# Project Assessment

**Assessment event 2 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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Innovative Manufacturing, Robotics and Science SkillsPoint

Hamilton Campus

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## Assessment instructions

Table 1 Assessment instructions

| Assessment details | Instructions |
| --- | --- |
| **Instructions for the trainer and assessor** | This is an assignment based assessment and will be assessing the student on their knowledge and performance of the unit.  This assessment is in 3 parts and includes an Assessment Feedback form:   1. Assignment 2. Assessment Checklist 3. Assessment Feedback   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 project/product must contain the information indicated in this marking guide in order to deem it satisfactory. 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 criteria, 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. |
| **About this marking guide** | All tasks and activities must responded to 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** | Pens and calculator, computer with a spreadsheet program is optional |
| **Assessor must provide** | Access to a computer with a spreadsheet if the student chooses to use a spreadsheet |
| **Due date and time allowed** | Due date should be set at least six weeks after the date of issue. |

## Part 1: Assignment

To complete this part of the assessment, you will be required to respond to all the questions in this section of the Assessment. The responses in the tables maybe either single words or up to 50 words for longer responses.

**Question 1**

1. Name four (4) pieces of information that should be recorded about a sample that has arrived for testing. Indicate in the table why the information is important.

Table 3 Sample information

|  |  |  |
| --- | --- | --- |
| Number | Sample information recorded | Reason |
| **1** | Sampling date and time | Necessary to track sample and changes particularly if routine analysis for particular site |
| **2** | Sampling location | To check against the sampling plan that it is the correct location |
| **3** | Tests required | Required for planning and allocation of resources (staffing, equipment etc) |
| **4** | Customer details | Details of who and where to send the results |
|  | Others could include:  Preservation conditions  Observations of conditions  Sample code applied at lab &/or on the sample | Suitable responses for the information required |

1. Estimation is an important ‘tool’ for anyone working in a laboratory. Explain how estimation can be useful in identifying incorrect data.

If you have a rough idea of the expected result you may notice if the value actually obtained is very different. This should enable technician to run further checks. It is useful as a means of detecting bias in instruments/equipment.

1. The data below contains two sets of data from the same sample. The true value for the average of each sample is 25.0. Determine the relative precision and relative error for each set.

Table 4 Accuracy and precision

|  |  |  |
| --- | --- | --- |
|  | Set A | Set B |
|  | 24.30 | 25.0 |
|  | 24.35 | 24.6 |
|  | 24.2 | 25.5 |
|  | 24.25 | 24.9 |
|  | 24.30 | 25.4 |
|  | 24.25 | 25.4 |
|  | 24.35 | 24.6 |
| Average | 24.29 | 25.06 |
| Range | 0.15 | 0.90 |
| Relative precision % | 0.31 | 1.8 |
| Relative error % | 2.84 | 0.24 |

1. Explain the terms accuracy and precision as they relate to laboratory work. Use the above data sets as an example.

Accuracy is a measure of the closeness to the true value. Precision is a measure of the repeatability of the values. The average value for Set B is 25.06 suggesting the result is close to the expected 25.0. This has a relative error of 0.31%. The relative precision for Set B is not as good as for Set A at 1.8% compared to 0.31%.

The Relative precision for Set B (0.26%) shows the set of numbers are very close however the accuracy, shown as relative error is 2.84% is not good.

1. Describe a typical laboratory procedure for checking result data to ensure the information recorded is correct.

Will vary depending on laboratory

Responses could indicate:

Having another person check

Checking against expected (eg control chart0

Running standard to check procedure

1. Describe the way data entry errors are rectified in a typical laboratory.

Will vary depending on laboratory

Responses could include:

Changed after authorisation

Crossed out, initialled and new value written in

A new test run

1. What is the laboratory procedure for dealing with results that are deemed outliers? Provide an example of an outlier you have experienced in the TAFE laboratory. Why is it important that outliers are identified and checked routinely?

Will vary depending on laboratory

Second or repeat test run

New sample requested

Once verification received a change may be made to a process.

