This handbook provides important information for persons planning to take ARRT-administered state licensing examinations for purposes of state credentialing in Radiography, Nuclear Medicine Technology, Radiation Therapy or a post-primary category.

EXAMINATION HANDBOOK
for State Licensing Exams
administered by ARRT in

2019

Policies, procedures, and information in this handbook supersede previous editions. Please review this information carefully; you are responsible for understanding the contents of this handbook. Direct questions and/or correspondence to the state agency with which you applied for licensing.

Important Notice: State Licensing is Not ARRT Credentialing

A passing score on a state licensing examination does not make an individual eligible for ARRT certification and registration. If the six-digit ID number on your Candidate Status Report begins with a “9,” you are a state candidate only. Individuals seeking ARRT certification and registration must have submitted an application directly to ARRT and must have met all other criteria for ARRT certification and registration. Those seeking only state licensing must meet criteria established by the state. Test scores earned as a state candidate may not be used for ARRT certification and registration, however the attempt will count towards the three-attempt, three-year policy for a future exam as an ARRT certification and registration candidate.
How to Use This Handbook

This Examination Handbook is designed to help state licensing candidates understand and prepare for the examination. It is published for each calendar year, but changes to content specifications and policies and procedures may occur during the year so be sure to check www.staterhc.org for updates. To ensure that your exam experience is as successful as possible, you will want to read the following information very carefully and keep the handbook for future reference.

The information in this handbook supersedes that in any prior publications of the ARRT. Earlier versions may contain outdated information. It is your responsibility to obtain a handbook corresponding to the year in which your examination is to be taken, as noted on the front cover of the handbook.

ARRT does not discriminate against individuals on the basis of their race, color, creed, religion, national origin, sex, marital status, status with regard to public assistance, familial status, disability, sexual orientation, gender identity, veteran status, age, or any other legally protected basis.

ARRT is unable to respond to questions regarding individual state licensing requirements and application procedures. Direct your questions to your state licensing agency. A link to individual state licensing agency contact information can be found at www.staterhc.org.

Watch for These Symbols

This icon tips you to ways you can streamline your journey through the examination process.

This exclamation point is your pointer to key pieces of information you need to know.

TIP

NCCA Accreditation

ARRT’s Radiography, Nuclear Medicine Technology, Radiation Therapy, Sonography, Computed Tomography and Registered Radiologist Assistant certification programs have earned accreditation by the National Commission for Certifying Agencies (NCCA), the accrediting body of the Institute for Credentialing Excellence (ICE).

To receive NCCA accreditation, ARRT demonstrated that this certification program met strict standards in accordance with ICE’s mission to promote excellence in competency assurance for practitioners in all occupations and professions.

For more information on ICE/NCCA and their accreditation programs, visit www.credentialingexcellence.org.
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State Licensing vs. ARRT Credentialing

Examinations for radiologic technologist state licensing are administered by The American Registry of Radiologic Technologists® on behalf of your state licensing agency, but state licensing is not ARRT credentialing.

Certification and Registration vs. State-Related Licensing

More than 75 percent of the states have licensing laws covering the practice of radiologic technology. In those states, you must obtain a state license before you can work as a radiologic technologist. In addition, many states use ARRT exam scores and/or credentials when making licensing decisions.

Terminology used in establishing the authority of a technologist is often confusing. ARRT uses the term “certification and registration” when an individual satisfies all eligibility requirements — which include ethics, education and examination. If you wish to become certified and registered with ARRT, you need to submit an application directly to ARRT. Submitting an application to an individual state licensing agency would not make you eligible for ARRT certification and registration.

Although you may have earned your ARRT credential, this does not automatically mean that you are eligible to work in your state. Most states have their own application policies and procedures that you must meet in order to work in the state. Verify with the state licensing agency in the state where you plan to work to make sure you meet their eligibility requirements.

Exam scores earned as a state candidate may not be used for later application to ARRT for certification and registration; however, if you attempt to pass an exam as a state licensing candidate it will be counted as an attempt for purposes of ARRT’s three-attempt, three-year limit for certification and registration (see page 17 for details).

Check your Candidate Status Report (CSR) to ensure that your application was processed for the exam you want — either ARRT certification and registration or state licensing. If the six-digit ID number listed on the front of your CSR begins with a “9,” you are scheduled for state examination only.

ARRT Credentialing

Beyond its state licensing program, ARRT administers a national credentialing program. The following page provides some general information; for details, visit www.arrt.org or phone the ARRT office at (651) 687-0048.

Upholding Exam Security

ARRT takes very seriously its responsibility for exam security... so much so that candidates are held responsible, too. Not upholding your end of the deal could expose you to an ARRT investigation and/or legal complaint.

Why Does Security Matter So Much?

It's a matter of public health.

Security is critical to ensuring that the examination is an accurate and reliable measure of the critical knowledge and cognitive skills underlying the tasks typically required for the practice of medical imaging, interventional procedures, and radiation therapy. In fact, subverting the integrity of ARRT’s exams is illegal, based on a Minnesota law that went into effect August 1, 2010. More information can be found by visiting www.staterhc.org.
Two Pathways to Certification: Primary and Post-Primary

Primary
ARRT provides a primary pathway to certification in five disciplines of radiologic technology:

Radiography
Radiographers apply ionizing radiation to demonstrate portions of the human body — on a radiograph, fluoroscopic screen, or other imaging system — to assist physicians in diagnosis of disease and injury.

Nuclear Medicine Technology
Nuclear medicine technologists use radioactive materials in specialized studies of body organs to assist physicians in diagnosis and treatment of disease.

Radiation Therapy
Radiation therapists use ionizing-radiation producing equipment to administer therapeutic doses of radiation as prescribed by physicians for treatment of disease.

Magnetic Resonance Imaging
Magnetic resonance technologists utilize the resonant frequency properties of atoms within a magnetic field to image anatomic and/or physiologic conditions of the body to assist physicians in the diagnosis of disease.

Sonography
Sonographers use nonionizing, high-frequency sound waves to image portions of the human body to assist physicians in making diagnoses.

Post-Primary
ARRT offers a post-primary pathway to certification in mammography, computed tomography, magnetic resonance imaging, quality management, bone densitometry, cardiac-interventional radiography, vascular-interventional radiography, sonography, vascular sonography, and breast sonography. ARRT also offers certification for radiologist assistants.

Candidates for post-primary certification must be registered by ARRT (except where noted) in the appropriate disciplines as indicated below:

<table>
<thead>
<tr>
<th>Disciplines</th>
<th>Radiography</th>
<th>Nuclear Medicine Technology*</th>
<th>Radiation Therapy</th>
<th>Sonography**</th>
<th>Magnetic Resonance Imaging</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mammography</td>
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<td>Quality Management</td>
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<td>Bone Densitometry</td>
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<td>Cardiac-Interventional Radiography</td>
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<td>Vascular-Interventional Radiography</td>
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<td>Sonography</td>
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<td>Vascular Sonography</td>
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<td>Breast Sonography</td>
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<tr>
<td>Radiologist Assistant</td>
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* Supporting category of Nuclear Medicine Technology may be through ARRT or NMTCB.
** Supporting category of Sonography may be through ARRT or ARDMS.
*** Registration in both Radiography and Mammography as supporting categories are needed for Breast Sonography eligibility.

Candidate Agreement On Exam Disclosure

Disclosing exam information using language that is substantially similar to that used in questions and/or answers on the ARRT exams is considered an attempt to subvert the integrity of the exam when such information is gained as a direct result of having been a candidate. This includes (but is not limited to) disclosures to: students in educational programs, graduates of educational programs, educators or anyone else involved in the preparation of candidates to sit for the exam. It is also considered an attempt to subvert the integrity of the exam to receive, from an exam candidate, exam information that uses language that is substantially similar to that used in questions and/or answers on the ARRT exam, whether requested or not, or to relay such information.

Ask yourself: Would you want a loved one to receive care from an individual who “passed” the ARRT-administered exam because they got a sneak peek at questions and memorized the answers rather than having learned all the critical content that the questions scientifically sample?

Disclosing Exam Information: The Bright Line Between What’s OK and What’s Not

Candidates for state licensing and/or permit examinations see language in the ARRT state licensing examination handbooks, as well as the non-disclosure screens at the test center that clarify what they are agreeing to comply with regarding exam security. This language is reproduced in the box on page 16.

Not living up to these agreements can result in an ARRT investigation which may lead up to the invalidation of the results of the current and any prior examinations. This could also permanently bar the candidate from all future exams as well as
result in the appropriate state licensing agency being notified. Violating these agreements could also lead to legal action. Appendix I has a list of potential exam disclosure scenarios.

If you have any questions about your responsibilities under ARRT’s exam disclosure policy, visit www.staterhc.org.

A video depicting the consequences of violating this policy is available at www.arrt.org/video-library.

Before the Examination

Schedule an appointment to test during your assigned 90-day window, at any of hundreds of test centers across the U.S. and internationally.

Candidate Status Report

ARRT will mail you a Candidate Status Report (CSR) (see Appendix F for sample) after your examination fee is processed at the ARRT. The CSR contains your identification information, your permanent six-digit ARRT ID number, and examination window dates.

Be sure your name on your CSR matches your IDs that you will bring for admission to the test center (see “Acceptable Forms of ID” on page 12). Notify your state immediately — and before scheduling your appointment — if any identification information is incorrect or does not match your IDs. Do not contact ARRT with identification changes.

