# Skills Assessment

**Assessment event 3 of 3**

# Trainer & Assessor Marking Guide

## Criteria

### Unit code, name and release number

MSL974019 - Perform chemical tests and procedures (1)

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

MSL40118 - Certificate IV in Laboratory Techniques (1)

MSL50118 - Diploma in Laboratory Technology (1)

\*\*Amend the qualification box before distributing to the student. The information here should only contain the qualification the student is enrolled in.\*\*

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Hamilton Campus

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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 skills based assessment and will be assessing the student on their ability to demonstrate skills required in the unit.  This assessment is in 3 parts:   1. Practical 2. Observation Checklist 3. Assessment Feedback (student facing document)   In this assessment students will perform the three tests that you have chosen for this assessment and the Project Assessment.  The tests that you choose for this Skills Assessment must be the same tests that the students researched in the Project Assessment and must be tests that the student has practiced in training. To meet the unit requirements, you need to choose at least 1 of the following:   * colorimetric techniques * infrared and ultraviolet-visible (UV-VIS) spectrophotometry * other spectrometric techniques * chromatographic techniques * electrochemical techniques * electrophoretic techniques * soil testing techniques * gravimetric analysis * titrimetric analysis * filtration, separation and solvent extraction techniques * corrosion testing, cement content and accelerated weathering   The remaining 2 tests can come from this list or others that the laboratory may undertake. The student must be familiar with all 3 tests.  The student should have access to their completed Project Assessment during this Skills Assessment. The Project Assessment should be collected at the end of each skills assessment.  For each test you choose the following must be available:   * Instrument/equipment manuals * Standard methods (SOPs) for the tests chosen * SDS for any chemicals involved * Pre-use and calibration requirements * Risk assessments   Only tests for which all of the above are available to students can be chosen.  You will need to provide a customised marking guide for each of the allocated tests that will be retained for audit purposes. All of the above information must also be retained with the student submissions for audit purposes.  Model answers, sample responses or criteria for each task or activity are provided. An example of paperwork is provided for the analysis of steel by AAS  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.  Complete the Observation Checklist for each task and activity and the Assessment Feedback to the student. Ensure you have taken a copy of the assessment prior to it being returned to the student.  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.  Ensure the students name appears on the bottom of each page of the submitted assessment. |
| **About this marking guide** | For each of the three tests you will have prepared a complete marking guide. This is to accompany the student faced documentation for audit purposes.  The student’s response to each task or activity must contain the criteria indicated in this marking guide in order for their response to be correct.  All tasks and activities must be completed correctly in order to satisfactorily complete this assessment event.  Assessors will need to make a judgement call as to whether each response meets the criteria based upon the:   * Rules of Evidence:   + Validity – does the answer address the skill required and does the evidence reflect the four dimensions of competency?   + Sufficiency – is the task or activity 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, PPE as required by the individual laboratory (a minimum would be safety glasses, enclosed shoes, laboratory coat/overalls.  Other depending on laboratory could include face shield, sunglasses, helmet, ear protection |
| **Assessor must provide** | The actual test method. You must ensure all that is required for the student to undertake the assessment is available. This includes:   * Arrangements for laboratory staff to have the laboratory prepared for the Assessment Task. * Risk assessment * Computers * Safety data sheets * Reference texts * Organisational policy etc that is referenced in the assessment. These may be hard copy or made available online. * Graph paper * Access to Excel |
| **Due date/time allowed/venue** | *Date:* TBA  *Time allowed:* 3 hours in each of 3 Assessment sessions  *Venue:* Your normal instrumental laboratory |

## Specific task instructions

The instructions and the criteria in the tasks and activities below will be used by the assessor to determine whether the tasks and activities have been satisfactorily completed. Use these instructions and criteria to ensure you demonstrate the required skills and knowledge.

The unit requires you to safely preform 3 different tests. These will be tests that you practiced during training and which you researched in your Project Assessment.

Use the table below to indicate whether you have received training in the tests that your assessor has allocated for this assessment.

|  |  |
| --- | --- |
| Allocated test | I have received training in this test |
|  | Yes / No |
|  | Yes / No |
|  | Yes / No |

## Part 1: Practical

To complete this assessment the student is required to participate in a practical demonstrations of the tests they have researched.

These practicals will be observed by you. Their responses will be used as part of the overall evidence requirements of the unit.

You should refer to the list of criteria in the Observation Checklist to understand what you need to observe in this section of the assessment.

This assessment will generally be completed during 3 observed sessions of your routine work in the laboratory.

Once completed the student is required to submit this assessment and the tasks and activities required to be completed to you for marking including the following:

* the Assessment paper
* any calculations additional to the Laboratory Record Form including graphs, Excel Spreadsheets if completed, instrument readouts if available
* the laboratory method (or indicate where it may be found in the laboratory)
* the Project Assessment will also need to be resubmitted

Use the observation guide as a way of checking the scope of the observations required to be made by the Assessor.