Eg in production run process appears out or specification or heading out of control. Changes will be made to bring process back on line.

1. What is a typical laboratory procedure for storing and filing data?

Will vary depending on the laboratory

Paper based- signed off by authorised person and manually filed

Electronic – entries manually or automatically into data base

Saving automatically every minute

Back up file on offsite server.

1. Describe how laboratory data can be protected from tampering, damage, or loss. What systems are used protect data from fire/water damage etc?

Will vary depending on laboratory

Most will have storage as backup on offsite server

Newer systems may use the cloud

Authorised access only, password protected

**Question 2**

1. Complete the following table listing the **seven (7)** base units of the SI system by physical quantity, name and symbol. The first of these has been added as an example.

Table 5 SI Units

|  |  |  |
| --- | --- | --- |
| SI Base unit (physical quantity) | Name | Symbol |
| Mass | kilogram | kg |
| length | metre | m |
| time | second | s |
| Electric current | ampere | A |
| Luminous intensity | Candela | cd |
| temperature | Kelvin | K |
| Amount of substance | mole | mol |

1. Name and give the symbols for the **six (6)** standard SI prefixes.

Table 6 SI prefixes

| SI prefix | Symbol |
| --- | --- |
| Giga | G |
| Mega | M |
| Kilo | K |
| Milli | M |
| Micro | µ |
| nano | n |

**Question 3**

1. Explain why tables, charts and graphs are useful in the workplace as a way of representing data.

Makes it easy to interpret without having to look at lots of numbers.

Control charts provide quick recognition that a process is within limits

Good for those with poor LLN

1. A patient’s food and energy intake was monitored. It was found that the following nutrients contributed the percentages of total energy intake as shown in the table:

Table 7: Energy contributed by different nutrients

|  |  |
| --- | --- |
| **Nutrient** | **Percentage (%)** |
| Carbohydrate | 50 |
| Protein | 25 |
| Fat | 25 |

Complete the following bar chart by entering bars representing the three nutrients using data from the above table. Then using the same data complete the pie chart next to it by drawing lines and labelling the 3 different categories.

**Figure 1 Percentage of energy intake contributed by different nutrients**

**Figure 2 energy intake contributed by different nutrients**

Carbohydrate 50%

Fat 25%

Protein 25%

1. Refer to Figure 1 below which shows causes of injury due to drug reaction over the course of a year.

**Figure 3 – Causes of injury due to drug reaction**

Examine Figure 3 to identify the appropriate answers to the following questions

1. Which was the greatest cause of injury?

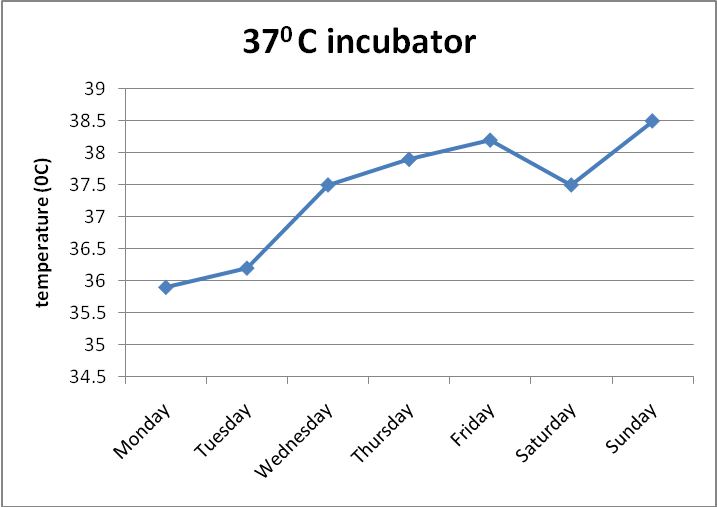
Allergic

1. How many injuries were due to an inappropriate drug being given to the patient?

25

1. Refer to the graph for the temperature changes in the 37°C incubator and answer the following questions.

**Figure 4 – Temperature changes in incubator**



i. On what day was the temperature 37.5°C?