Don’t schedule your exam appointment until you receive a new CSR and verify that the information is correct. You may then proceed to schedule your appointment.

If you lose your CSR, please contact the ARRT and a duplicate will be mailed. If you do not receive your exam information within the anticipated processing time of four weeks, contact your state licensing agency to verify they have approved your application for examination and have forwarded your exam eligibility to ARRT.

ARRT 90-Day Examination Window

ARRT will assign you a 90-day exam window, which will be printed on your CSR. You should schedule your exam appointment for a date within the 90-day exam window printed on your CSR. Generally, examination windows begin on the Wednesday after your application is processed at the ARRT and extend for 90 calendar days. For example, if an exam payment is processed on Thursday, April 18, 2019, the examination window will begin on Wednesday, April 24, 2019, and ends on Monday, July 22, 2019.

Your exam window will close automatically after 90 days, or if you miss your appointment, your appointment is not canceled in time, if you fail to comply with the non-disclosure agreement at the test center (see page 16), the name on your IDs do not match the name on your CSR, or you have an invalid ID. To open a new exam window, you would have to re-apply through your state licensing agency.

Test Centers

ARRT examinations are administered by Pearson VUE, the electronic testing business of Pearson Education. Their network of more than 200 high-security test centers is specifically designed and built for professional licensure and certification markets in the U.S. and its territories. Certain international test centers are equipped to deliver ARRT exams in selected cities in Canada, Europe, Asia, and Australia. A geographic list of test center locations appears in Appendix G of this handbook, but please keep in mind that location changes may occur after publication. Current test center locations and driving directions may be viewed at www.staterhc.org.
Testing Accommodations

To comply with the Americans With Disabilities Act (ADA), we’ll provide testing accommodations if our partner organization, Paradigm Testing, determines that you meet ADA requirements. Exam accommodations include any changes to standard testing procedures, including requests for additional time, a reader, as well as medical aids such as insulin pumps, Pico magnifiers, lumbar pillows, asthma inhalers, etc.

Process for Exam Fees Paid Directly to ARRT
If your state sends you information on paying ARRT directly, you must submit a Request for Test Accommodations form (located at www.staterhc.org) along with a copy of your state eligibility letter and cashier’s check or money order (personal and business checks are not accepted.) If you are requesting testing accommodations, you may not pay for your exam using the credit card option.

Once ARRT receives your information, we’ll send you instructions (including a 10-digit alpha/numeric authorization code) explaining how to submit your online request for accommodations to Paradigm Testing. You’ll also be required to submit documentation verifying the reason you need accommodations.

ARRT will not assign you an exam window until Paradigm notifies us of the approval or denial of your request for accommodations. If Paradigm denies your request, you have the option to appeal their decision.

If you request accommodations with ARRT, but do not submit your documentation to Paradigm, we will return your fee after one year and your exam eligibility will close. If you apply for accommodations and then decide you no longer wish to go through the approval process, you will need to notify ARRT by fax (651.687.0349, attn: StateRHC Coordinator) to process your exam without test accommodations.

Process for Exam Fees Paid Directly to State
If you paid your exam fee to your state licensing agency and have been assigned an exam window, do not schedule an exam appointment. You must submit a Request for Test Accommodations form (located at www.staterhc.org) to ARRT. Once ARRT receives your request form, we’ll send you instructions (including a 10-digit alpha/numeric authorization code) explaining how to submit your online request for accommodations to Paradigm Testing. You’ll also be required to submit documentation verifying the reason you need accommodations.

Do NOT schedule your exam appointment with Pearson VUE until you receive approval or denial notification of your request for accommodations. If Paradigm denies your request, you have the option to appeal their decision.

If you request accommodations with ARRT, but do not submit your documentation to Paradigm or decide you wish to test without accommodations, you may go ahead and schedule your exam appointment.

Remember, you must submit a Request for Test Accommodations form to ARRT each time you are eligible for examination. If you don’t submit the form each time you wish to take an exam, you’ll have to take your exam without accommodations for the assigned window.

If you asked for and received approval for ADA accommodations, ARRT will send you a letter with instructions on scheduling your appointment with Pearson VUE. You will need to bring your approval letter with you to your exam appointment and give it to test center staff when checking in.
Name/Address Change?

Notify the State
You should notify your state licensing agency (not ARRT) immediately of any name and/or address changes and before scheduling an examination appointment.

TIP
Window Extensions: Maximum of Three Changes
If approved by your state licensing agency, you will be allowed a maximum of three window changes per exam application. If a third window change is allowed to expire, you forfeit your exam fee. To be considered for a new exam window, you must make your request to your state licensing agency.

Address or Name Changes
You must immediately notify your state licensing agency — not ARRT — of any changes to your name or address as submitted on your application form. Changes cannot be processed by ARRT or the Pearson VUE Call Center, or at the test center.

At the test center, the name on your IDs must match your name as it appears on your CSR (the only permissible exception is middle initial versus middle name, as long as the first letters match). Name change requests must be directed to your state licensing agency at least 10 business days before your scheduled appointment to allow enough time for your information to be submitted to Pearson VUE for processing. Requests received less than 10 business days before your exam may not be processed in time, which may result in you being turned away from the test center and forfeiting your fee. If the name on your IDs doesn’t match your CSR, cancel your appointment (see page 10) and correct the discrepancy with your state licensing agency. Don’t schedule a new appointment until you receive a new CSR and verify the changes are correct.

Extending an Exam Window
If circumstances make it impossible for you to schedule your examination during your assigned 90-day exam window, you may request a window extension. Direct requests to your state licensing agency for approval. If your state approves the change, it will contact ARRT to arrange a window extension. ARRT processes window extension requests only when they are received from your state licensing agency, not from you.

If you have an existing appointment, you must cancel it before requesting a window extension, scheduling a new exam date, or changing the test center location. (See “Canceling or Rescheduling Your Appointment” on page 10.)

ARRT must receive a written request from your state — not from you — for a new window on or before the last day of your current 90-day examination window. If your window expires on a weekend or holiday, the request must be received on or before the last business day prior to the expiration date. (Saturday, Sunday and holidays are not considered ARRT business days.) Your new exam window will begin on the day ARRT processes the extension request. ARRT will not accept requests for specific window dates.

ARRT cannot process requests it receives after the last day of your current 90-day exam window or if an examination appointment has been scheduled. ARRT will send you a new CSR when your request is processed.
The Exam Appointment

Once you receive your CSR from ARRT and confirm all of the information is correct, you’re ready to schedule your appointment.

Scheduling Your Appointment

Pearson VUE schedules appointments on a first-come, first-served basis. As soon as you receive your CSR, you may schedule your appointment by:

- calling the Pearson VUE Call Center at the toll-free phone number shown on your CSR (Monday–Friday, 7 a.m.–7 p.m. Central Time); or
- online at www.pearsonvue.com/arrt (see tip at left for details).

Even if you don’t want to take your exam immediately, it’s better to schedule early to obtain your desired choice of exam date. If you delay too long in scheduling your examination, you may not find an available appointment prior to your expiration date. If your window is allowed to expire, you must re-apply with your state licensing agency.

You will be providing and receiving a great deal of important information when scheduling your appointment with Pearson VUE. It is your responsibility to manage that information each step along the way.

Have Your Information Available

Have your CSR at hand when going online or calling to schedule. You cannot schedule a testing appointment until you receive your CSR. You will be able to select a test center from those in Appendix G or on the Pearson VUE website.

When calling to schedule your appointment, you will be asked to verify your name as listed on your CSR and address and to provide your ID number from your CSR. (ARRT does not provide ID numbers over the phone.) Calls may be recorded for quality assurance purposes.

Pearson VUE Call Center staff will help you schedule a date and time for your exam. Test centers are generally open Monday through Friday between the hours of 8 a.m. and 6 p.m. Some test centers offer extended evening or weekend hours.

NOTE: Call Center staff cannot make changes (except adding email and phone info) to the application information you provided to your state and to ARRT. Resolve any discrepancies in name or address with your state licensing agency before you schedule your appointment.

Confirm Your Scheduling Information

Space is provided on the back of your CSR for you to write the date, time, confirmation number, test center location, and name of the Call Center representative. Pearson VUE will email a letter confirming your appointment. The letter will include the address, phone number, and directions to the test center, as well as the date and time of your exam and other important information. Driving directions are also available at www.pearsonvue.com/arrt.

NOTE: Occasionally the email confirmation may be filtered into a SPAM folder based on the security settings of your email account. Be aware that the email confirmation comes from PearsonVUEconfirmation@pearson.com. If you do not receive an email confirmation from VUE within two days, check your filter settings and/or contact the VUE Call Center to confirm your email address on file and your appointment date and time, and request that a new confirmation email be sent.

ARRT and your state licensing agency are not able to confirm testing dates, times, or locations for your exam, nor can ARRT provide driving directions to test centers.
Missing Your Appointment

If you fail to keep your appointment or reschedule it as detailed in the next section, your file will close and you will forfeit your exam fee. ARRT and your state licensing agency are not responsible for appointment time discrepancies between you and the test center.

