

Standards and Assessment Guide

Chemical Laboratory Technology

Introduction

Welcome to the Standards and Assessment Guide (SAG), a comprehensive resource designed to support excellence in assessment practices for all skills competitions hosted at the WorldSkills Competition. A key component of the SAG is the commitment to continuous improvement through ongoing review, ensuring that these guides consistently reflect the latest industry innovations and high standards of assessment in an open and transparent manner.

Purpose

The primary purpose of this guide is to provide a structured framework for the consistent and fair assessment of each skill competition. It aims to ensure that all assessments are conducted with a high degree of accuracy, reliability, validity, and reflect global industry standards. By adhering to these guidelines, assessors can maintain the integrity of the competition and uphold the high standards associated with WorldSkills.

Note: this guide is not a replacement for the Marking Scheme and should only be used as a reference when required during the assessment process. Competitors are not allowed to have a copy of this SAG in the workshop in either digital or paper form.

Scope

This document covers general assessment practices applicable to a diverse range of industry sectors including:

- Manufacturing and Engineering Technology
- Information and Communication Technology
- Construction and Building Technology
- Transportation and Logistics
- Social and Personal Services
- Creative Arts and Fashion

Each skill competition has its unique requirements and benchmarks, which are detailed within sections of this guide. The consistency of assessment across each skill is the overarching principle, ensuring a unified approach to evaluating Competitor performance to the highest standards.

Key Components

The guide is structured into several key components, each addressing critical aspects of the assessment process:

Assessment Principles and Objectives

- Emphasis on fairness, transparency, and objectivity in assessments.
- Alignment with global industry standards and best practices.

Assessment Methods and Tools

- Description of various assessment methods in Measurement and Judgement.
- Guidance on the application of appropriate assessment tools and equipment (if applicable).

Criteria and Benchmarks

- Examples of assessment criteria and aspects for each skill, outlining the expected competencies and performance standards.
- Benchmarks for different levels of proficiency i.e. Judgement award range 0, 1, 2, 3 or Yes/No criteria alongside clear measurable descriptors.

Expert assessment requirements

- Completion of the Access Programme.
- Approved Curriculum Vitae (CV).
- Reaching **100%** Expert preparedness.
- Full participation of online and in-person Mandatory Assessment Training (MAT).
- Completion of practical assessment testing at the Competition.

Quality Assurance and Improvement

- Monitoring and evaluation: Ensuring assessments are carried out correctly and produce reliable results.
- Continuous improvement: Using feedback from Experts and Skill Competition Managers to enhance future assessments.
- Periodic review: Regularly updating processes to reflect current industry and WorldSkills standards.

Implementation

For effective implementation, this guide should be used for guidance purposes only and in parallel with the Technical Description for each skill. Experts are encouraged to familiarize themselves thoroughly with both the general guidelines and the particular requirements of their respective skill areas. Collaborative efforts between the Skill Management Team, Experts, and Competitors are vital for achieving the ultimate goal of global skills development.

Conclusion

The Standards and Assessment Guide embodies the commitment of the WorldSkills movement to nurturing talent and promoting the highest standards of vocational education and training worldwide. By providing clear and comprehensive guidance, we aim to empower Experts to conduct marking and assessment practices that are not only rigorous and equitable but also inspiring and transformative for all participants.

Thank you for your dedication to upholding these standards and contributing to the success of the WorldSkills Competition. Together, we can continue to champion skills excellence and celebrate the achievements of talented individuals from around the globe.

Skill 52 – Chemical Laboratory Technology

Measurement

Measurement is used to assess accuracy, precision, and other performance that can be measured objectively. It is used where ambiguity must be avoided.

The total marks allocated to measurement marking may vary from competition to competition depending on the Test Project.

Aspect	WSOS	Descriptor
Planning and justifying the volume and concentration of the solutions to be prepared.	1	The competitor presented, at the report, the volume and concentration of the solution to be prepared and the justification for the definition, considering all the consumptions of the task. * This criterion will only be used in cases where the task does not specify the volume and/or concentration of the solution to be prepared.
Registering the mass or volume of reagent used.	1	The competitor registered, at the Excel spreadsheet for inventory management, the mass or volume or reagent used. *The spreadsheet will be provided on the USB drive.
Health and Safety familiarization.	1	The competitor lists, at the report, all reagents that will be used during the task, their respective principal Globally Harmonized System (GHS) code, and their protective actions. It must be checked and assessed in the moment the competitor starts the practical work. Missing or incomplete familiarization results in a zero for this criterion. The competitor cannot start the task before correcting the error and must sign the acknowledgment form.
Identifying residues during the module execution.	2	The temporary residues flask contains at least the country abbreviation, the module letter (A, B, C, or D), and date. The test project will specify if some residue needs special segregation. Experts must take a picture of the label.
Identifying the prepared solutions	2	The solutions must be labelled with country abbreviation, substance, concentration and date. Experts must take a picture of the label.