Wednesday

1. What is the trend of the temperature?

General increase across the week with the exception of Saturday

**Question 4**

Consider the following data of a set of analysis results (30) for pH determination taken every 30 minutes on a production line.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Sample | pH | Sample | pH | Sample | pH |
| 1 | 7.4 | 11 | 7.6 | 21 | 9.5 |
| 2 | 7.2 | 12 | 7.5 | 22 | 7.3 |
| 3 | 11.4 | 13 | 7.4 | 23 | 7.1 |
| 4 | 7.2 | 14 | 7.5 | 24 | 7.5 |
| 5 | 7.3 | 15 | 7.6 | 25 | 7.0 |
| 6 | 7.2 | 16 | 7.9 | 26 | 7.0 |
| 7 | 7.3 | 17 | 8.3 | 27 | 7.0 |
| 8 | 6.9 | 18 | 8.8 | 28 | 7.2 |
| 9 | 7.4 | 19 | 9.2 | 29 | 7.1 |
| 10 | 7.3 | 20 | 9.4 | 30 | 7.1 |

1. Calculate the average pH over the time set.

As given the average pH is 7.7 (including 11.4)

Removing the 11.4 pH is 7.6 (excluding the 11.4 outlier)

1. Which result could be an outlier? How would you deal with this value in your calculations?

Sample 3

Repeat if possible,

check calibration of instrument.

L*eav*e off if found to be inaccurate

Seek supervisor input

1. What is the range of pH units in the data provided?

Not including the outlier the range is 2.6

Including the outlier the range is 4.5

1. The tolerance for pH in the process is ± 0.5 pH units from the ideal of 7.3. How many results are outside the tolerance limit?

Suitable range 6.8 – 7.8

Using all data points outside tolerance limit = 7

1. Are there any trends evident in the evidence provided? Explain the trends observed.

Generally stable for 10 readings (with the exception of the outlier at sample 3).

Gradual increase in pH heading to out of control at sample 16. Rectification after sample 21.

Process appears to have stabilised after 22

1. Is there a better way to present the data to allow easy recognition of possible problems in the process? Explain your response

Visual representation such as a control chart. If automated even better as this could have audible alarms set to indicate out of specification and thus lead to quicker rectification.

1. After which sample should there have been an attempt made to bring the process into specification?

After sample 16

1. After which sample does it appear that there has been a change made to the process? Why did you choose this sample?

After sample 21, the pH falls dramatically to 7.3, the ideal and stabilises.

**Question 5.**

Calculate the % content of the following food specimens given the following raw data. Show all working out and highlight your final answer

* 1. % Moisture in dry cereal (Method: drying to constant mass at 100oC)

Table 8: Moisture Calculation

|  |  |  |  |
| --- | --- | --- | --- |
|  | Mass (g) | Working Out | Answer |
| Mass of container + sample before drying | 36.5520 | Moisture lost = 36.5520-36.5090  = 0.043 g  % moisture in = 0.043/2.0110 x 100  Cereal = 2.1% | 2.1% w/w |
| Mass of container + sample after drying | 36.5090 |
| Weight of original sample | 2.0110 |

* 1. % Ash of dry cereal (Method: ashing for 6 hrs at 1000oC)

Table 9: Ash calculation

|  |  |  |  |
| --- | --- | --- | --- |
|  | Mass (g) | Working Out | Answer |
| Mass of dry container | 3.6080 | Ash remaining = 3.6154 – 3.6080  = 0.0074  % ash = 0.0074 / 1.500 x 100  = 0.49 % | 0.49%w/w |
| Mass of container + sample before ashing | 5.1080 |
| Mass of container + sample after ashing | 3.6154 |
| Mass of original sample | 1.5000 |

* 1. The food sample was analysed using the Kjeldahl nitrogen method. If the %Nitrogen was determined to be 0.4% what % Protein was in the sample. (The conversion factor for nitrogen to protein is 6.25).

