# Knowledge Assessment

**Assessment 1 of 2**

# Trainer & Assessor Marking Guide

## Criteria

### Unit code, name and release number

MSL922001 - Record and present data (2)

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

MSL30118 - Certificate III in Laboratory Skills (1)

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This assessment can be found in the: [Learning Bank](https://share.tafensw.edu.au/share/access/searching.do?doc=%3Cxml%2F%3E&in=P7ac4831b-430a-4b8d-8b56-f7b32ed5b9cf&q=&type=standard&sort=rank&dr=AFTER)

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## Assessment instructions

Table 1 Assessment instructions

| Assessment details | Instructions |
| --- | --- |
| **Instructions for the trainer and assessor** | This is a written assessment and will be assessing the student on their knowledge of the unit.  This assessment is in 4 sections:   1. Multiple choice questions (1 – 15) 2. True or False questions (16 – 25) 3. Short answer questions (26 – 40) 4. Assessment feedback   Model answers, sample responses or a criteria for each question are provided below.  The student is permitted to take into the assessment their class notes as reference material. They are asked to show their working and also highlight the final answer to the question.  Use these to support your judgement when determining a satisfactory result. The student may provide working to the question. The final answer is to be marked.  The student’s response to each question must contain the information indicated in this marking guide in order for their response to be correct. However, if a student provides information other than indicated below, and in the professional opinion of the assessor it is appropriate and meets the intent of the question, it may be considered correct.  The assessment feedback page must be signed by both the student and the assessor so the student displays that they have received, understood and accepted the feedback.  Complete the assessment feedback to the student and ensure you have taken a copy of the assessment prior to it being returned to the student.  Ensure the students name appears on the bottom of each page of the submitted assessment. |
| **About this marking guide** | The student’s response to each question must contain the information indicated in this marking guide in order for their response to be correct.  All questions must be answered correctly in order to satisfactorily complete this assessment event.  Assessors will need to make a judgement call as to whether each answer/response meets the criteria based upon the:   * Rules of Evidence:   + Validity – does the answer address the assessment question and does the evidence reflect the four dimensions of competency?   + Sufficiency – is the answer sufficient in terms of length and depth?   + Currency – has the work been done so recently as to be current?   + Authenticity – is this work the student’s own authentic work? * Principles of Assessment:   + Fairness – individual student’s needs are considered in the assessment process   + Flexibility – assessment is flexible to the individual student   + Validity – any assessment decision is justified, based on the evidence of performance of the student   + Reliability – evidence presented for assessment is consistently interpreted and assessment results are comparable irrespective of the assessor conducting the assessment * Dimensions of competency   + Task skills   + Task Management Skills   + Contingency Planning Skills   + Job Role Environment Skills |
| **Student must provide** | Calculator, pens, measuring equipment, class notes as reference material |
| **Assessor must provide** | One copy of this assessment per student |
| **Time allowed** | 2 hours 30 minutes |

## Multiple choice (Questions 1 – 15)

Read the question and each answer by putting an X in the table next to your chosen answer.

1. Estimation is an important technique that should be used when noting and recording any qualitative or quantitative result in the laboratory. The best estimate (or approximation) of the following calculation 5.91 x 20.14 is:

Table 2 Multiple choice

| Answer choices | Put X next to your answer |
| --- | --- |
| 1. 12.0 |  |
| 1. 120 | X |
| 1. 1200 |  |
| 1. 1.20 |  |

1. The best estimate (or approximation) of the following calculation  is:

Table 3 Multiple choice

| Answer choices | Put X next to your answer |
| --- | --- |
| 1. 0.5 | X |
| 1. 0.05 |  |
| 1. 5.0 |  |
| 1. 1.0 |  |

1. 52.8 g of 2.5 kg is what percentage

Table 4 Multiple choice

| Answer choices | Put X next to your answer |
| --- | --- |
| 1. 2112% |  |
| 1. 0.0211% |  |
| 1. 2.1% | X |
| 1. 21.1% |  |

