



The Sonography Examination

The purpose of The American Registry of Radiologic Technologists® (ARRT®) Sonography Examination is to assess the knowledge and cognitive skills underlying the intelligent performance of the tasks typically required of sonographers. 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 sonographers¹. 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](http://arrrt.org) is available at arrrt.org.

The following table presents the major content categories covered on the examination, and indicates the number and percentage 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 ARRT programs for certification and registration 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	Percent of Test	Number of Scored Questions ²
A. Patient Care	8%	29
B. Physical Principles of Ultrasound	32%	115
C. Abdominal Procedures	21%	76
D. Obstetrical and Gynecological Procedures	30%	108
E. Superficial Structures and Other Sonographic Procedures	9%	32
Total	100%	360

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 40 unscored (pilot) questions.



A. Patient Care (29)

I. Patient Interactions (10-12)

- A. Confirmation of Exam Requisition
 - 1. verification of patient identification
 - 2. comparison of request to clinical indications
 - 3. verification of exam coding
- B. Legal Issues
 - 1. common terminology (e.g.,* negligence, malpractice)
 - 2. legal doctrines (e.g., respondeat superior, res ipsa loquitur)
- C. Patient's Rights
 - 1. informed consent (written, oral, implied)
 - 2. confidentiality (HIPAA)
 - 3. American Hospital Association (AHA) Patient Care Partnership (Patient's Bill of Rights) (e.g., privacy, access to information, health care proxy, research participation)
- D. ARRT Standards of Ethics
- E. Interpersonal Communications
 - 1. modes of communication
 - a. verbal, written
 - b. nonverbal (e.g., eye contact, touching)
 - 2. challenges in communication
 - a. patient characteristics (e.g., cultural factors, physical or emotional status)
 - b. strategies to improve understanding
 - 3. patient education
 - a. pre-procedural preparation
 - b. explanation of procedure (e.g., risks, benefits)
 - c. follow-up instructions
 - d. referral to other services
 - 4. medical terminology

*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.

2. Patient Management (17-19)

- A. Patient Monitoring and Safety
 - 1. ultrasound bioeffects and safety
 - a. pressure and intensity measurement
 - 1. thermal index (soft tissue, cranium, bone)
 - 2. mechanical index
 - b. research on biological effects
 - c. AIUM recommendations
 - 2. routine monitoring
 - a. fall prevention
 - b. vital signs
 - c. physical signs and symptoms
 - 3. interventional procedures
 - a. patient preparation
 - b. time-out
 - c. informed consent
 - d. sterile technique
 - e. follow-up instructions
 - 4. patient transfer and movement
 - a. operator ergonomics
 - b. body mechanics (balance, alignment, movement)
 - c. patient transfer
 - 5. assisting patients with medical equipment
 - a. infusion catheters and pumps
 - b. pacemakers
 - c. oxygen delivery systems
 - d. other (e.g., nasogastric tubes, urinary catheters)
 - 6. response to common emergencies
 - a. allergic reactions (e.g., contrast, latex)
 - b. cardiac/respiratory arrest (e.g., CPR)
 - c. physical injury or trauma
 - d. other medical disorders (e.g., seizures, diabetic reactions)

(Section A continues on the following page.)



A. Patient Care (continued)

B. Infection Control

1. terminology and basic concepts
 - a. types of asepsis
 - b. sterile technique
 - c. pathogens (e.g., fomites, vehicles, vectors)
 - d. nosocomial infections
 2. cycle of infection
 - a. pathogen
 - b. source or reservoir of infection
 - c. susceptible host
 - d. method of transmission (contact, droplet, airborne, common vehicle, vector-borne)
 3. CDC Standard Precautions (general patient contact)
 - a. handwashing
 - b. gloves, gowns
 - c. masks
 - d. medical asepsis/disinfection
 4. additional or transmission-based precautions (e.g., hepatitis B, HIV, MRSA, tuberculosis)
 - a. blood borne
 - b. airborne (e.g., negative ventilation)
 - c. droplet (e.g., mask)
 - d. contact (e.g., gloves, gown)
 5. reverse isolation
 6. disposal of contaminated materials
 - a. linens
 - b. needles
 - c. patient supplies
 - d. blood and body fluids
 7. equipment
 - a. sterilization
 - b. disinfection
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B. Physical Principles of Ultrasound (115)

I. Propagation of Ultrasound (77-81)

A. Generation of Signal

1. transducers
 - a. construction and properties
 1. crystal thickness, wavelength
 2. frequency spectrum, resonance
 3. damping
 - b. operation
 1. focusing
 2. beam diameter
 3. piezoelectric effect
 - c. types
2. beam configuration
 - a. near and far field
 - b. focal zone
 - c. beam profile
3. pulse characteristics
 - a. pulse repetition frequency
 - b. pulse repetition period
 - c. spatial pulse length
 - d. duty factor
 - e. frequency
- f. resolution
 1. axial
 2. lateral
 3. temporal
 4. elevational
 5. contrast
- g. transducer malfunctions
4. technical factors
 - a. frequency, bandwidth, Q factor
 - b. power
 - c. pressure
 - d. intensity
 - e. amplitude
5. modes
 - a. B-mode
 - b. M-mode
 - c. Doppler
 1. color
 2. spectral
 3. power/energy

(Section B continues on the following page.)



