

TECHNOLOGIST IN CYTOGENETICS, CG(ASCP) INTERNATIONAL TECHNOLOGIST IN CYTOGENETICS, CG(ASCPⁱ) EXAMINATION CONTENT GUIDELINE

EXAMINATION MODEL

The CG(ASCP) and CG(ASCPⁱ) certification examination is composed of 100 questions given in a 2 hour 30 minute time frame. All exam questions are multiple-choice with one best answer. The certification exam is administered using the format of computer adaptive testing (CAT).

With CAT, when a person answers a question correctly, the next test question has a slightly higher level of difficulty. The difficulty level of the questions presented to the examinee continues to increase until a question is answered incorrectly. Then a slightly easier question is presented. In this way, the test is tailored to the individual's ability level.

Each question in the test bank is calibrated for level of difficulty and is classified by content area. The content area aligns with the examination specific content outline. The examinee must answer enough questions correctly to achieve a measure above the pass point in order to successfully pass the certification examination. There is no set number of questions one must answer to pass, nor is there a set percentage one must achieve to pass. If at the end of the exam the examinee's score is above the pass point, then he or she passes the exam.

EXAMINATION CONTENT AREAS

The CG exam questions encompass the following content areas within Cytogenetics: Specimen Preparation, Molecular Cytogenetic Testing, Chromosome Analysis and Imaging, and Laboratory Operations. Each of these content areas comprises a specific percentage of the overall 100-question exam. The content areas and percentages are described below:

CONTENT AREAS	DESCRIPTION	EXAM PERCENTAGES
SPECIMEN PREPARATION	Specimen collection and transport, verification of specimen and test request, selection of culture system, performance of culture, monitoring and documenting cell growth, selection of harvest technique, slide preparation, evaluation of harvest, and chromosome banding and staining techniques	20 – 25%
MOLECULAR CYTOGENETIC TESTING	Preparation and analysis of FISH slides, FISH quality control, and microarray (theory, limitations, performance, results, and validation)	15 – 20%
CHROMOSOME ANALYSIS AND IMAGING	Operation and maintenance of imaging equipment, chromosome selection, karyogram preparation, chromosome documentation, chromosome identification, and karyogram review	45 – 50%
LABORATORY OPERATIONS	Specimen labeling, reagents, operation and maintenance of lab equipment, cleaning/decontamination, laboratory safety, quality management, continuous quality improvement, patient confidentiality, and professional ethics	10 – 15%

For a more specific overview of the CG exam, please refer to the **CONTENT OUTLINE** starting on page 2.

TECHNOLOGIST IN CYTOGENETICS, CG(ASCP) INTERNATIONAL TECHNOLOGIST IN CYTOGENETICS, CG(ASCPⁱ) EXAMINATION CONTENT OUTLINE

Examination questions, which are related to the subtest areas outlined below, may be both theoretical and procedural. Theoretical questions measure skills necessary to apply knowledge, calculate results, and correlate patient results to disease states. Procedural questions measure skills necessary to perform laboratory techniques and follow quality assurance protocols. Additionally, regulatory questions are based on U.S. sources (e.g., AABB, FDA, CLIA, etc.).

I. SPECIMEN PREPARATION (20 – 25%)

A. Specimen Preparation, Culture, and Harvest

1. Methods for specimen collection and transport
 - a. Specimen requirements: size, containers, transport conditions
 - b. Quality factors: viability, cellularity, contamination
 - c. Compromised or unacceptable specimens
 - d. Specimens for multiple tests
2. Verification of the specimen and test request
 - a. Patient information and test order
 - b. Assign test priority
3. Selection of the appropriate culture system
 - a. Prepare specimens
 - b. Optimal tissue for culture
 - c. Number of cultures
 - d. Label cultures
 - e. Prepare media: supplements, culture conditions
4. Performance of aseptic culture technique
 - a. Prevent microbial contamination
 - b. Prevent cross-contamination between cultures
5. Monitoring and documentation of cell growth
 - a. Contamination: detect, identify, and control
 - b. Culture maintenance
 - c. Subculture monolayer cells
 - d. Assess for harvest
 - e. Culture failures

