American Society for Clinical Pathology Board of Certification (ASCP BOC)

Practice Analysis Report: Specialist in Cytometry – SCYM

For Development of Content Guideline and June 1, 2026 Examination Publication for SCYM(ASCP) & SCYM(ASCP^{i}) Credentials

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Introduction

The purpose of conducting a practice analysis (a.k.a. job analysis or job task analysis) is to provide the foundation of a credentialing examination by defining practice in a profession. The practice analysis provides evidence of content validation. It is required by psychometric standards and is considered best practice for high-stakes examination development. It also ensures the examination is fair, valid, job-related, and most importantly, legally defensible (Chinn and Hertz 2010)[1]. The American Society for Clinical Pathology Board of Certification (ASCP BOC) conducts a practice analysis approximately every five years in accordance with ASCP BOC Policy and requirements of the accrediting body, ANAB (ANSI [American National Standards Institute] National Accreditation Board), under ISO/IEC 17024.

A practice analysis is a formal process for determining or verifying the responsibilities of individuals in the job/profession, the knowledge individuals must possess, and the skills and abilities necessary to practice safely and effectively in the field. It provides a complete and modern understanding of the duties and functions of practicing laboratory professionals. The practice analysis process is carried out in the form of a survey that lists all the tasks thought to be completed by practicing laboratory professionals. The results of the practice analysis inform the specifications and content of the ASCP BOC examinations. This ensures that the examinations are reflective of current practices, and it helps guarantee that individuals who become credentialed are current and up-to-date on the state of practice and perform safely and effectively as credentialed laboratory professionals.

Practice Analysis Process

The ASCP BOC conducted a practice analysis survey to inform the Specialist in Cytometry – SCYM examination category.

The process for conducting a practice analysis consists of the following steps:

1. Survey Development
2. Demographics
3. Task Inventory – Knowledge and Skill Questions
4. Rating Criteria
5. Survey Construction
6. Pilot Testing and Revision
7. Survey Distribution
8. Survey Analysis
9. Subject Matter Expert (SME) Review and Discussion
10. Examination Revision and Publication

[1] Chinn, R.N., and N.R. Hertz. 2010. *Job Analysis: A Guide for Credentialing Organizations.* Lexington: Council on Licensure, Enforcement and Regulation (CLEAR).

Survey Development

During the October 2022 ASCP BOC Cytometry Examination Committee Meeting, the examination committee volunteers, serving as subject matter experts (SMEs), provided the input and discussion to develop a practice analysis survey. The SMEs collectively discussed all pertinent aspects of their profession to design a concise survey to extract useful feedback from field professionals while maximizing response rate. The survey had two main components: demographics and task inventory with appropriate rating scales for each.

Demographics

The demographic questions asked respondents about their experience, education, job title, type of facility, gender, age, etc. The purpose of these questions was to aid the SMEs in deciding whether the sample of respondents obtained was representative of the profession in general.

Task Inventory – Knowledge and Skill Questions

The survey was broken into two core areas: knowledge and skills. The SMEs developed a series of knowledge areas and job-related task questions that formed the body of the survey. The survey had five major sections:

- Instrumentation
- Panel/Experiment Design
- Applications
- Data
- Laboratory Operations

Rating Criteria

Different rating scales were used to assess knowledge and skills on the survey. One rating scale was used for the knowledge-only tasks and asked respondents to assess the significance of having that knowledge to effectively perform their jobs. The rating scale used for the job-related task questions asked respondents to indicate whether or not they currently performed specific tasks as part of their jobs. If the respondents noted that they did not perform a task, they were asked to indicate whether they needed to have knowledge of the concept or protocol.

Survey Construction

The practice analysis survey was created and delivered through Key Survey. Using an electronic tool allowed survey review and testing via the internet, email tracking of respondents using email addresses, and the ability to send email reminders for completion of the survey.

Pilot Testing and Revision

The SMEs tested a pilot version of the survey. They reviewed and revised different aspects of the survey (e.g., information correctness, grammar/spelling, survey branching). The pilot testing comments and edits informed the final version of the survey.