At the conclusion of the test your assessor will complete the documentation and provide feedback.

1. **Identify the test procedure and the correct sample for analysis**

* identify the sample, the test identification, the procedure for the allocated test
* check the SDS and note the PPE required, spill control and waste disposal
* note the hazards and controls identified for sample preparation, test procedure (including the reagents)
* record all information on the Laboratory Record form

1. **Prepare for testing of the sample**

* Locate the SOP for any equipment/instruments
* Conduct any safety checks required prior to operation of equipment
* Optimise the equipment (including calibration if required).
* Check reagents for deterioration and note outcomes on Laboratory Record

1. **Test the sample**

* Ensure all reagents, instruments/equipment have been located
* Follow the laboratory test procedure (including standards as necessary) recording all observations and test results
* Minimise use of reagents
* Shutdown equipment/instruments according to SOP at conclusion
* Clean up and dispose of wastes

1. **Process the data**

* Construct or determine using computer any calibration graph required (this may not be required for all tests)
* Determine the actual test result and record all required information including instrument logs.

**Note:** Do not leave blank spaces on the Laboratory Report sheet. Record N/A (not applicable) where there is nothing to record as it does not apply to this particular test.

Laboratory Record sheet completed as an example for Nickel in Steel by AAS

| Test 1 LABORATORY RECORD | | | | | |
| --- | --- | --- | --- | --- | --- |
| 1. Date: XY/AS/20XX | 1. Analyst WYX | | 1. a. Sample Description Steel sample received as grindings   b. Sample Reference No. 678 | | |
| 1. Test requested Nickel | | | 1. a. Standard Method ID Ni in steel by AAS Lab No 123   b. SOP ID AAS SOP 124 | | |
| **6. SDS information and test procedure safety:** | | | **7. Equipment and reagents required for the test** | | |
| 1. PPE safety glasses, enclosed footwear, eye protection, laboratory coat | | | Steel sample  5 M HCl  1:1 HNO3  purified water  100 mL volumetric flasks  1000 mg/L Ni2=  standard stock solution  3 dp balance  Beakers  Hardened filter papers  Filter funnels  AAS  Ni Hollow cathode lamp  Fume cupboard  Bulb pipettes 10, 20, 40 mL  Wash bottle | | |
| 1. Spill Control spills of acid or reaction solution neutralised with sodium hydrogen carbonate. | | |
| 1. Disposal: small amounts of chemicals may be placed down the sink with copious amounts of water. | | |
| 1. Hazards and control: Concentrated acids: control automatic dispenser to limit exposure   Heat for digestion: conducted in fume cupboard, lifting tongs available  High temperatures of AAS flame: flame is shielded  Flammable gases (acetylene): training provided in use  Electrical: all leads checked for suitability and for Tag and test date | | |
| 1. Other: NA | | |
| **8. Safety and calibration checks** | | | **9. Reagent checks** | | |
| Electrical leads should show no signs of exposure. Should be within the tag and test date.  Fume cupboard should have compliance plate  AAS should be optimised at 354.2 nm, current 5 mA | | | Generally a use by date is not applicable to the required solutions  No discolouration  No sign of solids  Solutions should be clear | | |
| **10. Raw data/Calculations:** | Sample completed in duplicate  Sample mass 1.032g 1.0021  Abs 0.324 0.319  Conc (mg/L) 15.57 15.32  Converting to % w/w  Sample 1 = 0.01557/1.032 x 100 = 1.51% w/w  Sample 2 = 0.01532/1.0021 x 100 = 1.53% w/w | | | Calibration standards if required:  Blank Abs 0.00  10 mg/L Abs 0.21  20 mg/L Abs 0.43  40 mg/L Abs 0.81  Rr = 0.9988  Y = 0.023x + 0.008  Observations noted: instrument stable | |
| **11. a. Final result** | 1.5% w/w | 11. b. Sample No verified | | | Yes / No |
| **12. Result typical/atypical** | Typical (Expected <2%) | 13. Action for atypical | | | NA |
| **14.Waste disposal and collection arranged (if required)** | All liquid wastes down sink  Filter papers in general refuse | 15. Workplace logs completed | | | Yes/No |
| **16. Analyst signature** | CCCCCCCCCCc | **17. Supervisor Signature:** | | | gggggggggggg |
| **18. Comments** | Noted that the gas cylinder is getting low. Report in maintenance log | | | | |

Calibration data for Nickel in steel.