Canceling or Rescheduling Your Appointment

You may cancel or reschedule an appointment up to 24 hours (one business day) prior to the scheduled appointment — either by phoning (800) 632-9055 (leaving a voicemail on an answering machine is not acceptable) or by visiting www.pearsonvue.com/arrt (be sure to follow the prompts to complete the process). Pearson VUE will send you an email confirmation each time an appointment is scheduled, changed, or canceled. If you do not receive a confirmation, contact Pearson VUE the next day to confirm the transaction. Pearson VUE charges a $10 fee for exam appointments that are canceled or rescheduled. Pearson VUE will collect fees by credit card payment (American Express, MasterCard, Visa or Discover) at the time the appointment is canceled or rescheduled. This includes all changes made online or via the Pearson VUE Call Center.

The table below shows that appointments for a given time on the scheduled exam day must be canceled by that same time on the preceding business day:

<table>
<thead>
<tr>
<th>Scheduled Exam Day</th>
<th>Cancel/Change Deadline (same time as appointment)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monday</td>
<td>Friday of the preceding week</td>
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<tr>
<td>Tuesday</td>
<td>Monday of the same week</td>
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<tr>
<td>Wednesday</td>
<td>Tuesday of the same week</td>
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<tr>
<td>Thursday</td>
<td>Wednesday of the same week</td>
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<tr>
<td>Friday</td>
<td>Thursday of the same week</td>
</tr>
<tr>
<td>Saturday</td>
<td>Friday of the same week</td>
</tr>
</tbody>
</table>

For example, if your exam is scheduled for 9 a.m. on Monday, you must call by 9 a.m. on Friday to cancel. VUE will follow-up with a confirmation email detailing your cancellation or appointment change information.

NOTE: National holidays and weekends are not considered business days.

If you fail to appear for your scheduled appointment and do not reschedule through the procedure above, you will forfeit your examination fee. Neither ARRT, Pearson VUE, nor your state licensing agency are responsible for appointment errors.

ARRT does not grant exceptions for missed appointments under any circumstances.

Follow-Up and Confirm Your Exam Appointment

You are responsible for confirming the date, time, and location of your exam with Pearson VUE. If you don’t receive an email confirmation within one day of scheduling, call the Pearson VUE Call Center to confirm over the phone and request that a duplicate confirmation letter be sent.

This applies to appointments scheduled via the Call Center as well as those scheduled via the Internet.

Exception

Due to call center hours, if your appointment is in a time zone ahead of Central (i.e., Eastern or further east), you must cancel any 8 a.m. appointment by 7 p.m. CT two days in advance.

Calling to Reschedule? Remember to Cancel

Just because a candidate calls to reschedule a testing appointment doesn’t necessarily mean that the initial appointment is automatically canceled. And an uncanceled appointment is the candidate’s responsibility, potentially resulting in forfeiting the application fee.

If you call Pearson VUE intending to reschedule a testing appointment, your initial appointment will remain in effect until you formally approve a new appointment date/time. If you can’t find an appropriate alternative appointment and plan to call back later, your initial appointment will still be on the books.

Play it safe when changing your appointment. Be sure to specifically request that the initial appointment is canceled. The next day, call Pearson VUE to confirm that the appointment was canceled.
Exam Administration Day

Here’s a preview of what you’ll encounter when you open the test center’s front door on the day of your state licensing exam appointment.

Test Center Environment

Pearson VUE test centers provide computerized testing for many organizations. Be aware that other exams may be administered in the test center at the same time as ARRT examinations.

Most test centers are located in buildings comprised of several other offices. Waiting areas at the test centers are small. Friends, relatives or children will not be permitted to wait in the test center or to contact you during your examination.

Test center personnel try to maintain a comfortable temperature in the testing rooms. In spite of these efforts, the room may be too cool or too warm for an individual’s preference, so dress accordingly. Be aware that outerwear (overcoat, windbreaker, jacket, etc.) is not allowed in the testing room; however, clothing typically worn indoors (sweater, sweatshirt without hood, blazer, etc.) is allowed.

Keep in mind that there will be other people at the test center taking exams, so typing, coughing and/or people entering and leaving the testing room may be heard. It is impossible to provide a completely noise-free exam environment. If you feel these distractions may be disruptive to your testing, be sure to request earplugs before beginning your exam. Noise reduction headphones can also be provided.

Follow Procedures

Test center personnel adhere to designated procedures to ensure that their operations meet ARRT criteria for standardized testing. Review the following information before the examination to become familiar with the procedures.

Arrive Early

Having already confirmed the location of the test center, plan your schedule and route to ensure that you arrive at least 30 minutes before your scheduled appointment, to allow time for check-in procedures. Be sure to allow ample time for your commute, especially if inclement weather is a factor.

If you arrive at the test center 15 minutes after your scheduled appointment, you may be required to forfeit your appointment. If an appointment is forfeited, the test center will report to ARRT your failure to take the examination and your file will close. ARRT does not refund examination fees on forfeited appointments. To be considered eligible for a new exam window, you must contact your state licensing agency.

ID, Photo, Signature, Palm Vein Recognition (PVR)

When you arrive at the test center, you will be required to show two forms of identification, both of which show your signature and your pre-printed name as it appears on your CSR. One of the IDs must be a current official government-issued photo ID. See next page for examples of the two types of IDs required.

Your name on your government-issued ID must be the same as that on record with ARRT, as reflected on your most recent CSR. Your ID may contain your full middle name as long as the middle initial on your CSR matches the first letter of your middle name. If your name has a cultural variation, ensure that the same variation appears on the CSR and both IDs.
If you arrive without proper ID or with discrepancies in your name listed on the IDs, you will not be admitted to the test center. You will not be allowed to re-schedule your exam appointment and will forfeit your examination fee. If you are admitted with questionable ID, you may have your score canceled following investigation by ARRT.

Upon checking in, you will be asked to provide a digital signature, which constitutes a) your consent for ARRT and/or Pearson VUE to retain and transmit personal data and exam responses; and b) your agreement to abide by the ARRT Candidate Rules Agreement, which will be presented to you prior to your exam.

You will also have your palm vein scanned and be photographed. If you leave the testing area for any reason, your palm will be scanned upon leaving and again before re-entering.

The palm-vein information and photo are for authentication purposes only. The information is kept confidential and not shared with any organization.

Assignment to Testing Station

Test center personnel will give you a short orientation, provide you with a copy of the ARRT Candidate Rules Agreement (see Appendix K) to read, and then escort you to an assigned workstation. You must remain in your assigned seat during the examination, except when authorized to leave by a test center staff member.

You will be required to keep all personal items in a secure locker. Don’t wear jewelry that may be noisy or disruptive in the testing room. You will be asked to remove jewelry that is wider than ¼” as such items can pose a threat to exam security. If you bring a phone or other electronic device, turn off the device and store it in your locker. You may not access the device until you have completed your exam and are ready to leave the test center. You cannot access items placed in a secure locker for the duration of your exam unless you receive written pre-approval from ARRT. This includes breaks. Test centers assume no responsibility for candidates’ personal belongings.

If you need to leave the testing room for personal reasons, you must first raise your hand to get test center staff’s permission. No additional time is allowed to make up for lost time due to this reason. Test center staff is required to file an incident report with ARRT on any candidate that leaves the testing room for more than 10 minutes.

Test center personnel are not trained to answer specific questions related to ARRT examination content.

Calculators and Notes

Personal calculators are not permitted. Examples of calculators are also presented in the tutorial at the beginning of the exam. Both scientific and basic four-function calculators are provided on the computer, or you may request a basic four-function calculator from test center personnel. Appendix D presents facsimiles of the computer calculators.

Test center personnel will provide an erasable note board and pen, which may be replaced as needed during testing but may not be removed from the testing room at any time. You are not to use the note board until after responding to the non-disclosure agreement, and may not hold your note board up to the screen when

Acceptable Forms of Identification

<table>
<thead>
<tr>
<th>PRIMARY: Must be government-issued, have <strong>pre-printed name, photo, and signature</strong>, and not be expired.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>·</strong> Government-issued driver’s license</td>
</tr>
<tr>
<td><strong>·</strong> State ID card</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SECONDARY: Must have <strong>pre-printed name and signature</strong> and not be expired.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>·</strong> Passport</td>
</tr>
<tr>
<td><strong>·</strong> Military ID</td>
</tr>
</tbody>
</table>

| Very Important! Please note that Permanent Residence Cards (“Green Cards”) or any other IDs that do not have your signature will not be accepted at the test center as valid primary or secondary identification. |

Don’t Bring Yours... Calculators Are Provided

Personal calculators aren’t permitted, so don’t even bring one to the test center. You can use theirs.
responding to questions. You are not allowed to take scratch paper, pens, or pencils into the testing room.

**Requesting Assistance**

Raise your hand to notify test center personnel if:
- you need assistance adjusting the computer screen’s brightness or contrast;
- you would like a hand-held calculator;
- you need earplugs;
- an image appears too large to be fully viewed;
- you suspect a problem with the computer;
- you need another erasable note board;
- you need a break;
- you have completed the exam; or
- you need a staff member for any other reason.

**Test Center Misconduct and Score Cancellation**

Numerous security measures are enforced during the exam administration to ensure the integrity of ARRT exams. Be aware that you will be observed at all times while completing the exam. This includes direct observation by test center staff, as well as video and audio recording of the testing session.

**Zero Tolerance Policy**

ARRT has a zero tolerance policy regarding possession of cell phones and other electronic devices in the test center, as well as candidates leaving the test center building prior to completing the examination and attempting to re-enter the test center. Automatic score cancellation will result for any candidate violating this policy.