Survey Distribution

The SMEs determined that the survey should be sent to all current SCYM(ASCP) credential holders in the ASCP BOC Personify database. The survey was open for a 3-week period between February 17 – March 10, 2023. The ASCP BOC team also directly emailed the survey to the SMEs and encouraged these volunteers to disseminate the survey to their colleagues. Additionally, the survey link was shared with the International Clinical Cytometry Society (ICCS) and posted on ASCP BOC social media sites (i.e., Facebook, Instagram, and LinkedIn).

Survey Analysis

The respondents were asked to answer all questions and rate all tasks in the survey. Any individuals not currently practicing (e.g., retired, unemployed, or simply not working in a clinical or research flow cytometry laboratory) were removed from the practice analysis survey.

SME Review and Discussion

During the July 2023 Cytometry Examination Committee Meeting, the SMEs reviewed the practice analysis results. They agreed that the demographic results accurately reflected the SCYM population **(Appendix A).**

In general, tasks performed by at least 40% of the respondents were retained on the task list and considered valid to be included on the examination. The SMEs reviewed all tasks performed by less than 40% of the respondents. If the SMEs determined that a task was critical to patient care and/or was up-and-coming in practice, then it was retained on the task list and considered valid for the examination. If a task was considered outdated or too esoteric, then it was removed from the task list and not included on the examination. The task decisions were compiled into the Final Task List for SCYM **(Appendix B)** which was used to inform the examination content guideline and the content for the examination.

Examination Revision and Publication

The SMEs revised the SCYM Examination Content Guideline based on the Final Task List for SCYM **(Appendix B)**. They reviewed the content area percentages and determined no changes were needed. The SMEs also reviewed the examination database according to the updated content guideline and deleted or revised questions accordingly. They wrote new questions to fulfill the content guideline, and reclassified questions according to the updated guideline. After this work was completed, the SMEs performed standard setting to determine the pass point of the examination, and the new examination was published on June 1, 2026.

SCYM Demographic Analysis

There were 144 total usable survey respondents. Usable respondents met the following criterion:

- Currently working in a clinical or research flow cytometry laboratory in the U.S., U.S. Territories, or Canada

ASCP BOC Credentials

Respondents may have multiple credentials. The most common credentials included:

- 74% Specialist in Cytometry – SCYM(ASCP) or SCYM(ASCP^{i})
- 25% Medical Laboratory Scientist – MLS(ASCP) or MLS(ASCP^{i})
- 4% Medical Laboratory Technician – MLT(ASCP) or MLT(ASCP^{i})
- 3% Specialist in Hematology – SH(ASCP) or SH(ASCP^{i})

Geographic Distribution

There were respondents from across the U.S. The highest percentage were from:

- 9% California
- 9% Texas
- 8% Massachusetts
- 8% New York
- 7% Pennsylvania
- 6% North Carolina

Education

Highest level of education completed:

- 2% associate degree
- 44% baccalaureate degree
- 8% postbaccalaureate program certificate
- 20% master's degree
- 15% doctorate
- 10% postdoctoral training

Experience

Years of experience:

- Mean: 17
- Minimum: 1
- Maximum: 38

Age

Years of age:

- Mean: 47
- Minimum: 24
- Maximum: 65

Facility

Respondents worked in the following types of facilities:

- 33% hospitals
- 29% shared resource facilities
- 17% independent (reference/commercial/private) laboratories
- 13% research laboratories
- 8% other types of facilities

Gender

- 49% female
- 44% male
- 1% nonbinary
- 6% chose not to answer

SCYM Final Task List

The following topics were included on the SCYM examination based on the practice analysis results (see SME Review and Discussion on page 5).

Instrumentation

- Fluidics (e.g., hydrodynamic focusing, properties of sheath fluids)
- Sample delivery techniques (e.g., syringe pump, pressure based, vacuum, acoustic)
- Optical filters (e.g., longpass, bandpass, shortpass, dichroic, neutral density, polarizing)
- Light sources (e.g., laser type, laser line, LED)
- Lenses (e.g., beam shape, collecting, focusing, objective)
- Optical pathways (e.g., transmission, reflection, interrogation point, collinear, spatial separation, light scatter)
- Amplifiers (e.g., linear, logarithmic)
- Pulse measurement (e.g., area, width, height)
- Signal processing (e.g., compensation, time delay, window extension, binning, baseline restoration, background correction)
- Detectors (e.g., photomultiplier tube, photodiode, CCD camera, avalanche photon detector)
- Noise reduction/correction
- Thresholds/discriminators
- Instrument troubleshooting
- Instrument maintenance