6. Selection of harvest techniques
 - a. Culture harvest: suspension, in situ or monolayer
 - b. Chromosome elongation techniques
 - c. Mitotic inhibitors, hypotonic solutions, fixatives
 - d. Store fixed cell pellets
7. Preparation of slides
 - a. Ambient conditions
 - b. Slide quality: cell density, morphology, metaphase spreading
 - c. Troubleshoot slide preparation
8. Evaluation of harvest
 - a. Mitotic index
 - b. Troubleshoot: reagents, equipment, specimens

B. Chromosome Banding and Staining Techniques

1. Selection and performance of staining and banding techniques
2. Assessment of staining and troubleshooting

II. MOLECULAR CYTOGENETIC TESTING (15 – 20%)

A. Preparation of Fluorescence In-Situ Hybridization (FISH) Slides

1. Specimen quality
2. Analysis: interphase or metaphase
3. Probe strategy (e.g., break-apart, fusion, locus specific)
4. Processing: denaturation, hybridization, postwash, counterstain

B. Analyses of FISH Slides

1. Signal patterns: score and interpret cells
2. Capture images
3. Document analyses: ISCN
4. Troubleshoot FISH

C. FISH Quality Control

1. Validate probes, establish acceptable ranges
2. Positive/negative controls

D. Microarray

1. Theory and limitations
2. Evaluate and process specimens
3. Evaluate results
4. Confirm results
5. Validation

4. Use of an established format for recording results
 - a. ISCN
 - b. Preliminary results

C. Chromosome Identification and Karyogram Review

1. Metaphase chromosomes: identification, structural and numerical abnormalities
2. Karyogram: chromosome identification, placement and orientation
3. Band level
4. Clinical implications: constitutional, acquired, variants

**III. CHROMOSOME ANALYSIS AND IMAGING
(45 – 50%)**

A. Microscope and Imaging Equipment Operation and Maintenance

1. Operate and maintain microscopes
 - a. Microscopes (e.g., brightfield, fluorescent, phase)
 - b. Identify microscope components and functions
 - c. Achieve optimal resolution
 - d. Troubleshoot microscopy
2. Operate and maintain imaging system
 - a. Capture images
 - b. Enhance images
 - c. Troubleshoot imaging

B. Chromosome Selection, Analysis & Documentation

1. Selection and analysis of suitable metaphases
 - a. Select, count, and analyze metaphases
 - b. Review previous or related results
 - c. Number of cells analyzed
 - d. Number of cultures analyzed
 - e. Document analysis
 - f. Troubleshoot analysis
2. Preparation of accurate karyograms
 - a. Representative images
 - b. Karyogram format
 - c. Number of karyograms
3. Evaluation of constitutional or acquired chromosome abnormalities and clinical implications
 - a. Abnormalities: numerical, structural, mosaicism, fragile sites
 - b. Cultural artifacts, instability syndromes, variants

IV. LABORATORY OPERATIONS (10 – 15%)

A. Laboratory Practice

1. Label specimens
2. Prepare, label and store reagents
3. Operate and maintain laboratory equipment (e.g., temperature, %CO₂, %O₂, humidity)
4. Cleaning/decontamination: instruments, equipment, and work surfaces
5. Monitor laboratory supplies and chemicals
6. Retention times (e.g., specimen, cultures, analysis, image, reports)

B. Laboratory Safety

1. Biological hazards: PPE, biological safety cabinet
2. Chemical hazard plans: SDS, emergency procedures
3. Disposal: biohazard, glass, sharps
4. Ergonomics
5. Laboratory accidents (e.g., needle sticks, spills, splashes)
6. Safety training (e.g., fire, biological hazards)

C. Quality Management and Continuous Quality Improvement

1. Equipment function
2. Reagent performance and/or sterility
3. Document culture or probe failure
4. Record quality indicators
5. Proficiency testing
6. Inspections (e.g., CAP)
7. Training and competency

D. Professional Standards

1. Patient confidentiality
2. Professional ethics and/or standards

Examples provided (as indicated by e.g.) are not limited to those listed.

All Board of Certification examinations use conventional and SI units for results and reference ranges.

You will need to bring a non-programmable calculator with log function to the examination.

END OF CONTENT GUIDELINE