B. Physical Principles of Ultrasound (continued)

B. Tissue Interactions

1. beam interactions
 - a. speed of sound in soft tissue
 1. density
 2. stiffness
 - b. time and distance - range equation
 - c. acoustic impedance
 - d. normal and oblique incidence
 - e. reflection
 - f. transmitted/refracted waves
 - g. intensity
 - h. causes of artifacts
2. attenuation of signal
 - a. frequency dependence
 - b. absorption
 - c. scattering
3. bioeffects
 - a. thermal
 - b. mechanical (e.g., cavitation)
 - c. output measures
(e.g., MI, TIS, TIC, TIB, SPTA)
 - d. ALARA

2. Image Production (34-38)

A. Technical Factors for Diagnostic Quality Images

1. power
2. focal zone
3. depth
4. gain
5. compensation
6. harmonics
7. spatial compounding

B. Detection and Display of Echoes

1. transducer
2. receiver
3. amplitude
4. dynamic range and compression
5. analog-to-digital converter (ADC)
6. digital-to-analog converter (DAC)
7. brightness
8. contrast
9. write magnification
10. post-processing (e.g., smoothing, edge enhancement, filtering, read magnification)
11. emerging technologies
(e.g., 3D imaging, panoramic imaging)

C. Display Modes

1. real-time imaging
 - a. echogenicity of reflectors
 - b. echotextures
 - c. artifacts
2. Doppler
 - a. angle of incidence
 - b. flow direction
 - c. flow velocity
 - d. spectral display (e.g., RI, PI, scale, wall filter)
 - e. hemodynamics

D. Appearance and Causes of Artifacts

1. gray scale (e.g., reverberation, mirror imaging, shadowing, posterior enhancement, comet tail)
2. Doppler (e.g., aliasing, twinkle, mirror image)

E. Evaluation and Selection of Representative Images

F. Improvement of Suboptimal Images

G. Image Archiving



C. Abdominal Procedures (76)

TYPE OF EXAM

1. Abdominal and Transplant Vasculature (16-20)

- A. Aorta and Branches
- B. Inferior Vena Cava (IVC) and Confluences
- C. Portal Veins and Confluences
- D. Transplants (i.e., kidney, liver)

2. Abdominal Organs (56-60)

- A. Biliary System
 1. gallbladder
 2. bile ducts (e.g., CBD, extra-hepatic)
- B. Urinary Tract
 1. kidneys
 2. ureters
 3. bladder
- C. Spleen
- D. Pancreas
- E. Liver
- F. Other
 1. lymph nodes
 2. adrenal glands
 3. gastrointestinal tract
 4. prostate
 5. peritoneal cavity

FOCUS OF QUESTIONS

1. Practice Guidelines (e.g., AIUM, ACR)

- clinical indications
- patient preparation
- patient positioning
- instrumentation (e.g., transducer, stand-off pads)
- technical factors
- evaluation and documentation of visualized anatomy
- optimizing image quality

2. Anatomy and Physiology

- normal
- normal variant
- abnormal
- measurements

3. Abnormalities

- pathology
- congenital anomalies
- lab values
- differential diagnosis

4. Doppler Applications/Blood Flow Characteristics



D. Obstetrical and Gynecological Procedures (108)

TYPE OF EXAM

I. First Trimester Obstetrics (14-16)

- A. Standard Measurements (e.g., heart rate, CRL, MSD)
- B. Maternal Anatomy (e.g., uterus, cervix, adnexa, corpus luteum)
- C. Embryonic Anatomy and Physiology
 1. fetal number
 2. gestational age
 3. gestational sac
 4. decidual layer
 5. amnion
 6. chorion
 7. yolk sac
 8. embryonic pole
 9. cardiac activity
 10. nuchal translucency
- D. Key Abnormalities (e.g., anembryonic pregnancy, spontaneous abortion, ectopic pregnancy, embryonic demise)