% Protein = 6.25 x 0.4

= 2.5%

1. A Whisky sample was prepared by pipetting 5.0 mL and making it up to 20 mL in a volumetric flask with Milli-Q water. It was then analysed using a Gas Chromatograph. The analysed sample was found to contain 9.8% ethanol. What is the ethanol content in the undiluted whisky?

9.8 x 20/5 = 39.2%

1. Sulfite (a preservative) was found at a level of 3.1 mg per 500 g packet of dried apples. What is the % SO2, express your answer in scientific notation if appropriate.

3.1/500000 x 100 = 0.00062

= 6.2 x 10-4 %

f. Atomic Absorption Spectroscopy (AAS) analysis showed that 5.5 ppm of zinc was present in a sample of town water. Express this in % zinc (Remember to use the correct unit and also scientific notation if appropriate).

5.5 x 10 -3 / 10 = 5.5 x 10 -4 %w/v

**Question 6**

**Analysis of caffeine**

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

Table 10: Caffeine standards

|  |  |
| --- | --- |
| **Caffeine Standard mg/L** | **Absorbance** |
| 20 | 0.15 |
| 40 | 0.32 |
| 60 | 0.88 |
| 80 | 0.62 |
| 100 | 0.78 |

1. Identify (highlight or circle) the suspicious data point in the table.
2. Disregarding the suspicious data point plot the remaining caffeine standards on the graph paper provided or use a computer to generate the graph and attach the copy to your assessment.

**Figure 5 Caffeine Calibration**

**Note:** Acceptable responses can be a hand drawn graph or an Excel generated graph. The graph must have: title, axes labels with units indicated, suitable scale and must be adequate for generating results for part c) which means that hand drawn graphs must be clear enough to read of values or Excel graphs have an equation of the line which can be used to generate values. There should be a line of best fit with points marked and correctly plotted, as shown above.

1. 5 cups of brewed coffee were analysed on the same instrument as the standards. The samples were prepared by taking 5 mL of the sample (quantitatively) and diluting to 25 mL. The absorbance of each sample is noted below. Determine the mass of caffeine in each cup of coffee (250 mL).

Table 11: Analysis of caffeine by HPLC

|  |  |
| --- | --- |
| **Brewed sample** | **Absorbance** |
| 1 | 0.35 |
| 2 | 0.40 |
| 3 | 0.28 |
| 4 | 0.45 |
| 5 | 0.30 |

From the graph concentration of caffeine using dilution factor 5 and only 250 mL in a cup

Sample 1 = 42 mg/L 🡪 42.5 x 5 /4 = 52.5 mg/cup

Sample 2 = 50 mg/L 🡪 50 x 5 / 4 = 62.5 mg / cup

Sample 3 = 34.0 mg/L 🡪 34.0 x 5 /4 = 42.5 mg/cup

Sample 4 = 56 mg/L 🡪56 x 5/4 = 70 mg/cup

Sample 5 = 37 mg/L 🡪 37 x 5 /4 = 46.2 mg/cup

Using equation from Excel y = 0.0078x-0.0002 (or in the case of a hand drawn graph, using the graph created in the previous question)

Sample 1 = 56 mg/cup

Sample 2 = 64 mg/cup

Sample 3 = 45 mg/cup

Sample 4 = 72 mg/cup

Sample 5 = 48 mg/cup

**Question 7**

* 1. Calculate the Perimeter and then Area of each of the following shapes.

i)

Rectangle

12cm

7cm

Perimeter:

Area:

16m

Square

ii)

Perimeter:

Area:

iii)

3m

5m

5m

8m

Isosceles Triangle

Perimeter:

Area:

* 1. Calculate the volume of each of the following shapes.

i)

Cube

350mm

Volume:

Students may choose to change the units.

ii)

200mm

200mm

250mm

Rectangular Prism

Volume:

Students may choose to change the units.

iii)

30mm (radius)

100mm

Cylinder

Volume:

Students may choose to change the units.

iii) If the rectangular prism and the cylinder above were containers, what is the maximum number of these cylinders that could be packed into the rectangular prism? (ignoring wall thickness and without squashing or stretching the containers).

