
CONTENT SPECIFICATIONS FOR THE EXAMINATION IN COMPUTED TOMOGRAPHY



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The purpose of the ARRT Examination in Computed Tomography is to assess the knowledge and cognitive skills underlying the intelligent performance of the tasks typically required of staff technologists practicing in this specialized area. In order to identify the knowledge and skills covered by the examination, the ARRT conducted a practice analysis study involving a nationwide sample of CT technologists¹. The results of the practice analysis are reflected in this document.

The table below presents the three major content categories covered on the examination, along with the number of test questions in each major category. The remaining pages of this document list the specific topics addressed within each major content category. The approximate number of test questions allocated to each topic appears in parentheses.

CONTENT CATEGORY	NUMBER OF QUESTIONS²
A. Patient Care	31
B. Imaging Procedures	76
C. Physics and Instrumentation	<u>58</u>
	165

1. A special debt of gratitude is due to the hundreds of professionals participating in this project as committee members, survey respondents, and reviewers.
2. Each exam includes an additional 20 unscored (pilot) questions. On the pages that follow, the approximate number of test questions allocated to each content category appears in parentheses.

A. PATIENT CARE (31)

1. Patient Preparation (2)

- a. Consent
- b. Scheduling and Screening
- c. Patient Education
- d. Immobilization

2. Assessment and Monitoring (4)

- a. History
- b. Vital Signs
- c. Lab Values
 1. BUN
 2. creatinine
 3. PT
 4. PTT
 5. platelet
- d. Medications

3. IV Procedures (5)

- a. Venipuncture
 1. site selection
 2. aseptic and sterile technique
- b. Injection Techniques
 1. manual
 2. automatic
 - a. single phase
 - b. multi-phase
 - c. flow rate

4. Contrast Agents (10)

- a. Types
 1. ionic
 2. non-ionic
 3. barium sulfate
 4. water soluble
 5. air
 6. water
- b. Administration Route and Dose Calculations
 1. IV (angiocatheter or butterfly)
 2. oral
 3. rectal
 4. intrathecal
 5. catheters
- c. Special Considerations
 1. allergy preparation
 2. pathologic processes
 3. contraindications
 4. indications
- d. Adverse Reactions
 1. recognition and assessment of symptoms
 2. treatment (e.g., compresses, medications)
 3. documentation

5. Radiation Safety and Dosimetry (10)

- a. Technical Factors Affecting Patient Dose
 1. kVp
 2. mAs
 3. pitch
 4. collimation
- b. Radiation Protection
 1. shielding
 2. scatter radiation
- c. CT Dose Index (CTDI)/Multiple Scan Average Dose (MSAD)
- d. Pediatric Dose Reduction

B. IMAGING PROCEDURES (76)

<u>TYPE OF STUDY</u>	<u>APPROX. # QUESTIONS</u>	<u>FOCUS OF QUESTIONS</u>
1. Head a. cranial nerves b. internal auditory canal c. petrous pyramid d. pituitary e. orbit f. paranasal sinuses g. maxillofacial h. temporomandibular joint i. posterior fossa j. brain k. cranium l. vascular	(13)	<p><i>Questions about each of the studies listed on the left may focus on any of the following relevant factors:</i></p> <ol style="list-style-type: none"> 1. Sectional Anatomy <ul style="list-style-type: none"> • sagittal plane • transverse plane (axial) • coronal plane • off-axis (oblique) • landmarks • pathology recognition 2. Contrast Media <ul style="list-style-type: none"> • types of agents • indications • contraindications • dose calculation • administration route • scan/prep delay 3. Scanning Procedures <ul style="list-style-type: none"> • positioning • scout • acquisition methods (e.g., spiral, non-spiral, dynamic, multi-row detector) • parameter selection (e.g., slice thickness, mA, time, algorithm, pitch) • protocol modification for pathology or trauma 4. Special Procedures <ul style="list-style-type: none"> • 3-D studies • biopsies • radiation therapy planning • drainage and aspiration • post myelography • CT arthrography • CT angiography • cardiac gating • PET/CT fusion
2. Neck a. larynx b. soft tissue neck c. vascular	(7)	
3. Chest a. mediastinum b. lung c. heart d. airway e. vascular	(14)	
4. Abdomen a. liver b. biliary c. spleen d. pancreas e. adrenals f. kidneys/ureters g. peritoneum h. retroperitoneum i. GI tract j. vascular	(23)	
5. Pelvis a. bladder b. colorectal c. reproductive organs d. vascular	(6)	
6. Musculoskeletal a. upper extremity b. lower extremity c. spine d. pelvic girdle; hips e. shoulder girdle f. sternum g. vascular	(13)	

C. PHYSICS AND INSTRUMENTATION (58)

1. CT System Principles, Operation and Components (17)

- a. Tube
 - 1. kVp
 - 2. mA
 - 3. warm-up procedures
- b. Generator and Transformers
- c. Detector (single and multi-row) and DAS
- d. Collimation
- e. Computer and Array Processor
- f. Equipment Maintenance

2. Image Processing and Display (25)

- a. Image Reconstruction
 - 1. filtered back projection reconstruction
 - 2. reconstruction filters (algorithms)
 - 3. raw data vs. image data
 - 4. prospective/retrospective reconstruction (single and multi-row)
 - 5. effective slice thickness
 - 6. reconstruction interval
- b. Image Display
 - 1. pixel, voxel
 - 2. matrix
 - 3. image magnification
 - 4. field of view (scan, reconstruction and display)
 - 5. attenuation coefficient
 - 6. CT number
 - 7. window level, window width
 - 8. plane specification (x, y, z coordinates)
 - 9. cine
 - 10. ROI (single and multiple image)

- c. Post-Processing
 - 1. multiplanar reformation
 - 2. 3-D rendering (MIP, SSD, VR)
 - 3. quantitative measurements (volume, distance, diameter)
- d. Data Management
 - 1. hard copy
 - 2. storage/archive
 - 3. electronic transmission

3. Image Quality (10)

- a. Spatial Resolution
- b. Contrast Resolution
- c. Noise
- d. Quality Assurance Procedures

4. Artifact Recognition and Reduction (6)

- a. Beam Hardening
- b. Partial Volume Averaging
- c. Motion
- d. Metallic
- e. Edge Gradient
- f. Patient Positioning
- g. Equipment-Induced
 - 1. rings
 - 2. streaks
 - 3. tube arcing
 - 4. cone beam