|  |  |  |  |
| --- | --- | --- | --- |
| ` | conc mg/L) | Abs |  |
|  | 0 | 0 |  |
|  | 10 | 0.21 |  |
|  | 20 | 0.43 |  |
|  | 40 | 0.81 |  |
| sple1 | 15.57 | 0.324 |  |
| sple2 | 15.32 | 0.319 |  |
|  |  |  |  |
| sple 1 | 0.01557/1.032x100 |  | 1.51%w/w |
| sple 2 | 0.01532/1.0021x100 |  | 1.53%w/w |

## Part 2: Observation Checklist

The Observation Checklist will be used by you to assess the student ability to safely perform 3 allocated tests. Use this Checklist to understand what skills are needed to be demonstrated. The Checklist lists the assessment criteria used to determine whether the student has successfully completed this assessment event. All the criteria must be met. Your demonstration will be used as part of the overall evidence requirements of the unit. The assessor may ask questions while the demonstration is taking place or if appropriate directly after the task/activity has been completed.

| TEST | 1. | | | 2. | | | 3. | | | Comments and questions |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| DATE |  | | |  | | |  | | | Assessors are to record their observations in sufficient detail to demonstrate their judgement of the student’s performance against the criteria required |
|  | S | US | NA | S | US | NA | S | US | NA |
| 1. **Interpret test requirements** |  |  |  |  |  |  |  |  |  | The task will be stopped immediately for any breach of safety. |
| 1. Obtains and notes the correct procedure for the sample to be tested and the analysis required, identifying any equipment and test reagents required. |  |  |  |  |  |  |  |  |  | More than one procedure will be available in the session. The student must take the correct sample and corresponding procedure, reagents etc  Completes 1-5a, 7 on the Laboratory Record sheet as per benchmark responses listed in the laboratory record. |
| 1. Checks the Safety Data Sheet and notes information related to use, clean-up, disposal of any chemicals required. |  |  |  |  |  |  |  |  |  | Locates the SDS for the test and records information at 6a-c on the Laboratory Record sheet, as per benchmark responses listed in the laboratory record. |
| 1. Identifies and notes the workplace hazards and the appropriate control methods that are in place for this analysis (including the sample preparation, test methods and reagents). |  |  |  |  |  |  |  |  |  | Completes 6d of the Laboratory Record Sheet as per benchmark responses listed in the laboratory record. |
| 1. **Prepare for test** |  |  |  |  |  |  |  |  |  | The task will be stopped immediately for any breach of safety. |
| 1. Ensures safe work practices are followed by all in the area. |  |  |  |  |  |  |  |  |  | There should be no safety breaches. Student should be observant of others working in the area. |
| 1. Locates the SOP for equipment/instrument required for the test and notes identified hazard and controls |  |  |  |  |  |  |  |  |  | Student locates relevant SOP for any instruments/equipment and records information at 7 on Laboratory Record Sheet, as per benchmark responses listed in the laboratory record. |
| 1. Conducts any safety inspections required according to operational guidelines, noting outcome |  |  |  |  |  |  |  |  |  | Actions required are noted at 8 on the Laboratory Record Sheet. If there are no inspections directly required Assessor should record as NA |
| 1. Optimises the equipment/instrument using workplace SOP’s |  |  |  |  |  |  |  |  |  | Student uses the instrument/equipment SOP identified at 5b to optimise or ensure the correct functioning. |
| 1. Checks reagents to ensure they are all able to be used (visual and expiry dates), and notes findings |  |  |  |  |  |  |  |  |  | Student checks any solutions for use-by-date, turbidity, discoloration, cloudiness, presence of solids where applicable and records observations at 9 on L:aboratory Record sheet. If test has no reagents then NA should be recorded. |
| 1. **Test samples to determine chemical species or properties** |  |  |  |  |  |  |  |  |  | The task will be stopped immediately for any breach of safety. |
| 1. Ensures all equipment and reagents required for the test are available and operational |  |  |  |  |  |  |  |  |  | Student has checked all listed at 7 on the Laboratory Record sheet is available and operational. |
| 1. Prepares and tests the samples (and standards if necessary) following the appropriate method. |  |  |  |  |  |  |  |  |  | Student follows the procedures identified on the Laboratory Report at 5, as per benchmark responses listed in the laboratory record. |
| 1. Uses a minimum of reagent(s) to reduce waste and associated disposal issues |  |  |  |  |  |  |  |  |  | Student should only take the required amount of reagents into labelled containers. Reagents should not be taken directly from the stock solutions. |
| 1. Disposes of laboratory and hazardous waste according to workplace protocols |  |  |  |  |  |  |  |  |  | Wastes should be disposed of according to laboratory protocols. 14 in Laboratory Record sheet should be completed, as per benchmark responses listed in the laboratory record. |
| 1. Records all test data (noting any atypical results or observations for samples and standards). |  |  |  |  |  |  |  |  |  | Atypical results should be reported according to Laboratory procedures and actions noted at 13 in the Laboratory Record sheet as per benchmark responses listed in the laboratory record. |
| 1. Follows the SOP for the shutdown of equipment and instruments |  |  |  |  |  |  |  |  |  | Instrument SOP is followed and log is completed 15 on Laboratory Record Sheet, as per benchmark responses listed in the laboratory record. |
| 1. Clean up and store equipment and reagents |  |  |  |  |  |  |  |  |  | Area is left clean and tidy. Problems may be noted in the Comments section of the Laboratory Record sheet |
| 1. **Process and Interpret Data** |  |  |  |  |  |  |  |  |  |  |
| 1. Constructs calibration graphs (either manually or electronically) for the sample (if required). |  |  |  |  |  |  |  |  |  | Not all tests will require this. At least one of the three tests must include calibration data.  Student is to either graph manually or electronically (via Excel or the instrument generated report) the calibration standards and from the line generated determine the concentration of the sample.  NA should be recorded if no calibration is required for the particular test. |
| 1. Determines and records the actual test result for the sample. |  |  |  |  |  |  |  |  |  | Student calculation should be shown. The final result should be in line with the actual sample type. For example the AAS determination of Ni in steel from the graph would give a result in mg/L. this is not appropriate to the sample type and the result should be converted to %Ni or another appropriate unit. The calculations should be shown. The result should be recorded at 11. On the Laboratory Report sheet. |
| 1. Records all required information about the sample and the test result in the workplace system (manual or LIMS) according to workplace protocols. |  |  |  |  |  |  |  |  |  | Student should determine if the result is typical or atypical. If atypical the actions taken should be recorded at 12. On the Laboratory Result sheet.  Completes the Laboratory Record sheet. |