Solution: With a diameter of 60mm and a height of 100mm, 60x4=240, so 4 cylinders will fit along the bottom and 3 across the width and 2 high. So the rectangular container will hold 4x3x2=24.

Answer: 24

Note: Dividing the larger volume by the smaller volume will give an incorrect answer, as this does not take into account the spaces between the cylindrical containers.

**Question 8**

1. Present the following results of analyses in a suitably titled table:

*12/6/19 W.Grout D.O.B 23/2/75 Blood Alcohol 0.082%, J. Howard D.O.B. 18/11/87, Blood Alcohol 0.047%, J. Minh D.O.B. 11/4/81 Blood Alcohol 0.063%*

*13/6/19 B. Pitt D.O.B. 12/8/78 Blood Alcohol 0.078% L. Daley D.O.B. 21/4/84 Blood Alcohol 0.046%, B. Stamopoulos D.O.B. 28/2/86 Blood Alcohol 0.048%*

*14/6/19 G. Michael D.O.B. 16/1/83 Blood Alcohol 0.066% O. Laden D.O.B. 5/10/84 Blood Alcohol 0.046%, H. Golightly D.O.B. 15/11/82 Blood Alcohol 0.053%*

Table 12 Patient Record

| Test Date | Patient | DOB | Blood Alcohol % |
| --- | --- | --- | --- |
| **12/06/19** | **W. Grout** | **23/02/1975** | **0.082** |
|  | **J. Howard** | **18/11/87** | **0.047** |
|  | **J. Minch** | **11/4/81** | **0.063** |
| **13/06/19** | **B. Pitt** | **12/8/78** | **0.078** |
|  | **L. Daley** | **21/4/84** | **0.046** |
|  | **B. Stamopoulos** | **28/02/86** | **0.048** |
| **14/06/19** | **G. Michael** | **16/01/83** | **0.066** |
|  | **O. Laden** | **5/10/84** | **0.046** |
|  | **H. Golightly** | **15/11/82** | **0.053** |

1. A workplace requires patient records to be stored by patient’s family name. Sort the following patient record titles shown in the left table alphabetically by family name and enter into the table on the right.

Table 12: Patient records

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Family name** | **First given name** |  | **Family name** | **First given name** |
| Lahood | Cameron |  | Bozkus | Arthur |
| Wilson | Ruby |  | Campbell | Jordan |
| Bozkus | Arthur |  | Hong | Pyo |
| Moussa | Mohammed |  | Kumar | Rama |
| Nguyen | Bao |  | Lahood | Cameron |
| Campbell | Jordan |  | Lewis | Louise |
| Hong | Pyo |  | Moussa | Mohammed |
| Kumar | Rama |  | Nguyen | Bao |
| Tan | Terry |  | Tan | Terry |
| Lewis | Louise |  | Wilson | Ruby |

1. Test results were transcribed from a technician’s (Ralph) notebook to a laboratory record sheet. You are required to check the quality of the data.

**Technician: Ralph Notebook**

1/6/18 Fermenter 1 - % alcohol 5.7, pH 5.8, Fermenter 2 - % alcohol 1.5, pH 6.8, Fermenter 3 - % alcohol 3.8, pH 5.6, Fermenter 4 - % alcohol 6.9, pH 5.1

2/6/18 Fermenter 1 - % alcohol 6.2, pH 5.4, Fermenter 2 - % alcohol 2.3, pH 6.2, Fermenter 3 -% alcohol 4.1, pH 5.2, Fermenter 4 - % alcohol 7.4, pH 4.7

3/6/18 Fermenter 1 - % alcohol 6.9, pH 4.8, Fermenter 2 - % alcohol 4.1, pH 5.5, Fermenter 3 - % alcohol 5.0, pH 4.7, Fermenter 4 - % alcohol 7.8, pH 4.4

1. Circle 4 transcription errors in the table.
2. Correct them to what they should be, marking them in the Record sheet table.
3. Sign and date the Laboratory Record Sheet to indicate you checked the data.

