



The Computed Tomography Examination

The purpose of The American Registry of Radiologic Technologists® (ARRT®) Computed Tomography Examination is to assess the knowledge and cognitive skills underlying the intelligent performance of the tasks typically required of the technologists who perform computed tomography. Using a nationwide survey, the ARRT periodically conducts a practice analysis to develop a task inventory which delineates or lists the job responsibilities typically required of staff computed tomography technologists.¹ An advisory committee then determines the knowledge and cognitive skills needed to perform the tasks on the task inventory and these are organized into the content categories within this document. The document is used to develop the examination. The results of the most recent practice analysis have been applied to this document. Every content category can be linked to one or more activities on the task inventory. The complete [task inventory](#) is available at arrt.org.

The following table presents the major content categories covered on the examination, and indicates the number of test questions in each category. The remaining pages list the specific topics addressed within each category, with the approximate number of test questions allocated to each topic appearing in parentheses.

This document is not intended to serve as a curriculum guide. Although certification and registration programs and educational programs may have related purposes, their functions are clearly different. Educational programs are generally broader in scope and address the subject matter that is included in these content specifications, but do not limit themselves to only this content.

Content Category	Number of Scored Questions ²
A. Patient Care and Safety	36
B. Imaging Procedures	75
C. Physics and Instrumentation	54
Total	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.



A. Patient Care and Safety (36)

I. Patient Assessment and Preparation (8)

- A. Clinical History
- B. Scheduling and Screening
- C. Education
- D. Consent
- E. Immobilization
- F. Monitoring
 - 1. level of consciousness
 - 2. vital signs
 - 3. heart rhythm and cardiac cycle
 - 4. oximetry
- G. Management of Accessory Medical Devices
 - 1. oxygen delivery systems
 - 2. chest tubes
 - 3. in-dwelling catheters
- H. Lab Values
 - 1. renal function (e.g.,* BUN, eGFR, creatinine)
 - 2. blood coagulation (e.g., PT, PTT, platelet, INR)
 - 3. other (e.g., D-dimer, LFT)
- I. Medications and Dosage
 - 1. current (reconciliation)
 - 2. pre-procedure medications (e.g., steroid, anti-anxiety)
 - 3. post-procedure instructions (e.g., diabetic patient)

2. Contrast Administration (16)

- A. Contrast Media
 - 1. ionic, nonionic
 - 2. osmolarity
 - 3. barium sulfate
 - 4. water soluble (iodinated)
 - 5. air
 - 6. water
 - 7. other
- B. Special Contrast Considerations
 - 1. contraindications
 - 2. indications
 - 3. pregnancy
 - 4. lactation
 - 5. dialysis patients

- C. Administration Route and Dose Calculations
 - 1. IV
 - 2. oral
 - 3. rectal
 - 4. intrathecal
 - 5. catheters (e.g., peripheral line, central line, PICC line)
 - 6. other (e.g., stoma, intra-articular)
- D. Venipuncture
 - 1. site selection
 - 2. aseptic and sterile technique
 - 3. documentation (e.g., site, amount, gauge, concentration, rate and number of attempts)
- E. Injection Techniques
 - 1. manual
 - 2. power injector options
 - a. single or dual head
 - b. single phase
 - c. multi-phase
 - d. flow rate
- F. Post-Procedure Care
 - 1. treatment of contrast extravasation
 - 2. documentation
- G. Adverse Reactions
 - 1. recognition and assessment
 - 2. treatment
 - 3. documentation

(Section A continues on the following page.)

*e.g., This is used here and in the remainder of this document to indicate examples of the topics covered, but not a complete list.



A. Patient Care and Safety (continued)

3. Radiation Safety and Dosimetry (12)

A. Technical Factors Affecting Patient Dose

1. kVp
2. mAs
3. pitch
4. collimation/beam width
5. multi-detector configuration
6. gating

B. Radiation Protection and Shielding

1. traditional (e.g., lead apron)
2. non-traditional (e.g., bismuth)

C. Dose Measurement

1. CT Dose Index (CTDI)
2. Dose Length Product (DLP)
3. documentation

D. Patient Dose Reduction and Optimization

1. pediatric
2. adult
3. dose modulation techniques
(e.g., SMART mA, auto mA, CARE dose,
and SURE exposure)
4. iterative reconstruction



