ASCP BOARD OF CERTIFICATION

VALID ONLY FOR CG(ASCP) AND CG(ASCP^{i}) TESTING DATES BEGINNING JANUARY 1, 2024

TECHNOLOGIST IN CYTOGENETICS, CG(ASCP)
INTERNATIONAL TECHNOLOGIST IN CYTOGENETICS, CG(ASCP^{i})

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 AREA	DESCRIPTION	EXAM PERCENTAGE
SPECIMEN PREPARATION, CULTURE, AND HARVEST	Specimen collection and transport; verify specimen and test requests; select appropriate culture systems; aseptic culture technique; monitor and document cell growth; select harvest techniques; slide preparation; chromosome banding and staining techniques	**20 – 25%**
MOLECULAR CYTOGENETIC TESTING	Fluorescent *in situ* hybridization (FISH) slide preparation, analysis, quality control; microarray theory, limitations, result evaluation and confirmation	**15 – 20%**
CHROMOSOME ANALYSIS AND IMAGING	Operate and maintain microscopes and imaging equipment; chromosome selection, analysis, and documentation; chromosome identification; karyogram review	**45 – 50%**
LABORATORY OPERATIONS	Label specimens; reagents; operate and maintain laboratory equipment; laboratory safety; quality management and continuous quality improvement; patient confidentiality; professional ethics and/or standards	**10 – 15%**

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

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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, CULTURE, AND HARVEST (20 – 25%)

A. Specimen Preparation

1. Specimen collection and transport
   a. Specimen requirements (e.g., size, containers, transport conditions)
   b. Quality factors (e.g., viability, cellularity, contamination)
   c. Compromised or unacceptable specimens
   d. Specimens for multiple tests
2. Specimen and test requests
   a. Verify patient information and test orders
   b. Assign test priority

B. Specimen Culture

1. Select appropriate culture systems
   a. Prepare specimens
   b. Optimal culture for specimen type (e.g., monolayer, suspension)
   c. Determine number of cultures
   d. Label cultures
   e. Prepare media (e.g., supplements, culture conditions)
2. Aseptic culture technique
   a. Prevent microbial contamination
   b. Prevent cross-contamination between cultures
3. Monitor and document cell growth
   a. Detect, identify, and control contamination
   b. Culture maintenance
   c. Evaluate/subculture monolayer cells
   d. Assess cultures for harvest
   e. Investigate and document culture failures

C. Culture Harvest

1. Select harvest techniques
   a. Culture harvest (e.g., suspension, *in situ*, monolayer)
   b. Chromosome elongation techniques (e.g., sychronization, intercalation)
   c. Select, prepare, and use mitotic inhibitors, hypotonic solutions, and fixatives
   d. Store fixed-cell pellets
2. Prepare slides
   a. Ambient conditions
   b. Slide quality (e.g., cell density, mitotic index, morphology, metaphase spreading)
   c. Evaluate harvest
   d. Troubleshoot (e.g., reagents, equipment, suboptimal specimens)

D. Chromosome Banding and Staining Techniques

1. G-banding
2. Evaluate and troubleshoot staining/banding

II. MOLECULAR CYTOGENETIC TESTING (15 – 20%)

A. Prepare Fluorescence *In Situ* Hybridization (FISH) Slides

1. Evaluate specimen quality
2. Determine analysis type (i.e., interphase or metaphase)
3. Identify appropriate probe strategy (e.g., break-apart, fusion, amplification, enumeration)
4. Processing
   a. Denaturation
   b. Hybridization
   c. Postwash
   d. Counterstain
   e. Plasma cell enrichment

f. Formalin-fixed paraffin-embedded (FFPE) tissue sections

B. Analyze FISH Slides

1. Score and interpret signal patterns
2. Capture representative cell images
3. Document analyses using ISCN nomenclature
4. Troubleshoot FISH processing issues

C. FISH Quality Control

1. Validate probes and establish reference ranges and cut-offs
2. Positive/negative controls

D. Microarray

1. Theory and limitations
2. Evaluate and confirm results

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

A. Microscope and Imaging Equipment

1. Microscope
   a. Types (e.g., brightfield, fluorescent, phase-contrast)
   b. Components and functions
   c. Achieve optimal resolution
   d. Maintenance and troubleshooting
2. Imaging system
   a. Capture images
   b. Enhance images
   c. Maintenance and troubleshooting

B. Chromosome Selection, Analysis, and Documentation

1. Select and analyze suitable metaphases
   a. Select, count, and analyze metaphases
   b. Review previous or related results
   c. Analyze appropriate number of cells
   d. Analyze appropriate number of cultures
   e. Document analysis
   f. Troubleshoot analysis
2. Prepare accurate karyograms
   a. Select representative images
   b. Arrange chromosomes using an approved format
   c. Prepare appropriate number of karyograms
3. Evaluate constitutional or acquired chromosome abnormalities and clinical implications
   a. Abnormalities (e.g., numerical, structural, mosaicism)
   b. Cultural artifacts, instability syndromes, normal variants
4. Use an established format for recording results
   a. ISCN
   b. Preliminary results

C. Chromosome Identification and Karyogram Review

1. Metaphase chromosomes (e.g., identification, structural and numerical abnormalities)
2. Karyogram (e.g., chromosome identification, placement and orientation)
3. Assess band resolution
4. Clinical implications (e.g., constitutional, acquired, 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, %CO_2, %O_2, humidity)
4. Monitor laboratory supplies and chemicals
5. Retention times (e.g., specimens, cultures, analyses, images, reports)

B. Laboratory Safety

1. Biological hazard safety (e.g., PPE, biological safety cabinet, decontaminate instruments/ equipment and work surfaces)
2. Chemical hazard plans (e.g., SDS, emergency procedures)
3. Fire safety (e.g., fire extinguishers, emergency response)
4. Disposal (e.g., biohazard, glass, sharps)
5. Ergonomics (e.g., posture, chair adjustment)
6. Laboratory accidents (e.g., needlesticks, spills, splashes)
7. Safety training (e.g., fire, biological hazards)

C. Quality Management and Continuous Quality Improvement

1. Monitor/document reagent performance and/or sterility
2. Document culture or probe failures
3. Record quality indicators (e.g., band resolution, turnaround time, error reporting)
4. Proficiency testing

5. Acceditation inspections (e.g., internal, CAP)
6. Training and competency

D. Professional Standards

1. Patient confidentiality (e.g., HIPAA)
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.

END OF CONTENT GUIDELINE