Provided only as an example. Assessor to arrange for the paperwork for each test for the student to be available and ensure the paperwork for each test to be collected and kept with the student assessment document for audit purposes.

**Standard Method 123**: Determination of Nickel in Steel by AAS

1. Sample Pretreatment:
2. In duplicate weigh accurately about 1 g of the steel sample into 2 250 mL labelled beakers.
3. Add 60 mL 5 M HCl and gently heat un a fume cupboard until the steel dissolves (do not allow to boil dry).
4. Remove beakers from the heat and allow to cool slightly.
5. Add 10 mL 1:1 HNO3 carefully and boil until no more brown fumes are observed
6. Allow to cool
7. Make up to 100 mL accurately in a volumetric flask
8. Quantitatively dilute 10 mL of the sample to 100 mL in a labelled volumetric flask.

B. Preparation of Standards

1. Prepare a 100 mg/L Ni2+  intermediate solution by pipetting 10 mL 1000 mg/L Ni2+  into a labelled 100 mL volumetric flask and making up to the mark with purified water.
2. Cap and shake the 100 mg/L solution
3. Label 3 100 mL volumetric flasks 10 mg/L, 20 mg/L and 40 mg/L
4. Pipette from the 100 mg/L intermediate Ni2+ solution 10, 20 and 40 mL respectively into the three labelled volumetric flasks.
5. To each of the 100 mL volumetric flasks add 10 mL 5M HCl
6. Make up to the mark with purified water, cap and shake
7. Sample analysis
8. Run the samples through an optimised AAS using SOP 321 Optimisation of AAS for Ni2+

**Standard Operating Procedure 124**: Optimisation of Phillips AAS for Ni2+

**Specifications**: Nickel Hollow cathode Lamp

Wavelength: 354.2 nm

Fuel mixture: air / acetylene / oxidising

Lamp current: 5 mA

Slit width: 2 nm

**Instrument set-up:**

* Check that the drain is not blocked
* Check the exhaust fan is on
* Check all electrical leads for compliance
* Select and install the Nickel lamp
* Turn the power to the instrument on
* Set lamp current to 5 mA
* Check the lamp is glowing. If not check the position of the lamp in the lamp holder.
* Adjust slit width
* Select and peak resonance line on monochromators
* Align the lamp with respect to the detector (looking for the maximum response)
* Turn on the air to the required position
* Turn on the acetylene
* Ignite the flame using the ignite button
* Adjust fuel mixture until the sharp blue flame is visible
* Optimising the burner position
* Select absorbance readout on the main panel
* Zero instrument with de-ionised water

Instrument shutdown

* Run de-ionised water through the aspirator and flame for at least 30 seconds.
* THERE IS ONE OPERATION THAT IS CRITICAL WHEN TURNING OFF AN AAS INSTRUMENT!!! **THE FUEL (ie the acetylene) MUST BE TURNED OFF FIRST.**
* Turn off the acetylene at the instrument
* Once the flame is extinguished turn off the acetylene at the regulator.
* Bleed the line from the regulator to instrument
* Turn off the oxidant (the air) at the instrument
* Turn off lamp current
* Turn off all power
* Complete usage log