental data Release 1

### Qualification/Course code, name and release number

MSS50218 - Diploma of Environmental monitoring and technology Release 1

## Student details

### Student number

### Student name

## Assessment Declaration

* This assessment is my original work and no part of it has been copied from any other source except where due acknowledgement is made.
* No part of this assessment has been written for me by any other person except where such collaboration has been authorised by the assessor concerned.
* I understand that plagiarism is the presentation of the work, idea or creation of another person as though it is my own. Plagiarism occurs when the origin of the material used is not appropriately cited. No part of this assessment is plagiarised.

### Student signature and Date

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For queries, please contact:

Innovative Manufacturing, Robotics and Science Skills Point

TAFE Hamilton Campus

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## Assessment instructions

Table 1 Assessment instructions

| Assessment details | Instructions |
| --- | --- |
| **Assessment overview** | The objective of this assessment is to assess your knowledge in the topics of metrology, working with data and calculating scientific quantities and how it applies to your work. |
| **Assessment Event number** | 1 of 3 |
| **Instructions for this assessment** | This is a written assessment and it will be assessing you on your knowledge of the unit.  This assessment has three Parts;  Part 1 – Metrology (13 questions)  Part 2 – Working with data (4 questions)  Part 3 – Calculating scientific quantities (17 questions)  All questions are short answer and the assessment is open book.  Assessment feedback will be provided at the end of this document. |
| **Submission instructions** | This assessment will be undertaken in the presence of a teacher or assessor. |
| **What do I need to do to achieve a satisfactory result?** | To achieve a satisfactory result for this assessment all questions must be answered correctly. |
| **What do I need to provide?** | You should bring a pen/s, calculator and your Student Workbook. |
| **Due date/time allowed** | You will have **three hours** to complete this assessment. |
| **Assessment feedback, review or appeals** | In accordance with the TAFE NSW policy *Manage Assessment Appeals,* all students have the right to appeal an assessment decision in relation to how the assessment was conducted and the outcome of the assessment. Appeals must be lodged within **14 working days** of the formal notification of the result of the assessment.  If you would like to request a review of your results or if you have any concerns about your results, contact your Teacher or Head Teacher. If they are unavailable, contact the Student Administration Officer.  Contact your Head Teacher for the assessment appeals procedures at your college/campus. |

## Part 1 - Metrology

Read each question carefully and write your answer in the space provided.

1. What is **metrology**? Why is it important in laboratory work?

Answer correct ☐ Yes ☐ No

1. Identify the three key **international bodies** that contribute to metrology in a laboratory setting.

Answer correct ☐ Yes ☐ No

1. Identify and list the two **national** bodies associated with the quality of metrology in Australia.

Answer correct ☐ Yes ☐ No

1. a) Define the term **base unit**.

Answer correct ☐ Yes ☐ No

b) In the table below, list all the base units used in the metric system by **physical quantity,** **name** and **symbol** (mass is given as an example).

| Physical quantity | Name | Symbol |
| --- | --- | --- |
| Mass | kilogram | kg |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

Answer correct ☐ Yes ☐ No

1. a) What is a **derived** **unit**? Provide the name and notation as an example for one derived unit.

Answer correct ☐ Yes ☐ No

b) List three examples of derived units and **explain** the type of measurement that the unit relates to. *Example: Decibel (related to noise or signal measurements)*

|  |  |
| --- | --- |
| Derived unit | Type of measurement it relates to |
|  |  |
|  |  |
|  |  |

Answer correct ☐ Yes ☐ No

1. What is the difference between **metric** and **imperial** units?

Answer correct ☐ Yes ☐ No

1. Explain why a measurement is considered an **estimate**?

Answer correct ☐ Yes ☐ No

1. What is the difference between **accuracy** and **precision**?

Answer correct ☐ Yes ☐ No

1. What is the difference between **accuracy** and **precision**?

Answer correct ☐ Yes ☐ No

b) List four different categories or types of error

Answer correct ☐ Yes ☐ No

1. a) What is **calibration** when applied to metrology?

Answer correct ☐ Yes ☐ No

b) List two pieces of equipment in your lab that need to be calibrated.

Answer correct ☐ Yes ☐ No

1. a) What is **traceability** when applied to metrology?

Answer correct ☐ Yes ☐ No

1. a) What is **repeatability** when applied to metrology?

