# Topic Test 3 – Calculating scientific quantities

# Trainer & Assessor Marking Guide

## Criteria

### Unit code, name and release number

MSL924003 - Process and interpret data Release 1

\*\*This unit sits in all qualifications below. This assessment is not to be amended\*\*

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

MSL60118 Advanced Diploma of Laboratory Operations Release 1

MSL50118 Diploma of Laboratory Technology Release 1

MSL40118 Certificate IV in Laboratory Operations Release 1

MSL30118 Certificate III in Laboratory Skills Release 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 has 17 questions. It is to be conducted as a supervised open book test. Students are able to bring the Student Workbook into the test but no other information resources.  Model answers, sample responses or a criteria for each question are provided below.  Use these to support your judgement when determining a satisfactory result.  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.  Arrange a time for each student to view their marked tests and the assessor feedback. Assessors are to retain all tests after students have viewed their results. Students to not keep a copy of their completed test.  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** | Students must provide pen/s, calculator and their Student Workbook. |
| **Assessor must provide** | One copy of the assessment task per student, filename MSL924003\_AE\_Kn\_3of7. |
| **Time allowed** | 2 hours |

## Short answer

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 |
| a) | 0.003682 | 4 decimal places | 0.0037 |
| b) | 5.20196 | 2 decimal places | 5.20 |
| c) | 463.9 | Round to tens | 460 |
| d) | 8,420 | to nearest 100 | 8400 |
| e) | 68,420 | to nearest 10 000 | 70000 |
| f) | 4,724,361 | to nearest 1 000 000 | 5000000 |

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 |
| a) | 478 200 | 4 |
| b) | 0.01003 | 4 |
| c) | 3 000 | 1 |
| d) | 863.9462 | 7 |
| e) | 21.00 | 4 |
| f) | 0.00053 | 2 |

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 |
| a) | V=Lbw | w | w=V/Lb |
| b) | A=πr2 | r |  |
| c) | V2 = m2 + 2as | a | a = (v2-m2)/2s |
| e) | C1V1=C2V2 | C2 | C2=C1V1/V2 |

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 | | |
| A | B | C |
| a) | 6.93 x 11.2 | 7.76 | 77.6 | 776 |
| b) | 7.82 x 5.03 | 39.3 | 393 | 3930 |
| c) | 0.31 x 0.186 | 5.77 | 0.577 | 0.0577 |
| d) | 5.91 x 20.14 | 11.9 | 119 | 1 190 |
| e) | 0.00467 x 3.175 | 0.0148 | 0.00148 | 0.148 |

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

1.19x1011

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

4.22x10-4

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

42000

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

11:1

* 1. 4.8 : 1.6

3:1

* 1. 50g : 0.05kg

1:1

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.

Tail = 72 mm

Body = 60 mm

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.

A = 1.17 kg

B = 0.5 kg

C = 0.33kg

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?

A = 16 mL

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

160 grams

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

40 mL

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

2% w/v NaCl

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

0.0082 g or 8.2 x 10-3 g

* 1. 0.000056 km to mm

56 mm

* 1. 2.9 x 109 nL to ML

0.0000029 ML

* 1. 8.5 m2 to mm2

8 500 000 mm2

* 1. 246 µm3 to m3

2.46 x 10-16

* 1. 9.4 x 10-5 L to mm3

52000000

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.

1=2 mL

2=4mL

5=10 mL

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

DF = 5/1 = 5

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

5 ml

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?

DF = 10/2 = 5

CFU=5\*120 = 600