1. Under no circumstances are candidates permitted to access cell phones or any other type of electronic device after check-in at the test center. Test center personnel are instructed to dismiss any candidate found in possession of an electronic device after the candidate has completed the check-in procedures. This includes candidates on breaks.

   Such electronic devices include, but are not limited to:
   - cellular phones
   - media players
   - compact disc players or any other electronic communication/recording/listening device
   - removable storage devices
   - personal digital assistants (PDAs)
   - calculator or computing watches
   - scan pens
   - laptop computers, tablets or any computer device
   - photographic devices

   If a candidate is found possessing a cell phone or any other type of electronic device, the candidate will not be allowed to continue testing and the test center administrator will file an incident report. Possession of a cell phone or any other type of electronic listening device after check-in will result in automatic score cancellation.

2. If test center staff observes a candidate leaving the test center building and re-entering the test center prior to completing the exam, the candidate will not be allowed to continue testing and the test center administrator will file an incident report. Leaving the test center building and attempting to re-enter the test center will result in automatic score cancellation.

3. Candidates should not bring papers, pamphlets, books, notebooks or study guides into the exam center. If you bring these items they must remain in your locker for the duration of your exam.

4. For any candidate demonstrating misconduct or irregular behavior during or in connection with the examination — as evidenced by observation, statistical
analysis of exam responses or otherwise — the ARRT will withhold examination scores and may revoke or suspend a certificate, deny or reject an application for renewal of certification and registration, censure or take any other appropriate action. This includes permanently barring the candidate from all future examinations, terminating candidate participation in the exam and invalidating the results of that exam and any prior exam.

Examples of misconduct or irregular behavior include, but are not limited to:

- Removing items from a secured locker without prior authorization;
- Giving or receiving unauthorized help;
- Attempting to take the examination for someone else;
- Failing to follow test center staff instructions;
- Tampering with the operation of the computer or attempting to use it for any function other than completing the examination;
- Attempting to remove exam content (in any format) from the test center;
- Creating a disturbance of any kind; and
- Accessing notes, books, study guides or unauthorized electronic devices.

If found to be in violation of this policy, you may find yourself part of an ARRT ethics investigation, or even a federal court lawsuit for copyright infringement and/or breach of contract.

What if the Test Center is Closed?

If you are unsure whether a test center is closed because of inclement weather or some other factor, phone Pearson VUE’s Call Center at (800) 632-9055. If the test center is open, it is your responsibility to keep the appointment. If it is closed, you will be given the opportunity to reschedule your appointment.

In the event of a test center closing, Pearson VUE will contact you via the email address you provided during scheduling to reschedule your exam appointment. You may also call Pearson VUE to reschedule your exam.

Exam Content

ARRT designs examinations in collaboration with consultants from various specialties. The exams consist of questions designed to measure the knowledge and cognitive skills underlying the intelligent performance of the major tasks typically required in radiologic technology.

The content specifications for the Radiography, Nuclear Medicine Technology, and Radiation Therapy exams are included in this book as Appendices A, B, and C. If you are scheduled for a post-primary examination, the corresponding content specifications are included as a separate insert.

ARRT doesn’t provide specific lists of study materials or textbooks because the exams are built using many references. ARRT neither recommends nor endorses any review programs, mock registries, or study guides for any of its examinations.

ARRT owns the copyright for the examinations. Law prohibits any attempt to reproduce all or part of the examinations. Anyone caught removing exam materials from the test center, whether by physical removal or by reproducing materials from memory, will be prosecuted to the full extent of the law and will be permanently barred from future examinations.

Pilot Questions

Pilot questions are unscored questions embedded in the exam. ARRT uses data from these pilot questions to evaluate new exam questions. This is a cost-effective way to develop exam materials for future candidates, just as past candidates assisted in piloting questions for today.

These questions are not identified as pilot questions, and they appear just like any other question on the test. Up to 20 percent of your test may be unscored pilot questions, and ARRT has allotted extra time for you to complete them. Your answers to these questions will not affect exam scores.
Exam Timing

Time allowed for completing an examination is based on the number of questions. (Also see section on “Exam Content” on previous page.)

The column labeled “exam time” indicates the time allowed for answering the exam questions. The “total time” column adds 30 minutes to exam time to allow 18 minutes for the tutorial, followed by two minutes to respond to the non-disclosure agreement, and 10 minutes for the survey at the end of the exam. This extra 30 minutes is for completion of the tutorial and survey and cannot be used to answer exam questions.

Voluntary breaks are subtracted from the allowed exam time; that is, the clock is not stopped during voluntary breaks.

<table>
<thead>
<tr>
<th>Examination</th>
<th>Exam Time</th>
<th>Total Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radiography</td>
<td>3.5 hours</td>
<td>4.0 hours</td>
</tr>
<tr>
<td>Nuclear Medicine Technology</td>
<td>3.5 hours</td>
<td>4.0 hours</td>
</tr>
<tr>
<td>Radiation Therapy</td>
<td>3.5 hours</td>
<td>4.0 hours</td>
</tr>
<tr>
<td>Mammography</td>
<td>2.5 hours</td>
<td>3.0 hours</td>
</tr>
<tr>
<td>Computed Tomography</td>
<td>3.5 hours</td>
<td>4.0 hours</td>
</tr>
<tr>
<td>Magnetic Resonance Imaging</td>
<td>3.5 hours</td>
<td>4.0 hours</td>
</tr>
<tr>
<td>Quality Management</td>
<td>3.5 hours</td>
<td>4.0 hours</td>
</tr>
<tr>
<td>Sonography</td>
<td>6.5 hours</td>
<td>7.5 hours*</td>
</tr>
<tr>
<td>Bone Densitometry</td>
<td>1.75 hours</td>
<td>2.25 hours</td>
</tr>
<tr>
<td>Vascular Sonography</td>
<td>3.5 hours</td>
<td>4.0 hours</td>
</tr>
<tr>
<td>Cardiac-Interventional Radiography</td>
<td>3.0 hours</td>
<td>3.5 hours</td>
</tr>
<tr>
<td>Vascular-Interventional Radiography</td>
<td>3.5 hours</td>
<td>4.0 hours</td>
</tr>
<tr>
<td>Breast Sonography</td>
<td>3.5 hours</td>
<td>4.0 hours</td>
</tr>
</tbody>
</table>

*T The Sonography examination has a 30-minute break between the two segments of the exam, bringing the total time to 7.5 hours.

ARRT recommends that you complete the tutorial to familiarize yourself with the testing program and the online calculators. You must also click “A” for the non-disclosure agreement (see box on next page), which appears after the tutorial before starting the exam.

Taking the Exam

Order of Questions
ARRT examinations present questions in random order, which is consistent with the purposes of education and evaluation. When an individual learns an important concept, the intent is that he or she will take that knowledge beyond a specific context or environment and generalize that knowledge to the practice setting.

Question Format
Most exam items are standard multiple-choice with one best answer. ARRT is also introducing new formats on a limited basis. Some items may require that you select multiple answers from a list or use the mouse to sort a list of options into a particular order. A few items may require that you identify anatomic structures on an image by placing the mouse arrow (cursor) over the correct location on the screen and clicking. Others may require you to answer a multiple-choice question after viewing a short video clip. Appendix D provides additional information on exam item formats.

Selecting Answers
An answer must be recorded for a question before the computer allows display of the next question. You may mark questions for later review if you are unsure of the answer. For further information, refer to Appendix D.

Pacing
It’s important to use your time economically. Time remaining is displayed in the upper right corner of the screen. If a question is difficult, guess at the answer, flag the question for review and go on to the next question. When you have finished the examination and there is still time left, go back to the questions that you flagged and review them. (See Appendix D for more information.)
Guessing
Exam scores are based upon the total number of correct answers. Therefore, it is to your advantage to answer every question, even if that means selecting an answer of which you are not sure. You must indicate some response to each question before the computer will proceed to the next question.

Candidate Comments
You may comment on a specific question at the time you answer the question by clicking on the “Comment” button at the top of that page. No additional testing time is allowed during the exam for making comments on questions. You may comment on your test center experience in the evaluation survey at the end of your exam.

Leaving the Test Center
When you are finished with the examination and evaluation survey, raise your hand and test center staff will collect the erasable note board before dismissing you. Do not leave your seat until you have been dismissed. You may not remove note boards from the testing room. Your palm will be scanned again before leaving the test center.

Appeals of Exam Administration
ARRT makes every effort to assure that examinations are fairly administered in a comfortable and safe environment.

On rare occasions, candidates may encounter technical difficulties at the test center. If you experience a technical difficulty, notify the test center administrator immediately. Test center personnel will make every effort to correct any difficulties as quickly as possible.

Should the test center experience a loss of power, back-up systems are in place, so every reasonable effort will be made to retrieve testing data. Once power is restored, you will be able to continue your testing session from the point where you were interrupted. If you are unable to continue the testing session due to severe technical difficulties, reasonable accommodations will be made, including re-scheduling of an exam appointment. ARRT will evaluate individual requests for re-scheduling at no cost.

If you believe that your examination was administered in a manner that substantially deviated from normal testing procedures, you may request a review of the procedures. If you experience a problem, verify with the test center administrator before you leave the test center that they will file a report regarding your issue—and request a copy of the incident number from that report.

If you wish to request a review, submit a completed Appeal of Exam Administration Procedures form (at www.staterhc.org) detailing the specific nature of the alleged deviation from normal testing procedures. Be sure to include your email address, along with the examination discipline, administration date and test center location.