Answer correct ☐ Yes ☐ No

b) Why is **repeatability** important?

Answer correct ☐ Yes ☐ No

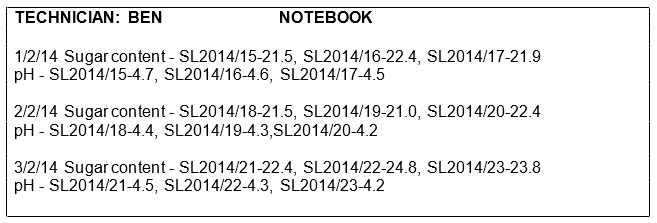
1. Using an example of where you have measured something in the lab (such as pH, temperature or conductivity), identify three **sources of error** that can occur in this measurement process.

Answer correct ☐ Yes ☐ No

## Part 2 – Working with data

Read each question carefully and follow the instructions to record your answer

1. Ben has done some analyses of grape samples, testing for sugar content and pH. Test results were transcribed (copied) from Ben’s notebook to a Laboratory Test Sheet as part of a report. Find and highlight the transcription errors in the table, that is, where the results were not copied correctly from Ben’s notebook.



**Laboratory Test Sheet – Grape Samples**

**Client: Winning Wines**

Table 1 Laboratory test sheet – highlight the results that were not copied correctly

| Date | SL Number | % sugar | pH |
| --- | --- | --- | --- |
| 1/2/14 | SL2014/15 | 21.5 | 4.7 |
| 1/2/14 | SL2014/16 | 22.4 | 4.6 |
| 2/2/14 | SL2014/17 | 22.9 | 4.5 |
| 2/2/14 | SL2014/18 | 21.5 | 4.4 |
| 2/2/14 | SL2014/19 | 21.0 | 4.3 |
| 2/2/14 | SL2014/21 | 22.4 | 4.2 |
| 3/2/14 | SL2014/21 | 22.4 | 4.5 |
| 3/2/14 | SL2014/22 | 24.8 | 4.8 |
| 3/2/14 | SL2014/23 | 23.8 | 4.2 |

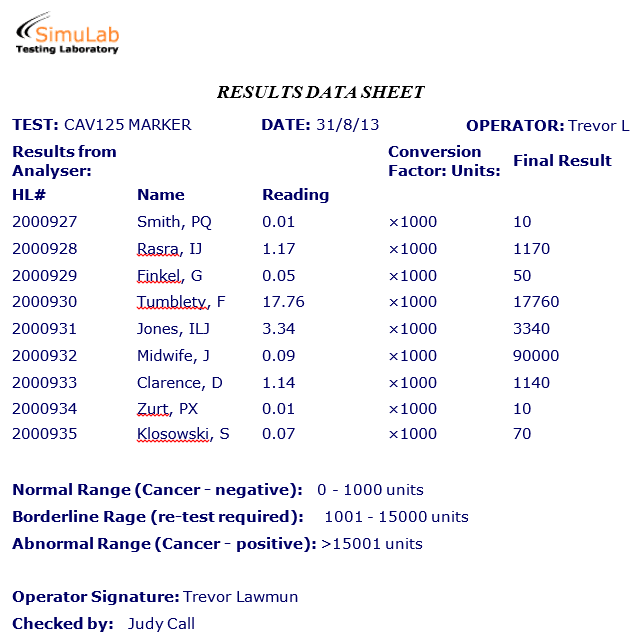
Highlight the results that were not copied correctly from Ben’s notebook.