Aspect	WSOS	Descriptor
Preparation of a solution from a solid.	3	Weighed the correct mass of solute, according to the calculated value. The calculation must be right. The tolerance is specified at the TP.
Scanning samples and importing data from equipment	3	Performed the scan of the sample between 300 and 600 nm (TP will specify the range) and imported the graph into the report.
Report identification	4	The report contains Title, Competitor name and country, and the day the module was carried out.
Registering measurements	4	The competitor registered, at the report, the volume (or mass, absorbance, refractive index, conductivity, etc.), with all the digits that the equipment allows, or in accordance with the Test Project claim. The measurement unit must be showed.
Plotting a calibration curve	5	The competitor plotted the calibration curve graph of the 'reagent 1' standards and displayed the line equation. Axis must be labelled.
The R^2 of a curve	5	If the R^2 is less than 0,9800, give zero points. If the $0,9800 \leq R^2 < 0,9899$, give 1/3 of the mark. If $0,9899 \leq R^2 < 0,9950$, give 1/2 of the mark. If $R^2 \geq 0,9900$ give full marks. The numbers are illustrative.
Planning a calibration curve using external standards	6	Assess if the calibration curve planning contains at least X points between Y and Z mg/L, and if the preparation calculations are correct. *X, Y and Z according to the test project.
Determining concentrations	6	The competitor determines the "analyte 1" concentration, which must be obtained according to the Test Project specifications — including the number of replicates, coefficient of variation, and tolerance.

Aspect	WSOS	Descriptor
Solvent recovery	7	The competitor recovered at least 50% (example) of the solvent used by distillation.
Segregated "Reagent 2" waste	7	If any waste containing "Reagent 2" is disposed of contrary to the guidance, or if any waste not containing "Reagent 2" is disposed of in the reagent 2-only waste, the expert must immediately request the competitor's signature on the acknowledgment form.

Judgement

Judgement is used to assess the quality of performance about which there may be small differences of view when applying the external benchmarks.

The Resources column in the table below may include all kinds/formats of resources such as a link to a YouTube video, a website link, an illustration, a photo, a reference to a book, and so on. It needs to be as detailed as possible to show the differentiation between 0, 1, 2, 3.

Generic rules:

The assessment group comprises three Experts plus one Expert who acts as the supervisor. The supervising Expert will replace an Expert in the marking group to prevent compatriot marking.

The difference of the three Experts' scores may not exceed 1. If this is the situation the Experts must re-score until there is a maximum difference of 1. As long as the three Experts judge within 1, the result can be entered into the CIS.

The total marks allocated to judgement marking may vary from competition to competition depending on the Test Project.

Aspect – Conclusion regarding the outcome of a synthesis.

WSOS section as per TD	Score	Descriptor	Resource
2	0	The competitor does not answer any of the following items: • The competitor indicates the synthesis yield and all the results of the product qualification and quantification tests. • The competitor comments, using technical language, on all the results of the product qualification and quantification tests, correlating the deviations with possible contaminants. • The competitor comments on which strategies could be used to improve the synthesis yield and the purification methods that could be applied to improve the results of the analyses performed on the obtained product.	

WSOS section as per TD	Score	Descriptor	Resource
	1	The competitor answers two of the three items: • The competitor indicates the synthesis yield and all the results of the product qualification and quantification tests. • The competitor comments, using technical language, on all the results of the product qualification and quantification tests, correlating the deviations with possible contaminants. • The competitor comments on which strategies could be used to improve the synthesis yield and the purification methods that could be applied to improve the results of the analyses performed on the obtained product.	

WSOS section as per TD	Score	Descriptor	Resource
	2	The competitor answers the three items: • The competitor indicates the synthesis yield and all the results of the product qualification and quantification tests. • The competitor comments, using technical language, on all the results of the product qualification and quantification tests, correlating the deviations with possible contaminants. • The competitor comments on which strategies could be used to improve the synthesis yield and the purification methods that could be applied to improve the results of the analyses performed on the obtained product.	

WSOS section as per TD	Score	Descriptor	Resource
	3	The competitor answers all three items and adds comments demonstrating a high level of knowledge about the analysis techniques applied or the type of synthesis performed: • The competitor indicates the synthesis yield and all the results of the product qualification and quantification tests. • The competitor comments, using technical language, on all the results of the product qualification and quantification tests, correlating deviations with possible contaminants. • The competitor comments on which strategies could be used to improve the synthesis yield and the purification methods that could be applied to improve the results of the analyses performed on the obtained product.	