Because ARRT will investigate complaints only if they are received before your results have been released, you have only two days to submit the request. You may fax the appeal form to 651.687.0349, then call 651.687.0048, ext. 3155, to confirm receipt.

If ARRT finds that any such deviation unfairly interfered with your ability to complete the exam to the best of your ability in the allotted time, your original score will be canceled and you will be allowed to retake the examination at no cost. Under no circumstances will your score be adjusted based upon the findings of the review.
Cancellation of Scores

ARRT may withhold or cancel scores if there is evidence that the security of the examination has been compromised. Such action may be necessary even in the absence of evidence indicating that a candidate was knowingly involved in the compromising activities. ARRT expects candidates to cooperate in any investigation. Once scores are cancelled, they are not available for reporting at a later date.

Some scores may be rendered invalid because of circumstances beyond a candidate’s control, such as technical difficulties. ARRT investigates each of these situations. When this results in a cancellation of scores, ARRT arranges for a makeup administration of the exam at no additional cost.

Score Reporting

You will not see a preliminary score at the end of your exam at the test center. ARRT does not release scores to state candidates. Your score information is forwarded to your state licensing agency, which determines the pass/fail status and notifies you of your official pass/fail status. Contact your state licensing agency — not ARRT — if you have not received your results within four weeks.

Interpreting Scores

ARRT uses “scaled scores” to report examination results. Scaled scores are more meaningful than raw scores (i.e., number or percentage correct) because they take into account the difficulty of a particular test compared to other forms of the same exam. Therefore, a scaled score of 75 represents the same level of exam performance, regardless of what examination form was administered.

Total scores are reported on a scale that ranges from 1 to 99. The total scaled score does not equal the number or percentage of questions answered correctly. A total scaled score of 75 is required to pass the exam. The number of correct answers required to achieve a score of 75 was determined through a standard-setting (or passing score) study. ARRT and panels of consultants periodically review the passing score to assure its validity.

Performance on each section of the exam is also reported using scaled scores. These section scores provide information to candidates regarding their strengths and weaknesses in particular content categories. Pass/fail decisions are not based on individual sections of the exam. Section scores can range from 1 to 10 and are reported in one-tenth point intervals (e.g., 8.1, 8.6). Section scores are intentionally placed on a narrower scale because they are based on fewer exam questions. Therefore, section scores are not as reliable as the total scaled score and should be interpreted with some discretion.

For more information on ARRT exam scoring, contact the ARRT office to request a copy of the “Settle the Score” brochure. Or, look for it on the web site at www.arrt.org.

Appeals of Exam Scoring

The ARRT employs several quality control procedures to ensure that all examinations are scored with complete accuracy. However, you may request a review of the accuracy of the scoring process if you feel an error has occurred.

If you wish a review of scoring, you must send a letter of request to the ARRT within 30 days of your exam date — detailing the specific reason a scoring error is suspected. Requests must be accompanied by a $25 fee, payable to ARRT. The
ARRT will review your responses to each question, compare those responses to the answer key, and recalculate both raw scores and scaled scores.

ARRT will report its findings to you and your state licensing agency within 30 days of receiving the written request. If ARRT finds evidence of any scoring error, it will cancel the original score and notify your state of the corrected score.

Re-examination

If you fail the examination, do not appear as scheduled, answer no or do not respond to the non-disclosure agreement, or allow your 90-day exam window to expire or you were turned away due to invalid IDs, you should contact your state licensing agency for information on their re-examination process. Once your state has determined you are eligible for re-examination, they will notify ARRT. Once ARRT processes your new exam fee, a new handbook and CSR indicating your new 90-day exam window will be mailed to you.

Appendices

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Radiography Examination

The purpose of the American Registry of Radiologic Technologists® (ARRT®) Radiography Examination is to assess the knowledge and cognitive skills underlying the intelligent performance of the tasks typically required of radiographers. 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 radiographers. 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 four 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 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.

<table>
<thead>
<tr>
<th>Content Category</th>
<th>Number of Scored Questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient Care</td>
<td>33</td>
</tr>
<tr>
<td>Patient Interactions and Management</td>
<td></td>
</tr>
<tr>
<td>Safety</td>
<td>53</td>
</tr>
<tr>
<td>Radiation Physics and Radiobiology</td>
<td></td>
</tr>
<tr>
<td>Radiation Protection</td>
<td></td>
</tr>
<tr>
<td>Image Production</td>
<td>50</td>
</tr>
<tr>
<td>Image Acquisition and Technical Evaluation</td>
<td></td>
</tr>
<tr>
<td>Equipment Operation and Quality Assurance</td>
<td></td>
</tr>
<tr>
<td>Procedures</td>
<td>64</td>
</tr>
<tr>
<td>Head, Spine and Pelvis Procedures</td>
<td></td>
</tr>
<tr>
<td>Thorax and Abdomen Procedures</td>
<td></td>
</tr>
<tr>
<td>Extremity Procedures</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>200</td>
</tr>
</tbody>
</table>

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.
3 SI units will become the primary (prINCIPLE) units of radiation measurement used on the radiography examination in 2017.
Patient Care (33)

1. Patient Interactions and Management (33)

A. Ethical and Legal Aspects
   1. patient’s rights
      a. informed consent (e.g., written, oral, implied)
      b. confidentiality (HIPAA)
      c. American Hospital Association (AHA) Patient Care Partnership
         (Patient’s Bill of Rights)
         1. privacy
         2. extent of care (e.g., DNR)
         3. access to information
         4. living will, health care proxy, advanced directives
         5. research participation
   2. legal issues
      a. verification (e.g., patient identification, compare order to clinical indication)
      b. common terminology (e.g., battery, negligence, malpractice, beneficence)
      c. legal doctrines (e.g., respondeat superior, res ipsa loquitur)
      d. restraints versus immobilization
      e. manipulation of electronic data (e.g., exposure indicator, processing algorithm, brightness and contrast, cropping or masking off anatomy)
   3. ARRT Standards of Ethics

B. Interpersonal Communication
   1. modes of communication
      a. verbal/written
      b. nonverbal (e.g., eye contact, touching)
   2. challenges in communication
      a. interactions with others
         1. language barriers
         2. cultural and social factors
         3. physical or sensory impairments
         4. age
         5. emotional status, acceptance of condition
      b. explanation of medical terms
      c. strategies to improve understanding
      3. patient education

   a. explanation of current procedure (e.g., purpose, exam length)
   b. verify informed consent when necessary
   c. pre- and post-examination instructions (e.g., preparation, diet, medications and discharge instructions)
   d. respond to inquiries about other imaging modalities (e.g., CT, MRI, mammography, sonography, nuclear medicine, bone densitometry regarding dose differences, types of radiation, patient preps)

C. Physical Assistance and Monitoring
   1. patient transfer and movement
      a. body mechanics (e.g., balance, alignment, movement)
      b. patient transfer techniques
   2. assisting patients with medical equipment
      a. infusion catheters and pumps
      b. oxygen delivery systems
      c. other (e.g., nasogastric tubes, urinary catheters, tracheostomy tubes)
   3. routine monitoring
      a. vital signs
      b. physical signs and symptoms (e.g., motor control, severity of injury)
      c. fall prevention
      d. documentation

D. Medical Emergencies
   1. allergic reactions (e.g., contrast media, latex)
   2. cardiac or respiratory arrest (e.g., CPR)
   3. physical injury or trauma
   4. other medical disorders (e.g., seizures, diabetic reactions)

*The abbreviation “e.g.” is used to indicate that examples are listed in parentheses, but that it is not a complete list of all possibilities.

(Patient Care continues on the following page.)
Patient Care (continued)

E. Infection Control
1. cycle of infection
   a. pathogen
   b. reservoir
   c. portal of exit
   d. mode of transmission
      1. direct
         a. droplet
         b. direct contact
      2. indirect
         a. airborne
         b. vehicle borne–fomite
         c. vector borne–mechanical or biological
   e. portal of entry
   f. susceptible host
2. asepsis
   a. equipment disinfection
   b. equipment sterilization
   c. medical aseptic technique
   d. sterile technique
3. CDC Standard Precautions
   a. hand hygiene
   b. use of personal protective equipment (e.g., gloves, gowns, masks)
   c. safe injection practices
   d. safe handling of contaminated equipment/surfaces
   e. disposal of contaminated materials
      1. linens
      2. needles
      3. patient supplies
      4. blood and body fluids
4. transmission-based precautions
   a. contact
   b. droplet
   c. airborne
5. additional precautions
   a. neutropenic precautions (reverse isolation)
   b. healthcare associated (nosocomial) infections

F. Handling and Disposal of Toxic or Hazardous Material
1. types of materials
   a. chemicals
   b. chemotherapy
2. safety data sheet (e.g., material safety data sheets)

G. Pharmacology
1. patient history
   a. medication reconciliation
      (current medications)
   b. premedications
   c. contraindications
   d. scheduling and sequencing examinations
2. administration
   a. routes (e.g., IV, oral)
   b. supplies (e.g., enema kits, needles)
3. venipuncture
   a. venous anatomy
   b. supplies
   c. procedural technique
4. contrast media types and properties
   (e.g., iodinated, water soluble, barium, ionic versus non-ionic)
5. appropriateness of contrast media to exam
   a. patient condition
      (e.g., perforated bowel)
   b. patient age and weight
   c. laboratory values
      (e.g., BUN, creatinine, GFR)
6. complications/reactions
   a. local effects
      (e.g., extravasation/infiltration, phlebitis)
   b. systemic effects
      1. mild
      2. moderate
      3. severe
   c. emergency medications
   d. radiographer’s response and documentation
Safety (53)