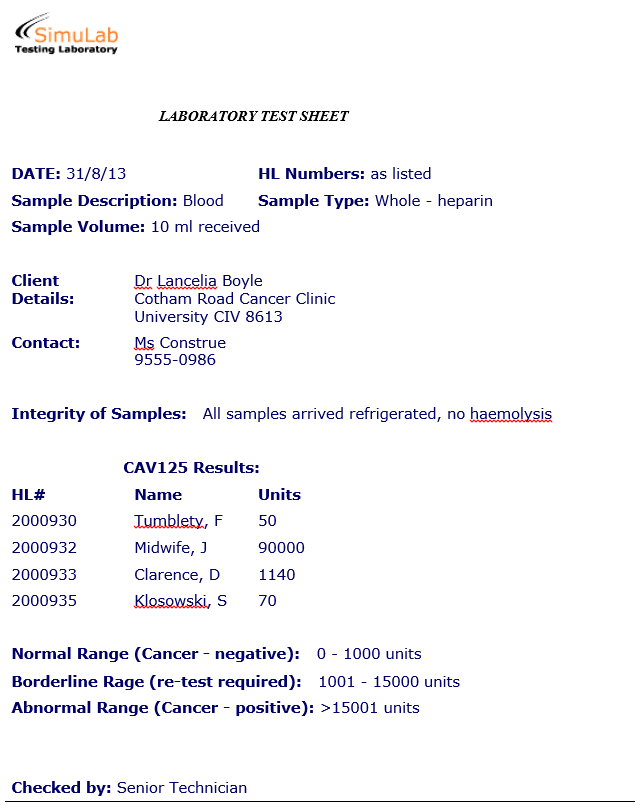
Answer correct ☐ Yes ☐ No

1. Test results must be checked to ensure they are copied correctly into final reports. Read the typical scenario below and perform the task and answer the questions on the next page.

Dr Lancelia Boyle medical specialist (oncology) calls the biological laboratory about a number of CAV125 (cancer marker results). She will not say if there is a problem or why exactly she is calling, but she wants you to check the results for the following patients (all tested on the same day - 31/8/13):

|  |  |
| --- | --- |
| Francis Tumblety | Duke Clarence |
| Severin Klosowski | Jillian Midwife |





Check the Results Data Sheet (used in the laboratory to record results and perform calculations) and the transcript of these results to the Laboratory Test Sheet (the result sheet sent to the customer).

1. Have any calculation mistakes been made? If so, what were they?
2. Have any transcription errors occurred? If so, what were they?

Answer correct ☐ Yes ☐ No

1. The liquid dispensed from an automatic pipette set at 500 µL is weighed to check it is dispensing the right amount as part of a calibration exercise. This is done 3 times. Identify the suspicious value from the list below and place an X in the column on the right.

Table 2 Multiple choice

| c | Put X next to your answer |
| --- | --- |
| 1. 0.5010g |  |
| 1. 0.5002g |  |
| 1. 0.5501g |  |

Answer correct ☐ Yes ☐ No

1. The table below shows how the readings from an instrument change as different concentrations of known standard solutions of caffeine are measured.

Look at the pattern in the data of how the absorbance increases as the concentration increases.

Identify (highlight or circle) the suspicious data point in the table.

**Analysis of caffeine by HPCL**

Table 3 Analysis of caffeine by HPLC

| Caffeine Standard mg/L | Absorbance |
| --- | --- |
| 20 | 0.09 |
| 40 | 0.21 |
| 60 | 0.88 |
| 80 | 0.39 |
| 100 | 0.52 |

Answer correct ☐ Yes ☐ No

## Part 3 - Calculating scientific quantities

This Part consists of 17 short answer questions

1. **Round off** the *problem* values in the table below correct to the nearest figure shown in the *criteria* column. Record your answer in the *Answer* column.

Table 2 rounding off questions

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Question | Problem | Criteria | Answer | Answer correct? |
| a) | 0.003682 | 4 decimal places |  | Yes  No |
| b) | 5.20196 | 2 decimal places |  | Yes  No |
| c) | 463.9 | Round to tens |  | Yes  No |
| d) | 8,420 | to nearest 100 |  | Yes  No |
| e) | 68,420 | to nearest 10 000 |  | Yes  No |
| f) | 4,724,361 | to nearest 1 000 000 |  | Yes  No |

1. Give the number of **significant figures** for each of the *problem* values in the table below and record your answer in the *Answer* column.

Table 3 Significant figures

|  |  |  |  |
| --- | --- | --- | --- |
| Question | Problem | Answer | Answer correct? |
| a) | 478 200 |  | Yes  No |
| b) | 0.01003 |  | Yes  No |
| c) | 3 000 |  | Yes  No |
| d) | 863.9462 |  | Yes  No |
| e) | 21.00 |  | Yes  No |
| f) | 0.00053 |  | Yes  No |

1. Use your skills and knowledge to **transpose** the following formulae to make a new subject.

Table 4 Transpose formula

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Question | Problem | Make this the subject | Answer | Answer correct? |
| a) | V=Lbw | w |  | Yes  No |
| b) | A=πr2 | r |  | Yes  No |
| c) | V2 = m2 + 2as | a |  | Yes  No |
| e) | C1V1=C2V2 | C2 |  | Yes  No |