Panel/Experiment Design

- Primary tissues (e.g., blood, bone marrow, solid tissue, body fluids)
- Cultured cells
- Soluble analytes (bead-based assays)
- Subcellular components (e.g., mitochondria, nuclei)
- Sample integrity assessment (e.g., sample collection, handling, storage, viability)
- Sample preparation and staining (e.g., disaggregation, lysing agents, aggregates, filtering, fixation, permeabilization)
- Cell enrichment (e.g., cell sorting, density gradient isolation, magnetic beads)
- Assay development (e.g., cell type, subcellular location, molecule)
- Sample state for functional studies (e.g., activated, resting, proliferating)
- Probes (e.g., antibodies, viability/DNA dyes, physiological, tracking dyes, fluorescent proteins)
- Fluorochrome selection (e.g., antigen density, protein coexpression, optimal combination, photostability, F/P ratio, quenching, signal to noise)
- Spectral overlap and compensation protocols
- Assay controls (e.g., fluorescence minus one [FMO], autofluorescence, biological systems control, background measurement controls)
- Assay optimization (e.g., appropriate use of limited sample, frequency of target, cell concentration, kinetics, scalability, blocking, statistical design)
- Assay-specific instrument optimization (e.g., detector settings, filter selections)

Applications

- Immunophenotyping (e.g., immunologic evaluations, hematologic disorders)
- Functional assays (e.g., cytokines, chronic granulomatous disease, calcium flux, phospho flow)
- Multiplex bead assays (e.g., cytokines, proteins, chemokines)
- Transplantation testing (e.g., HLA crossmatch)
- Stem cell analyses (e.g., CD34 absolute counts)
- Cell cycle / DNA ploidy testing
- Cell death (e.g., apoptosis, necrosis)
- Rare event analyses (e.g., circulating tumor cells, measurable residual disease [MRD], circulating endothelial cells)
- Small particle analyses (e.g., viruses, extracellular vesicles, lipid nanoparticles)
- Fetal red blood cell detection assays
- Cell sorting
- Imaging flow cytometry
- Full spectrum cytometry

Data

- Data standards (e.g., FCS format, image file format, listmode, MIFlowCyt checklist, storage requirements)
- Data display (e.g., types of displays, transformations)
- Gating (e.g., hierarchical vs. Boolean gating, gates, regions)
- Statistical methodology (e.g., central tendency, standard deviation, CV)
- Data modeling techniques (e.g., cell cycle analysis, proliferation)
- High-dimensional data analysis (e.g., t-SNE, PCA, UMAP, clustering algorithms)
- Quantitative cytometry (e.g., molecules of equivalent soluble fluorochrome [MESF])
- Enumeration assays (e.g., absolute cell counts)
- Data quality assessment and troubleshooting (e.g., compensation, unmixing, acquisition stability, doublet detection)

Laboratory Operations

- Instrument quality assurance (e.g., optical alignment, detector calibration, filter integrity, optimization)
- Instrument quality control (e.g., instrument performance assessment)
- Reagent verification (e.g., antibody, panel, titer, buffers, lot-to-lot variation, storage, handling)
- Sample integrity assessment (e.g., sample collection, handling, storage, viability)
- Selection of appropriate sample quality controls (internal, external)
- Trend analysis and interpretation (e.g., Levey-Jennings)
- Validation (e.g., accuracy, precision, sensitivity, specificity, linearity, reference ranges, LOD)
- Assay calibration (e.g., MESF, scatter)
- Biological (e.g., biosafety categories, personal protective equipment [PPE], specimen transport and preparation precautions, aerosols, decontamination)
- Instrument (e.g., lasers, electronics)
- Chemical (e.g., mutagenic agents, toxic agents)
- Environmental (e.g., waste disposal)
- Financial duties (e.g., capital equipment acquisition, cost analysis, reimbursement, purchasing, inventory)
- Operations duties (e.g., customer service, facility management, information technology)
- Personnel management (e.g., staffing and productivity, performance standards, training and evaluations, competency assessments)
- Quality management duties (e.g., continuous quality improvement, risk management/medical-legal issues)