2. Second/Third Trimester and High Risk Obstetrics (59-63)

- A. Standard Measurements (e.g., BPD, HC, AC, FL)
- B. Maternal Anatomy (e.g., uterus, cervix, adnexa)
- C. Fetal Anatomy and Physiology
 1. fetal number
 2. position, presentation and lie
 3. gestational age and weight
 4. amniotic fluid volume
 5. cord
 6. placenta
 7. cardiac activity
 8. anatomic systems visualized (e.g., GI, CNS, cardiovascular)
 9. nuchal fold
- D. Chromosomal Abnormalities (e.g., trisomies, triploidy)
- E. Genetic Abnormalities (e.g., polycystic kidney disease, skeletal dysplasia)
- F. Infection (e.g., TORCH)

FOCUS OF QUESTIONS

1. Practice Guidelines (e.g., AIUM, ACR)

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- technical factors
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- optimizing image quality

2. Anatomy and Physiology

- normal
- normal variant
- abnormal
- measurements

3. Abnormalities

- pathology
- congenital anomalies
- lab values
- differential diagnosis

4. Doppler Applications/Blood Flow Characteristics

(Section D continues on the following page.)



D. Obstetrical and Gynecological Procedures (continued)

TYPE OF EXAM

2. **Second/Third Trimester and High Risk Obstetrics (continued)**
 - G. Abnormal Growth and Development (e.g., club foot, atresia, anencephaly, renal agenesis, gastroschisis, VSD)
 - H. Neoplasm (e.g., teratoma)
 - I. Multiple Gestations (e.g., chorionicity, amnionicity, twin-to-twin transfusion syndrome, conjoined)
 - J. Assisted Reproduction/Implantation
 - K. Amniocentesis
 - L. Fetal Biophysical Profile
 - M. Placenta (e.g., trophoblastic disease, previa, accreta, insufficiency, abruption, hematoma)
 - N. Amniotic Fluid (e.g., polyhydramnios, oligohydramnios, PROM)
 - O. Hydrops (immune & non-immune)
 - P. Intrauterine Growth Restriction (symmetric and asymmetric)
 - Q. Umbilical Cord (e.g., 2-vessel cord, knots, vasa previa, prolapse)
 - R. Cervical Incompetence
 - S. Maternal Disease and Abnormality (e.g., diabetes, uterine anomaly)
3. **Gynecologic Structures (30-34)**
 - A. Uterus
 1. myometrium
 2. endometrium
 3. cervix
 - B. Adnexa
 1. ovaries
 2. fallopian tubes
 3. para-ovarian structures
 - C. Cul-de-Sac
 - D. Vagina

FOCUS OF QUESTIONS

1. **Practice Guidelines (e.g., AIUM, ACR)**
 - clinical indications
 - patient preparation
 - patient positioning
 - instrumentation (e.g., transducer, stand-off pads)
 - technical factors
 - evaluation and documentation of visualized anatomy
 - optimizing image quality
2. **Anatomy and Physiology**
 - normal
 - normal variant
 - abnormal
 - measurements
3. **Abnormalities**
 - pathology
 - congenital anomalies
 - lab values
 - differential diagnosis
4. **Doppler Applications/Blood Flow Characteristics**



E. Superficial Structures and Other Sonographic Procedures (32)

TYPE OF EXAM

- 1. Superficial Structures (16-18)**
 - A. Neck, Thyroid and Parathyroid
 - B. Scrotum and Testes
 - C. Breasts
- 2. Other Sonographic Procedures (14-16)**
 - A. Vascular Exams
 1. venous extremity Doppler (lower and upper)
 2. carotid Doppler
 3. post catheterization complications
 - B. Pediatric Exams
 1. neonatal (head, spine, hips)
 2. gastrointestinal tract (e.g., appendix, pylorus, intussusceptions)
 3. adrenal/renal
 - C. Ultrasound Guided Interventional Procedures (e.g., fine needle aspiration, biopsy, catheter placement)
 - D. Miscellaneous
 1. musculoskeletal
 2. superficial masses
 3. noncardiac chest (e.g., pleural space)
 4. abdominal wall

FOCUS OF QUESTIONS

- 1. Practice Guidelines (e.g., AIUM, ACR)**
 - clinical indications
 - patient preparation
 - patient positioning
 - instrumentation (e.g., transducer, stand-off pads)
 - technical factors
 - evaluation and documentation of visualized anatomy
 - optimizing image quality
- 2. Anatomy and Physiology**
 - normal
 - normal variant
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 - measurements
- 3. Abnormalities**
 - pathology
 - congenital anomalies
 - lab values
 - differential diagnosis
- 4. Doppler Applications/Blood Flow Characteristics**