1. Choose (highlight or circle) the best **estimation** A, B or C for these calculations

Table 5 Estimates

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Question | Calculations | Identify the best estimate below | | | Answer correct? |
| A | B | C |
| a) | 6.93 x 11.2 | 7.76 | 77.6 | 776 | Yes  No |
| b) | 7.82 x 5.03 | 39.3 | 393 | 3930 | Yes  No |
| c) | 0.31 x 0.186 | 5.77 | 0.577 | 0.057 7 | Yes  No |
| d) | 5.91 x 20.14 | 11.9 | 119 | 1 190 | Yes  No |
| e) | 0.00467 x 3.175 | 0.0148 | 0.00148 | 0.148 | Yes  No |

1. **Substitute** the data into the provided formulae and **calculate** the answer correct to the appropriate number of significant figures (which you need to determine).
   1. when *b* =3.4 106 and *h* = 7.0 104

Answer correct  Yes  No

* 1. when h = 5.0 10-1 , m= 3.2 106, v= 2.7 103

Answer correct  Yes  No

* 1. V = *u* + *at* when *u* = 2.7 104, *a* = 5, *t* = 3.0 103

Answer correct  Yes  No

1. Express each ratio in its lowest terms
   1. 132 : 12

Answer correct  Yes  No

* 1. 4.8 : 1.6

Answer correct  Yes  No

* 1. 50g : 0.05kg

Answer correct  Yes  No

1. The ratio of the length of the tail of a mouse to that of the rest of its body is 6:5 and its total length is 132mm. Calculate the length of the tail and the body, expressing your answers in millimetres.

Answer correct  Yes  No

1. An aspirin mixture composed of the three compounds A, B and C in the ratio 7:3:2 has a mass of 2 kg. Calculate the masses of each compound, expressing your answers in kilograms.

Answer correct  Yes  No

1. Liquids A and B are mixed in the ratio 2:7 (by volume). What volume of liquid A would be present in 72 mL of the mixed solution?

Answer correct  Yes  No

1. How much salt is weighed to make 2 L of 8% w/v salt brine?

Answer correct  Yes  No

1. How much 10% w/v salt brine is needed to prepare 200 mL of 2% w/v salt brine?

Answer correct  Yes  No

1. If 40 g of NaCl is dissolved in 2 litres of water what is the %w/v of the solution?

Answer correct  Yes  No

1. Convert each of the following
   1. 8200 µg to g

Answer correct  Yes  No

* 1. 0.000056 km to mm

Answer correct  Yes  No

* 1. 2.9 x 109 nL to ML

Answer correct  Yes  No

* 1. 8.5 m2 to mm2

Answer correct  Yes  No

* 1. 246 µm3 to m3

Answer correct  Yes  No

* 1. 9.4 x 10-5 L to mm3

Answer correct  Yes  No

1. Calculate the volume of stock solution (10 mg/100mL) required to prepare 20 mL of three standard solutions containing 1, 2 and 5 mg/100mL of tartrazine by dilution of the stock with 2-propanol.

Answer correct  Yes  No

1. In the determination of ethanol (%v/v), a brandy sample was diluted 1/5. What is the dilution factor?

Answer correct  Yes  No

1. How much 2M NaOH is required to make up 1000mL of a 0.01M NaOH solution?

Answer correct  Yes  No

1. If there were 120 micro-organisms on a pour plate of a 10-2 dilution, how many micro-organisms were there per mL of the original sample?

Answer correct  Yes  No

## Assessment Feedback

*NOTE: This section* ***must*** *have the assessor signature and student signature to complete the feedback.*

### Assessment outcome

Satisfactory

Unsatisfactory

### Assessor Feedback

Was the assessment event successfully completed?

If no, was the resubmission/re-assessment successfully completed?

Was reasonable adjustment in place for this assessment event?  
*If yes, ensure it is detailed on the assessment document.*

Comments:

### Assessor name, signature and date:

### Student acknowledgement of assessment outcome

Would you like to make any comments about this assessment?

### Student name, signature and date

***NOTE: Make sure you have written your name at the bottom of each page of your submission before attaching the cover sheet and submitting to your assessor for marking.***