1. Radiation Physics and Radiobiology (22)

A. Principles of Radiation Physics
   1. x-ray production
      a. source of free electrons (e.g., thermionic emission)
      b. acceleration of electrons
      c. focusing of electrons
      d. deceleration of electrons
   2. target interactions
      a. bremsstrahlung
      b. characteristic
   3. x-ray beam
      a. frequency and wavelength
      b. beam characteristics
         1. quality
         2. quantity
         3. primary versus remnant (exit)
      c. inverse square law
      d. fundamental properties
         (e.g., travel in straight lines, ionize matter)
   4. photon interactions with matter
      a. Compton effect
      b. photoelectric absorption
      c. coherent (classical) scatter
      d. attenuation by various tissues
         1. thickness of body part
         2. type of tissue (atomic number)

B. Biological Aspects of Radiation
   1. SI units of measurement
      a. absorbed dose
      b. dose equivalent
      c. exposure
      d. effective dose
      e. air kerma
   2. radiosensitivity
      a. dose-response relationships
      b. relative tissue radiosensitivities
         (e.g., LET, RBE)
      c. cell survival and recovery (LD_{50})
      d. oxygen effect
   3. somatic effects
      a. short-term versus long-term effects
      b. acute versus chronic effects
      c. carcinogenesis
      d. organ and tissue response
         (e.g., eye, thyroid, breast, bone marrow, skin, gonadal)
   4. acute radiation syndromes
      a. hemopoietic
      b. gastrointestinal (GI)
      c. central nervous system (CNS)
   5. embryonic and fetal risks
   6. genetic impact
      a. genetically significant dose
      b. goals of gonadal shielding

(Safety continues on the following page.)
Safety (continued)

2. Radiation Protection (31)

A. Minimizing Patient Exposure
   1. exposure factors
      a. kVp
      b. mAs
      c. automatic exposure control (AEC)
   2. shielding
      a. rationale for use
      b. types
      c. placement
   3. beam restriction
      a. purpose of primary beam restriction
      b. types (e.g., collimators)
   4. filtration
      a. effect on skin and organ exposure
      b. effect on average beam energy
      c. NCRP recommendations (NCRP #102, minimum filtration in useful beam)
   5. patient considerations
      a. positioning
      b. communication
      c. pediatric
      d. morbid obesity
   6. radiographic dose documentation
   7. image receptors
   8. grids
   9. fluoroscopy
      a. pulsed
      b. exposure factors
      c. grids
      d. positioning
      e. fluoroscopy time
      f. automatic brightness control (ABC) or automatic exposure rate control (AERC)
      g. receptor positioning
      h. magnification mode
      i. air kerma display
      j. last image hold
      k. dose or time documentation
      l. minimum source-to-skin distance (21 CFR)
   10. dose area product (DAP) meter

B. Personnel Protection (ALARA)*
   1. sources of radiation exposure
      a. primary x-ray beam
      b. secondary radiation
         1. scatter
         2. leakage
      c. patient as source
   2. basic methods of protection
      a. time
      b. distance
      c. shielding
   3. protective devices
      a. types
      b. attenuation properties
      c. minimum lead equivalent (NCRP #102)
   4. special considerations
      a. mobile units
      b. fluoroscopy
         1. protective drapes
         2. protective Bucky slot cover
         3. cumulative timer
         4. remote-controlled fluoroscopy
      c. guidelines for fluoroscopy and mobile units (NCRP #102, 21 CFR)
         1. fluoroscopy exposure rates (normal and high-level control)
         2. exposure switch guidelines
   5. radiation exposure and monitoring
      a. dosimeters
         1. types
         2. proper use
      b. NCRP recommendations for personnel monitoring (NCRP #116)
         1. occupational exposure
         2. public exposure
         3. embryo/fetus exposure
         4. dose equivalent limits
         5. evaluation and maintenance of personnel dosimetry records
   6. handling and disposal of radioactive material

* (August 24, 2016) Note: Although it is the radiographer’s responsibility to apply radiation protection principles to minimize bioeffects for both patients and personnel, the ALARA concept is specific to personnel protection and is listed only for that section.
Image Production (50)

1. Image Acquisition and Technical Evaluation (21)

A. Selection of Technical Factors Affecting Radiographic Quality
   Refer to Attachment C to clarify terms that may occur on the exam.
   (X indicates topics covered on the examination.)

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>a. mAs</td>
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<td>b. kVp</td>
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<td>c. OID</td>
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<td>e. focal spot size</td>
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<td>f. grids*</td>
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<td>g. tube filtration</td>
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<td>i. motion</td>
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<td>j. anode heel effect</td>
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<td>k. patient factors (size, pathology)</td>
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<tr>
<td>l. angle (tube, part, or receptor)</td>
<td>X</td>
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</table>

* Includes conversion factors for grids

B. Technique Charts

1. anatomically programmed technique
2. caliper measurement
3. fixed versus variable kVp
4. special considerations
   a. casts
   b. pathologic factors
   c. age (e.g., pediatric, geriatric)
   d. body mass index (BMI)
   e. contrast media

C. Automatic Exposure Control (AEC)

1. effects of changing exposure factors on radiographic quality
2. detector selection
3. anatomic alignment
4. exposure adjustment (e.g., density, +1 or -1)

D. Digital Imaging Characteristics

1. spatial resolution (equipment related)
   a. pixel characteristics (e.g., size, pitch)
   b. detector element (DEL) (e.g., size, pitch, fill factor)
   c. matrix size
   d. sampling frequency
2. contrast resolution (equipment related)
   a. bit depth
   b. modulation transfer function (MTF)
   c. detective quantum efficiency (DQE)
3. image signal (exposure related)
   a. dynamic range
   b. quantum noise (quantum mottle)
   c. signal to noise ratio (SNR)
   d. contrast to noise ratio (CNR)

E. Image Identification

1. methods (e.g., radiographic, electronic)
2. legal considerations (e.g., patient data, examination data)

(Image Production continues on the following page.)
Image Production (continued)

2. Equipment Operation and Quality Assurance (29)

A. Imaging Equipment
1. components of radiographic unit (fixed or mobile)
   a. operating console
   b. x-ray tube construction
      1. electron source
      2. target materials
   c. automatic exposure control (AEC)
      1. radiation detectors
      2. back-up timer
      3. exposure adjustment
         (e.g., density, +1 or −1)
      4. minimum response time
   d. manual exposure controls
   e. beam restriction
2. x-ray generator, transformers and rectification system
   a. basic principles
   b. phase, pulse and frequency
   c. tube loading
3. components of fluoroscopic unit (fixed or mobile)
   a. image receptors
      1. image intensifier
      2. flat panel
   b. viewing systems
   c. recording systems
   d. automatic brightness control (ABC) or automatic exposure rate control (AERC)
   e. magnification mode
   f. table
4. components of digital imaging
   a. CR components
      1. plate (e.g., photo-stimulable phosphor (PSP))
      2. plate reader
   b. DR image receptors
      1. flat panel
      2. charge coupled device (CCD)
      3. complementary metal oxide semiconductor (CMOS)
5. accessories
   a. stationary grids
   b. Bucky assembly
   c. compensating filters

B. Image Processing and Display
1. raw data (pre-processing)
   a. analog-to-digital converter (ADC)
   b. quantization
   c. corrections (e.g., rescaling, flat fielding, dead pixel correction)
   d. histogram
2. corrected data for processing
   a. grayscale
   b. edge enhancement
   c. equalization
   d. smoothing
3. data for display
   a. values of interest (VOI)
   b. look-up table (LUT)
4. post-processing
   a. brightness
   b. contrast
   c. region of interest (ROI)
   d. electronic cropping or masking
   e. stitching
5. display monitors
   a. viewing conditions (e.g., viewing angle, ambient lighting)
   b. spatial resolution (e.g., pixel size, pixel pitch)
   c. brightness and contrast
6. imaging informatics
   a. DICOM
   b. PACS
   c. RIS (modality work list)
   d. HIS
   e. EMR or EHR

(Image Production continues on the following page.)
Image Production (continued)

C. Criteria for Image Evaluation of Technical Factors
   1. exposure indicator
   2. quantum noise (quantum mottle)
   3. gross exposure error
      (e.g., loss of contrast, saturation)
   4. contrast
   5. spatial resolution
   6. distortion (e.g., size, shape)
   7. identification markers
      (e.g., anatomical side, patient, date)
   8. image artifacts
   9. radiation fog

D. Quality Control of Imaging Equipment and Accessories
   1. beam restriction
      a. light field to radiation field alignment
      b. central ray alignment
   2. recognition and reporting of malfunctions
   3. digital imaging receptor systems
      a. maintenance (e.g., detector calibration, plate reader calibration)
      b. QC tests (e.g., erasure thoroughness, plate uniformity, spatial resolution)
      c. display monitor quality assurance
         (e.g., grayscale standard display function, luminance)
   4. shielding accessories
      (e.g., lead apron, glove testing)
Procedures (64)

This section addresses imaging procedures for the anatomic regions listed below. Questions will cover the following topics:

1. Positioning (e.g., topographic landmarks, body positions, path of central ray, immobilization devices, respiration).
2. Anatomy (e.g., including physiology, basic pathology, and related medical terminology).
3. Procedure adaptation (e.g., body habitus, body mass index, trauma, pathology, age, limited mobility).
4. Evaluation of displayed anatomical structures (e.g., patient positioning, tube-part-image receptor alignment).