B. Imaging Procedures (75)

TYPE OF STUDY

1. Head (13)

- A. Cranial Nerves
- B. Internal Auditory Canal
- C. Temporal Bones
- D. Pituitary
- E. Orbits
- F. Sinuses
- G. Maxillofacial
- H. Temporomandibular Joint
- I. Posterior Fossa
- J. Brain
- K. Cranium
- L. Vascular

2. Neck (5)

- A. Larynx
- B. Soft Tissue Neck
- C. Vascular

3. Chest (15)

- A. Mediastinum
- B. Lung
- C. Heart
- D. Airway
- E. Vascular

4. Abdomen (25)

- A. Liver
- B. Biliary
- C. Spleen
- D. Pancreas
- E. Adrenals
- F. Kidneys and/or Ureters
- G. GI Tract
- H. Vascular

FOCUS OF QUESTIONS

Questions about each of the studies listed on the left may focus on any of the following relevant factors:

1. Sectional Anatomy

- sagittal plane
- transverse plane (axial)
- coronal plane
- off-axis (oblique)
- landmarks
- pathology recognition

2. Contrast Media

- types of agents
- indications
- contraindications
- dose calculation
- administration route
- scan/prep delay (e.g., bolus timing, test bolus)

3. Imaging Processes

- isocentric positioning
- scout
- acquisition methods (e.g., volumetric, axial or sequential)
- parameter selection (e.g., image thickness, mA, time, algorithm, pitch)
- protocol modification for pathology or trauma

4. Special Procedures

- 3D studies
- biopsies
- radiation therapy planning
- drainage
- colonography or virtual colonography
- brain perfusion studies
- transplant studies
- screening

(Section B continues on the following page.)



B. Imaging Procedures (continued)

TYPE OF STUDY

5. Pelvis (6)

- A. Bladder
- B. Colorectal
- C. Reproductive Organs
- D. Vascular

6. Musculoskeletal (11)

- A. Upper Extremity
- B. Lower Extremity
- C. Spine
- D. Pelvis and/or Hips
- E. Shoulder Girdle
- F. Sternum and/or Ribs
- G. Vascular
- H. Post Myelography
- I. CT Arthrography
- J. Diskography

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C. Physics and Instrumentation (54)

1. Radiation Physics (4)

- A. Radiation Interaction with Matter
- B. Acquisition (geometry)
- C. Physical Principles (attenuation)

2. CT System Principles, Operation, and Components (14)

- A. Tube
 - 1. kVp
 - 2. mA
 - 3. warm-up procedures
- B. Generator
- C. Detector Configuration
- D. Data Acquisition Systems (DAS)
- E. Collimation/Beam Width
- F. Computer and Array Processor

3. Image Processing (10)

- A. Reconstruction
 - 1. filtered backprojection reconstruction
 - 2. iterative reconstruction
 - 3. interpolation
 - 4. reconstruction algorithm
 - 5. raw data versus image data
 - 6. prospective/retrospective reconstruction
 - 7. reconstruction interval
- B. Post-Processing
 - 1. Multi-Planar Reformation (MPR)
 - 2. 3D rendering (MIP, SSD, VR)
 - 3. quantitative analysis (e.g., distance, diameter, calcium scoring, ejection fraction)

4. Image Display (10)

- A. Pixel, Voxel
- B. Matrix
- C. Image Magnification
- D. Field of View (scan, reconstruction, and display)
- E. Window Level, Window Width
- F. Cine
- G. ROI (e.g., mean, Standard Deviation [SD])

5. Informatics (2)

- A. Hard/Electronic Copy (e.g., DICOM file format)
- B. Archive
- C. PACS
- D. Security and Confidentiality
- E. Networking

6. Image Quality (9)

- A. Spatial Resolution
- B. Contrast Resolution
- C. Temporal Resolution
- D. Noise and Uniformity
- E. Quality Assurance
- F. CT Number (Hounsfield units)
- G. Linearity

7. Artifact Recognition and Reduction (5)

- A. Beam Hardening or Cupping
- B. Partial Volume Averaging
- C. Motion
- D. Metallic
- E. Edge Gradient
- F. Patient Positioning (out-of-field)
- G. Equipment Induced
 - 1. rings
 - 2. streaks
 - 3. tube arcing
 - 4. cone beam
 - 5. capping