1. The resultant length when 750 mm is decreased by 12.5% is:

Table 5 Multiple choice

| Answer choices | Put X next to your answer |
| --- | --- |
| 1. 94 mm |  |
| 1. 844 mm |  |
| 1. 762.5 mm |  |
| 1. 656 mm | X |

1. The mass of sodium chloride required to prepare 350 g of a 7% w/w solution is:

Table 6 Multiple choice

| Answer choices | Put X next to your answer |
| --- | --- |
| 1. 7 g |  |
| 1. 343 g |  |
| 1. 24.5 g | X |
| 1. 2.45 g |  |

1. A mass is weighed on a balance 5 times and the masses are shown below.

0.42764 g 0.42777 g 0.42765 g 0.42759 g 0.42761 g

The mean and greatest deviation from the mean is:

Table 7 Multiple choice

| Answer choices | Put X next to your answer |
| --- | --- |
| 1. 0.42764 g 8 x 10-5 |  |
| 1. 0.42765 g 1.2 x 10-4 | X |
| 1. 1.36858 g 0.94099 |  |
| 1. 0.42765 8 x 10-5 |  |

1. For the following data 4, 6, 8, 9, 3, 4, 2, 5, 7, 4, 5 the mean, median and mode (in that order) is:

Table 8 Multiple choice

| Answer choices | Put X next to your answer |
| --- | --- |
| 1. 5.7 4 5 |  |
| 1. 5.2 5 4 | X |
| 1. 4 5.2 5 |  |
| 1. 4 5 5.7 |  |

1. If the specific gravity (SG) of an alcoholic beverage is 0.95, what is the mass of 750 mL of the beverage?

Table 9 Multiple choice

| Answer choices | Put X next to your answer |
| --- | --- |
| 1. 750 g |  |
| 1. 789.5 g |  |
| 1. 750.95 g |  |
| 1. 712.5 g | X |

1. As part of a calibration task, repeated masses of the volume of deionised water dispensed from a 25 mL A grade pipette were recorded as below:

24.9935 g 25.0132 g 25.0274 g 24.9979 g ADDED 24.0182

Which of the measurements appears as suspect (an outlier) and should be repeated or disregarded from calculations?

Table 10 Multiple choice

| Answer choices | Put X next to your answer |
| --- | --- |
| 1. 24.9935 g |  |
| 1. 24.0182 g | X |
| 1. 25.0132 g |  |
| 1. 24.9979 g |  |

1. A stained cell yeast count was done microscopically.  There was a total cell count of 120 cell per mL of the suspension.  From this, 25 cells per mL were found to be dead.  The percentage of live yeast cells is equal to:

Table 11 Multiple choice

| Answer choices | Put X next to your answer |
| --- | --- |
|  | X |
| b) |  |
|  |  |
|  |  |

1. Which of the following could be used to maintain confidentiality of data in the workplace?

Table 12 Multiple choice

| Answer choices | Put X next to your answer |
| --- | --- |
| 1. Data base (for receipt, results and reports) is password protected |  |
| 1. Only authorised personnel are permitted to access data |  |
| 1. Release of data is only by authorisation of approved delegate |  |
| 1. All the above | X |

1. Which of the following information about a sample should be recorded into the laboratory data system?

Table 13 Multiple choice

| Answer choices | Put X next to your answer |
| --- | --- |
| 1. Identification code (noted on sample container, result sheet and data system) |  |
| 1. Date, time and location of sampling |  |
| 1. Testing required and test results |  |
| 1. All the above | X |

1. Which of the following is not a method of checking data to ensure it has been recorded correctly?

Table 14 Multiple choice

| Answer choices | Put X next to your answer |
| --- | --- |
| 1. Retesting sample |  |
| 1. Checking for transcription errors before results are processed |  |
| 1. Ignoring and failing to report strange results | X |
| 1. Using a graphical method, such as a control chart to identify possible outliers |  |

1. Which of the following would be used to ensure the accuracy of test results?

Table 15 Multiple choice

| Answer choices | Put X next to your answer |
| --- | --- |
| 1. Using a different procedure to verify the initial result |  |
| 1. Using only calibrated equipment and correcting for any bias |  |
| 1. Running a reference sample under the same experimental conditions |  |
| 1. All of the above | X |

1. Consider the following numbers:

183, 0.04, 15.301, 17.80, 0.00401.