The specific radiographic positions and projections within each anatomic region that may be covered on the examination are listed in Attachment A. A guide to positioning terminology appears in Attachment B.

1. Head, Spine and Pelvis Procedures (18)
   
   A. Head
   1. skull
   2. facial bones
   3. mandible
   4. zygomatic arch
   5. temporomandibular joints
   6. nasal bones
   7. orbits
   8. paranasal sinuses

   B. Spine and Pelvis
   1. cervical spine
   2. thoracic spine
   3. scoliosis series
   4. lumbar spine
   5. sacrum and coccyx
   6. myelography
   7. sacroiliac joints
   8. pelvis and hip
   9. hysterosalpingography

2. Thorax and Abdomen Procedures (21)

   A. Thorax
   1. chest
   2. ribs
   3. sternum
   4. soft tissue neck

   B. Abdomen and GI Studies
   1. abdomen
   2. esophagus
   3. swallowing dysfunction study
   4. upper GI series, single or double contrast
   5. small bowel series
   6. contrast enema, single or double contrast
   7. surgical cholangiography
   8. ERCP

3. Extremity Procedures (25)

   A. Upper Extremities
   1. fingers
   2. hand
   3. wrist
   4. forearm
   5. elbow
   6. humerus
   7. shoulder
   8. scapula
   9. clavicle
   10. acromioclavicular joints

   B. Lower Extremities
   1. toes
   2. foot
   3. calcaneus
   4. ankle
   5. tibia/fibula
   6. knee/patella
   7. femur
   8. long bone measurement

C. Urological Studies
   1. cystography
   2. cystourethrography
   3. intravenous urography
   4. retrograde urography

C. Other
   1. bone age
   2. bone survey (e.g. metastatic, child abuse)
   3. arthrography
# Attachment A

## Radiography Positions and Projections

### 1. Head, Spine and Pelvis

#### A. Head

1. **Skull**
   - a. AP axial (Towne)
   - b. lateral
   - c. PA axial (Caldwell)
   - d. PA
   - e. submentovertex (full basal)
   - f. trauma AP axial (reverse Caldwell)
   - g. trauma AP axial (reverse Caldwell)
   - h. trauma AP
   - i. trauma PA axial (Towne)

#### B. Spine and Pelvis

1. **Cervical Spine**
   - a. AP axial
   - b. AP open mouth
   - c. lateral
   - d. cross table (horizontal beam) lateral
   - e. PA axial obliques
   - f. AP axial obliques
   - g. lateral swimmers
   - h. lateral flexion and extension
   - i. AP dens (Fuchs)

2. **Thoracic Spine**
   - a. AP
   - b. lateral, breathing
   - c. lateral, expiration

3. **Scoliosis Series**
   - a. AP or PA
   - b. lateral

4. **Lumbar Spine**
   - a. AP
   - b. PA
   - c. anterior oblique
   - d. L5-S1 lateral spot
   - e. posterior oblique
   - f. anterior oblique
   - g. AP axial L5-S1
   - h. AP right and left bending
   - i. AP left and right bending
   - j. lateral flexion and extension

5. **Sacrum and Coccyx**
   - a. AP axial sacrum
   - b. AP axial coccyx
   - c. lateral sacrum and coccyx, combined
   - d. lateral sacrum or coccyx, separate

### 2. Facial Bones

1. **Mandible**
   - a. alveolar oblique
   - b. PA
   - c. AP axial (Towne)
   - d. PA axial
   - e. PA (modified Waters)
   - f. submentovertex (full basal)

### 3. Zygomatic Arch

1. **Temporalis Mandibular Joints**
   - a. alveolar oblique (modified Law)
   - b. alveolar (modified Schuller)
   - c. AP axial (modified Towne)

### 4. Nasal Bones

1. **PA axial (modified Towne)**

### 5. Orbita

1. **Orbita**
   - a. parietoancthal (Waters)
   - b. lateral
   - c. PA axial (Caldwell)
   - d. modified parietoancthal (modified Waters)

### 6. Paranasal Sinuses

1. **partial, horizontal beam**
   - a. parietoancthal (Waters)
   - b. PA axial (Caldwell), horizontal beam
   - c. parietoancthal (Waters), horizontal beam
   - d. submentovertex (full basal), horizontal beam
   - e. open mouth parietoancthal (Waters), horizontal beam
   - f. AP pelvis, bilateral frog-leg
   - g. AP pelvis, anterior pelvic bones (inlet, outlet)
   - h. anterior oblique pelvis, acetabulum (Judet)

### 7. Thorax and Abdomen

#### A. Thorax

1. **Chest**
   - a. PA or AP upright
   - b. lateral upright
   - c. AP lordotic
   - d. AP supine
   - e. lateral decubitus
   - f. anterior and posterior obliques

#### B. Abdomen and GI Studies

1. **Abdomen**
   - a. AP supine
   - b. AP upright
   - c. lateral decubitus
   - d. dorsal decubitus

2. **Esophagus**
   - a. RAO
   - b. left lateral
   - c. AP
   - d. PA
   - e. LAO

3. **Swallowing Dysfunction Study**

4. **Upper GI series**
   - a. AP scout
   - b. RAO
   - c. PA
   - d. right lateral
   - e. LPO
   - f. AP

5. **Small Bowel Series**
   - a. PA scout
   - b. PA (follow through)
   - c. ileocecal spots

6. **Contrast Enema**
   - a. left lateral rectum
   - b. left lateral decubitus
   - c. right lateral decubitus
   - d. LPO and RPO
   - e. PA
   - f. RAO and LAO
   - g. AP axial (sigmoid)
   - h. PA axial (sigmoid)
   - i. PA post-evacuation

7. **Nasal Cholangiography**

### 8. ERCP

*single or double contrast
C. Urological Studies
1. Cystography
   a. AP
   b. LPO and RPO
   c. lateral
   d. AP axial
2. Cystourethrography
   a. AP voiding cystourethrogram female
   b. RPO voiding cystourethrogram male
3. Intravenous Urography
   a. AP, scout, and series
   b. RPO and LPO
   c. post-void
4. Retrograde Urography
   a. AP scout
   b. AP pyelogram
   c. AP ureterogram

B. Lower Extremities
1. Toes
   a. AP, entire forefoot
   b. AP or AP axial toe
   c. oblique toe
   d. lateral toe
   e. sesamoids, tangential
2. Foot
   a. AP
   b. medial oblique
   c. lateral oblique
   d. lateral
   e. AP axial weight bearing
   f. lateral weight bearing
3. Calcaneus
   a. lateral
   b. plantolateral, axial
   c. dorsoplantar, axial
4. Ankle
   a. AP
   b. mortise
   c. lateral
   d. medial oblique
   e. AP stress views
   f. AP weight bearing
   g. lateral weight bearing
5. Tibia/Fibula
   a. AP
   b. lateral
6. Knee/patella
   a. AP
   b. Lateral
   c. AP weight bearing
   d. lateral oblique
   e. medial oblique
   f. PA axial–intercondylar fossa (Holmblad)
   g. PA axia–intercondylar fossa (Camp Coventry)
   h. AP axial–intercondylar fossa (Bécère)
   i. PA patella
   j. tangential (Merchant)
   k. tangential (Settegast)
   l. tangential (Hughston)
7. Femur
   a. AP
   b. lateral
8. Long Bone Measurement

C. Other
1. Bone Age
2. Bone Survey
3. Arthrography
Attachment B
Standard Terminology
for Positioning and Projection

**Radiographic View:** Describes the body part as seen by the image receptor or other recording medium, such as a fluoroscopic screen. Restricted to the discussion of a *radiograph* or *image*.

**Radiographic Position:** Refers to a specific body position, such as supine, prone, recumbent, erect or Trendelenburg. Restricted to the discussion of the *patient’s physical position*.