Table 13: Laboratory Record Sheet

**Laboratory Record Sheet**

**Wonder Wines Pty Ltd Table 1: Alcohol and pH of Fermenters records**

|  |  |  |  |
| --- | --- | --- | --- |
| Date | Fermenter | Alcohol (%v/v) | pH |
| 1/6/19 | 1 | 5.7 | 5.8 |
| 1/6/19 | 2 | 1.5 | 6.8 |
| 1/6/19 | 3 | 3.8 | 5.6 |
| 1/6/19 | 4 | 6.2 6.9 | 5.1 |
| 2/6/19 | 1 | 6.9 6.2 | 5.4 |
| 2/6/19 | 2 | 2.3 | 6.2 |
| 2/6/19 | 3 | 4.1 | 6.2 5.2 |
| 2/6/19 | 4 | 7.4 | 4.7 |
| 3/6/19 | 1 | 6.9 | 4.8 |
| 3/6/19 | 2 | 4.7 4.1 | 5.5 |
| 3/6/19 | 3 | 5.0 | 4.7 |
| 3/6/19 | 4 | 7.8 | 4.4 |

**Signed:** Ralph Reddit\_\_\_\_\_\_

**Date:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Date required

**Checked: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Student signature required**

**Question 9**

Consider each of the following graphs of a production run showing time against a particular reading.

Identify which Process Run indicates the following by placing the letter from the graph in the table below:

|  |  |
| --- | --- |
| 1. Process out of control: s out of | Run 6 or F |
| 1. Process very stable: | Run 1 or A |
| 1. Process with an exponential decrease in reading before stability: | Run 4 or D |
| 1. Process showing steady increase in reading: | Run 3 or C |
| 1. Process showing an exponential increase in reading before stability: | Run 5 or E |
| 1. Process showing steady decrease in reading | Run 2 or B |

**Question 10**

1. Reference material must be carefully filed and stored in a laboratory, as well as all test Data. Some of the types of reference materials that must be stored are identified in the table below. Identify those that can be readily found in your laboratory, where they are located and who is responsible for maintaining the material.

Different responses will be provided, depending on the actual laboratory. Responses provided are typical benchmark. Assessor should be aware of individual laboratory guidelines.

| Reference material | Location in laboratory | Location | Responsibility |
| --- | --- | --- | --- |
| NATA technical notes | Only in NATA certified laboratories | Hard copy | Authorised officer |
| Standards Australia test methods | Computer access | Server | QA officer |
| Sampling guidelines | LIMS | Server | Chief chemist |
| Testing guidelines | LIMS | Server | Each laboratory section |
| Company QA manual | LIMS (hardcopy with direct application in Lab) | Server and production office | QA manager |
| Safety Data sheets | Chemwatch | Internet access | WHS officer |
| WHS guidelines and regulations | LIMS | Server/hardcopy available from HR | WHS officer |
| Equipment operational manuals | Filed in filing cupboard | Hardcopy | Resource officer |
| Calibration logs and reports | Computer | Section computers, connected to Server | Shift analyst |
| Workplace test results | Computer | Computer and hardcopy of original and also in analyst logbood. | Analyst making entry |
| Chain of custody forms | Hardcopy in filing cupboard | Hardcopy scanned and saved on Server. | Shift supervisor |
| Environmental guidelines | LIMS | Server/hardcopy available from HR | Each person |

## Part 2: Assessment Checklist

The student’s copy of the Assessment Checklist will be used by you to capture evidence of their performance in the two parts of this assessment. This checklist outlines all the required criteria you will be marking the student on. All criteria must be met. The following checklist contains benchmark responses for you to use when assessing to ensure reliability of judgement. You may ask questions during the demonstration or if appropriate directly after the assessment has been completed noting that both the question and student response needs to be captured on the checklist.

| Part 1 # | Instructions | | S | U/S | Assessor Comments |
| --- | --- | --- | --- | --- | --- |
| **Assignment Questions** | Complete the assignment by providing responses to each question in the space provided |  | |  | *Date of Submission::*  *Benchmark responses are provided in this marking guide.* |