The number of significant figures shown for each number in the order above is:

Table 16 Multiple choice

| Answer choices | Put X next to your answer |
| --- | --- |
| 1. 3, 2, 5, 3, 5 |  |
| 1. 3, 1, 5, 4, 3 | X |
| 1. 1, 3, 4, 3, 5 |  |
| 1. 3, 1, 4, 3, 3 |  |

## True or false (Questions 16- 25)

Read the question and then write **True** or **False** in the space provided.

Table 17 True or false

| Question | Write *True* or *False* |
| --- | --- |
| 1. Estimation of an expected result is a quick way of identifying if there has been a calculation or transcription error | T |
| 1. The mean of a set of numbers is the average of all the numbers | T |
| 1. The mode of a set of numbers is the middle number | F |
| 1. The median of a set of numbers is the number that occurs the most often | F |
| 1. The standard deviation of a set of measurements indicates the spread of the numbers from the mean | T |
| 1. When working in a laboratory it is permissible to talk about work with people who work elsewhere | F |
| 1. A measurement is always an estimate of the true value | T |
| 1. The SI unit for temperature is degrees Celsius | F |
| 1. Results recorded in a laboratory will include both qualitative and quantitative data. Qualitative data is descriptive and no actual value can be assigned to it. | T |
| 1. You should always record data immediately when a measurement has been made. | T |

## Short answer (Question 26 – 42)

Read the question carefully. Where a response other than a number or list is required your responses should be less than 50 words.

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 18 rounding off questions

|  |  |  |  |
| --- | --- | --- | --- |
| Question | Problem | Criteria | Answer |
| a) | 0.004628 | 4 decimal places | 0.0046 |
| b) | 7.20419 | 2 decimal places | 7.20 |
| c) | 543.9 | Round to tens | 540 |

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 19 Significant figures

|  |  |  |
| --- | --- | --- |
| Question | Problem | Answer |
| a) | 578 100 | 4 |
| b) | 0.02003 | 4 |
| c) | 401.2 | 4 |

1. Express the following in **scientific notation.**

Table 20 Scientific notation

|  |  |  |
| --- | --- | --- |
| Question | Problem | Answer |
| a) | 578 100 | 5.781 x 105 |
| b) | 0.02003 | 2.003 x 10 -2 |
| c) | 0.000469 | 4.69 x 10 -4 |

1. Express the following as decimal numbers

Table 21 scientific notation to decimals

|  |  |  |
| --- | --- | --- |
| Question | Problem | Answer |
| a) | 2.6 x 10 -3 | 0.0026 |
| b) | 8.94 x 10 4 | 89400 |
| c) | 3.97 x 10 -5 | 0.0000397 |

1. Express the following as required:

Table 22 scientific notation to decimals

| Part | Problem | Answer |
| --- | --- | --- |
| a) | Write 0.0095 as a fraction in its simplest form. |  |
| b) | Write as a decimal to 3 dp. | 0.467 |
| c) | Convert to a percentage | 360 % |
| d) | What percentage is 2.8g of 2kg | 0.14 % |
| e) | Find the total amount of solution if 5% is 15mL | 300 mL |

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. *7st* when *s = 5.1 x 10-3*  and *t = 8.9 x 102*

7st = 7 x 5.1 x 10-3 x 8.9 x 102

7st = 31.773

7st = 32

* 1. when *b* =2.9 106 and *h* = 6.5 104

A = (2.9 x 106 x 6.5 x 104 ) / 2

A = 9.425 x 1010

A = 9.4 x 1010

* 1. V = *u* + *at* when *u* = 3.1 104, *a* = 4, *t* = 3.4 103

V = 3.1 x 104 + 4 x 3.4 x 103

V = 44600

V = 4.5 x 104

1. Express each ratio in its lowest terms
   1. 144 : 12

12 : 1

* 1. 6.4 : 1.6

4 : 1

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

Dilution factor = 10/2

Cfu = 5 x 120

Organisms per mL = 600

b. 2.5 g of potassium hydroxide is dissolved in 50 mL of water. Calculate the concentration of sodium hydroxide in:

* g/mL
* %w/v

g / mL = 2.5 / 50

= 0.05g / mL

%w/v = 2.5/50 x 100

= 5 %w/v

* 1. A solution contains 24 g of solute in 300 mL. What is the % concentration? Is this concentration w/v or w/w.

Conc = 24 / 300 x 100

Conc = 8 % w/v

* 1. What volume of 4% v/v sulfuric acid is required to prepare 1L of 0.5% v/v sulfuric acid.

Volume = 1 x 0.5 / 4

= 0.125 L

= 125 mL

* 1. Liquids A and B are mixed in the ratio 2:7 (by volume). What volume of liquid A would be present in 108 mL of the mixed solution?

A = 108 / 9 x2

= 24 mL

1. An aspirin mixture composed of the three compounds A, B and C in the ratio 7:3:2 has a mass of 3.25 kg. Calculate the masses of each compound, expressing your answers in kilograms.

A = 3.25 / 12 x 7 = 1.90 kg

B = 3.25 / 12 x 3 = 0.81 kg

C = 3.25/ 12 x 2 = 0.54 kg

1. Make the conversions indicated in the table below;

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Convert** | **To** | **Answer** |
| 1. 1 | 75 kJ | J | 75000 J |
| 1. 2 | 2.3 x 10-7 s | μs | 0.23 µs |
| 1. 4 | 2500 m2 | km2 | 0.0025 km2 |
| 1. 5 | 51.2oC | K | 324.35 K |

1. The acceptable range of mercury levels in fish is given as 0.08-0.10 mg/kg inclusive. A collaborative study of the analysis of mercury levels in fish was done with the following results:

**Analysis of mercury in reference samples in different laboratories**

|  |  |
| --- | --- |
| **Result (mg/kg)** | **Number of laboratories** |
| 0.05 | 1 |
| 0.06 | 1 |
| 0.07 | 3 |
| 0.08 | 7 |
| 0.09 | 6 |
| 0.10 | 4 |
| 0.11 | 2 |
| 0.12 | 1 |

* 1. How many laboratories were within the acceptable range?

17

* 1. What is this number as a ratio of the total number of laboratories in the study?

17 : 25

* 1. What percentage is this of the total number of laboratories?

68 %

* 1. What is this number as a decimal?

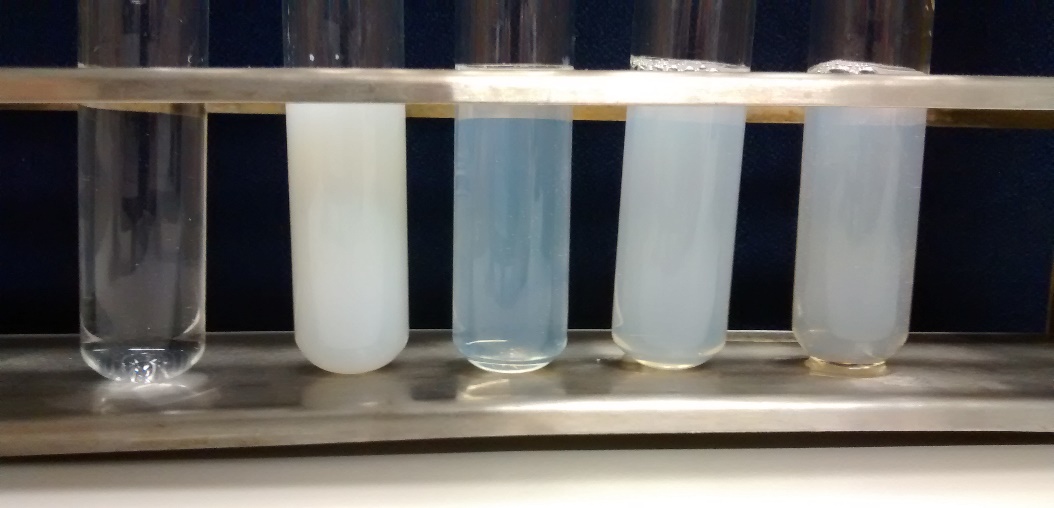
0.68

1. Semi-quantitative observations of the turbidity of a solution can allow a ranking of solutions. The following table uses scale – to ++++ to rank a set of solutions for turbidity.. Use the table below to rate the turbidity of the solutions shown. Place the symbol that corresponds to the amount of turbidity in the liquid in the box below each tube.

Table 23: Symbols showing indicative turbidity of liquids

| **Amount of turbidity of liquid in test tube** | **Symbol** |
| --- | --- |
| Clear, not turbid, | - |
| Slight turbidity or cloudiness | + |
| Moderate turbidity or cloudiness | ++ |
| Heavy turbidity or cloudiness | +++ |
| Extremely heavy turbidity or cloudiness | ++++ |

Figure 1.Turbidity of protein solutions



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|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| - |  | ++++ |  | + |  | +++ |  | ++ |

1. Bill S. has been monitoring his fasting blood glucose levels during May. His results have been plotted in the following graph (Figure 2).

Lower limit

Upper limit

The normal limits for blood glucose in healthy people are:

**Lower limit**: 4 mmole/L **Upper limit**: 8 mmole/L.

* 1. *Draw* and *label* the *upper and lower limits* on the graph above.
  2. Is his blood glucose within the normal limits? If not, which dates are they above and which dates are they below the normal limits?

His blood sugar levels generally fluctuate within the normal limits. They are outside the limits on 3 May (below) and 6, 7 and 11 May (above)

* 1. What was the maximum level of blood sugar in the time frame shown?

9.0 mmol/L

d. What was the minimum level of blood sugar in the time frame shown

3.8 mmol/L

1. Transcribe the following data from the Data Printout into the Manual Result Sheet.

|  |
| --- |
| Data Printout |
| **Sample**: O **Customer:** A.Food Pty Ltd  **Sample:** M  **Sample:** N **Date Received:** 25/03/2019  **Analyst:** A. Willing **Test Date:** 28/03/2019  **Test Results:**  **M:Sugar 2.71%, pH 4.5, Fat 8.1%, Mercury 0.0015ppb**  **N:Sugar 2.53%, pH 4.4, Fat 9.0%, Mercury 0.0011ppb**  **O:Sugar 2.60%, pH 4.7, Fat 10.0% Mercury 0.0009 ppb** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Manual Result Sheet | | | | | |
| Analyst: A. Willing | | Customer: A. Food Pty Ltd | | Test Date: 28/03/2019 | |
| Sample ID | Date Received | pH | Sugar % | Fat % | Mercury (ppb) |
| M | 25/03/2019 | 4.5 | 2.71 | 8.1 | 0.0015 |
| N | 25/03/2019 | 4.4 | 2.53 | 9.0 | 0.0011 |
| O | 25/03/2019 | 4.7 | 2.60 | 10.0 | 0.0009 |

1. Mark the four (4) errors in the second column, compared to the first column

|  |  |  |  |
| --- | --- | --- | --- |
| a | 2.3183 | a | 2.3183 |
| b | 2.2235 | b | 2.2225 |
| c | 2.2255 | c | 2.2235 |
| d | 2.3900 | d | 2.3900 |
| e | 3.0111 | e | 3.0111 |
| f | 2.9898 | f | 2.9998 |
| g | 2.0988 | g | 2.0988 |
| h | 3.1011 | h | 2.1011 |
| i | 3.1811 | i | 3.1811 |
| j | 2.1333 | j | 2.1333 |