**Radiographic Projection:** Restricted to the discussion of the *path of the central ray*.

**POSITIONING TERMINOLOGY**

A. Lying Down

1. *supine* − lying on the back
2. *prone* − lying face downward
3. *decubitus* − lying down with a horizontal x-ray beam
4. *recumbent* − lying down in any position

B. Erect or Upright

1. *anterior position* − facing the image receptor
2. *posterior position* − facing the radiographic tube

C. Either Upright or Recumbent

1. oblique torso positions
   a. anterior oblique (facing the image receptor)
      i. *left anterior oblique (LAO)* body rotated with the left anterior portion closest to the image receptor
      ii. *right anterior oblique (RAO)* body rotated with the right anterior portion closest to the image receptor
   b. posterior oblique (facing the radiographic tube)
      i. *left posterior oblique (LPO)* body rotated with the left posterior portion closest to the image receptor
      ii. *right posterior oblique (RPO)* body rotated with the right posterior portion closest to the image receptor

2. oblique extremity positions
   a. lateral (external) rotation from either prone or supine, outward rotation of the extremity
   b. medial (internal) rotation from either prone or supine, inward rotation of the extremity
Anteroposterior Projection
Posteroanterior Projection

Right Lateral Position
Left Lateral Position

Left Posterior Oblique Position
Right Posterior Oblique Position

Left Anterior Oblique Position
Right Anterior Oblique Position
## Attachment C
### ARRT Standard Definitions

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
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<tbody>
<tr>
<td><strong>Digital Radiography</strong></td>
<td>Digital Radiography includes both computed radiography and direct radiography.</td>
</tr>
<tr>
<td><strong>Computed Radiography (CR)</strong></td>
<td>Systems use storage phosphors to temporarily store energy representing the image signal. The phosphor then undergoes a process to extract the latent image.</td>
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<tr>
<td><strong>Direct Radiography (DR)</strong></td>
<td>Systems have detectors that directly capture and readout an electronic image signal.</td>
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<tr>
<td><strong>Spatial Resolution</strong></td>
<td>The sharpness of the structural edges recorded in the image.</td>
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<tr>
<td><strong>Receptor Exposure</strong></td>
<td>The amount of radiation striking the image receptor.</td>
</tr>
<tr>
<td><strong>Brightness</strong></td>
<td>Brightness is the measurement of the luminance of an area in a radiographic image displayed on a monitor. It is calibrated in units of candela (cd) per square meter</td>
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<tr>
<td><strong>Contrast</strong></td>
<td>Contrast is the visible difference between any two selected areas of brightness levels within the displayed radiographic image. It is determined primarily by the processing algorithm (mathematical codes used by the software to provide the desired image appearance). The default algorithm determines the initial processing codes applied to the image data. Grayscale refers to the number of brightness levels (or gray shades) visible on an image and is linked to the bit depth of the system. Long Scale is the term used when slight differences between gray shades are present (low contrast) but the total number of gray shades is great. Short Scale is the term used when considerable or major differences between gray shades are present (high contrast) but the total number of gray shades is small.</td>
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<tr>
<td><strong>Dynamic Range</strong></td>
<td>The range of exposures that may be captured by a detector.</td>
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<tr>
<td><strong>Receptor Contrast</strong></td>
<td>The fixed characteristic of the receptor. Most digital receptors have an essentially linear response to exposure. This is impacted by contrast resolution (the smallest exposure change or signal difference that can be detected). Ultimately, contrast resolution is limited by the quantization (number of bits per pixel) of the analog-to-digital convertor.</td>
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<tr>
<td><strong>Exposure Latitude</strong></td>
<td>The range of exposures which produces quality images at appropriate patient dose.</td>
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<tr>
<td><strong>Subject Contrast</strong></td>
<td>The magnitude of the signal difference in the remnant beam as a result of the different absorption characteristics of the tissues and structures making up that part.</td>
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Nuclear Medicine Technology Examination

The purpose of The American Registry of Radiologic Technologists® (ARRT®) Nuclear Medicine Technology Examination is to assess the knowledge and cognitive skills underlying the intelligent performance of the tasks typically required of the nuclear medicine technologist. 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 nuclear medicine 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 artrt.org.

The following table presents the four 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 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.

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<thead>
<tr>
<th>Content Category</th>
<th>Number of Scored Questions²</th>
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<td>Safety³</td>
<td>22</td>
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<tr>
<td>Image Production</td>
<td>38</td>
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<tr>
<td>Procedures</td>
<td>120</td>
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<tr>
<td>Radionuclides and Radiopharmaceuticals</td>
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<td>Cardiac Procedures</td>
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<td>Endocrine and Oncology Procedures</td>
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<td>Gastrointestinal and Genitourinary Procedures</td>
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<td>Other Imaging Procedures</td>
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<td><strong>Total</strong></td>
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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.
3 SI and conventional units of radiation measurement will continue to be used on the nuclear medicine technology examination.
Patient Care (20)

1. Patient Interactions and Management (20)

A. Ethical and Legal Aspects
   1. patient’s rights
      a. informed consent (*e.g., written, oral, implied)
      b. confidentiality (HIPAA)
      c. American Hospital Association (AHA) Patient Care Partnership
         (Patient’s Bill of Rights)
         1. privacy
         2. extent of care (e.g., DNR)
         3. access to information
         4. living will, health care proxy, advanced directives
         5. research participation
   2. legal issues
      a. verification (e.g., patient identification, compare order to
         clinical indication, exam coding)
      b. common terminology (e.g., battery, negligence, malpractice,
         beneficence)
      c. legal doctrines (e.g., respondeat superior, res ipsa loquitur)
      d. restraints versus immobilization
   3. ARRT Standards of Ethics

B. Interpersonal Communication
   1. modes of communication
      a. verbal/written
      b. nonverbal (e.g., eye contact, touching)
   2. challenges in communication
      a. interaction with others
         1. language barriers
         2. cultural and social factors
         3. physical and sensory impairments
         4. age
         5. emotional status, acceptance of condition
      b. explanation of medical terms
      c. strategies to improve understanding
   3. patient education
      a. explanation of current procedure (e.g., risks, benefits)
      b. verify informed consent when necessary
      c. pre- and post-examination instructions (e.g., preparations,
         diet, medications, discharge instructions)
      d. respond to inquiries about other imaging modalities (e.g., CT, MRI,
         mammography, sonography, radiography, bone densitometry)

C. Physical Assistance and Monitoring
   1. patient transfer and movement
      a. body mechanics (e.g., balance, alignment, movement)
      b. patient transfer techniques
   2. assisting patients with medical equipment
      a. infusion catheters and pumps
      b. oxygen delivery systems
      c. other (e.g., nasogastric tubes, urinary catheters, tracheostomy tubes)
   3. Routine Monitoring
      a. vital signs
      b. physical signs and symptoms (e.g., motor control, severity of injury)
      c. fall prevention
      d. documentation
      e. immobilization
      f. sedation

D. Medical Emergencies
   1. allergic reactions (e.g., pharmaceuticals, latex)
   2. cardiac or respiratory arrest (e.g., CPR)
   3. physical injury or trauma
   4. other medical disorders (e.g., seizures, diabetic reactions)

*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.

(Patient Care continues on the following page.)
Patient Care (continued)

E. Infection Control
   1. cycle of infection
      a. pathogen
      b. reservoir
      c. portal of exit
      d. mode of transmission
         1. direct
            a. direct contact
            b. droplet
         2. indirect
            a. airborne
            b. vehicle-borne – fomite
            c. vector-borne – mechanical or biological
      e. portal of entry
      f. susceptible host
   2. asepsis
      a. equipment disinfection
      b. equipment sterilization
      c. medical aseptic technique
      d. sterile technique
   3. CDC Standard Precautions
      a. hand hygiene
      b. use of personal protective equipment (e.g., gloves, gowns, masks)
      c. safe injection practices
      d. safe handling of contaminated equipment/surfaces
      e. disposal of contaminated materials
         1. linens
         2. needles
         3. patient supplies
         4. blood and body fluids
   4. transmission-based precautions
      a. contact
      b. droplet
      c. airborne
   5. additional precautions
      a. neutropenic precautions (reverse isolation)
      b. healthcare associated (nosocomial) infections
Appendix B – Nuclear Medicine Technology Exam Content Specifications

NUCLEAR MEDICINE TECHNOLOGY EXAMINATION CONTENT SPECIFICATIONS

ARRT® BOARD APPROVED: JANUARY 2016
IMPLEMENTATION DATE: JANUARY 2017

Safety (22)

1. Radiation Physics, Radiobiology, and Regulations (22)
   A. Physical Properties of Radioactive Materials
      1. decay of radioactivity
         a. atomic structure
         b. decay modes (e.g., alpha, beta, gamma)
         c. decay rate
         d. half-life
         e. parent-daughter relationship
      2. interaction of radiation with matter
         a. photoelectric effect
         b. Compton scattering
         c. pair production and annihilation
         d. internal conversion
         e. Auger electron
         f. bremsstrahlung
   B. Biological Effects of Radiation
      1. cellular biology
      2. effects of radiation on cells
         a. direct and indirect action
         b. radiolysis of water
         c. LET and RBE
      3. stochastic and deterministic effects
      4. acute effects of total body radiation
         a. radiation sickness
         b. hemopoietic syndrome
         c. gastrointestinal syndrome
         d. central nervous system syndrome
      5. long term effects of radiation
         a. somatic
         b. genetic
      6. relative tissue and organ sensitivity
         (e.g., law of Bergonié and Tribondeau)
      7. effects of radiation on embryo/fetus
   C. Basic Concepts of Radiation Protection
      1. units of radiation exposure
      2. principles of time, distance, and shielding
      3. personnel protection equipment (e.g., gloves, lab coats)
      4. personnel monitoring devices
         a. types
         b. use, care, and placement
      5. ALARA
      6. release of patients
   D. NRC Regulations for Radiation Exposure
      1. occupational
      2. public
      3. pregnancy or nursing
      4. internal dosimetry and bioassays
      5. personnel exposure records
   E. Medical Events
      1. definition
      2. NRC regulations for reporting and notification
   F. Area/Facilities Monitoring
      1. Basic Concepts
         a. units of measurement
         b. exposure rates
         c. definition of contaminated area
      2. Survey Equipment and Techniques
         a. well counters
         b. survey meters
         c. wipe test technique
      3. NRC Regulations
         a. frequency of surveys and wipes
         b. classification of areas
            1. work
            2. treatment
            3. storage
         c. posting of signs (e.g., types, locations)
         d. documentation of survey and wipes results
            1. interpretation
            2. reporting (corrective action)
            3. record retention
      4. Radioactive Spills
         a. major spills
         b. minor spills
         c. processes for decontamination
         d. reporting procedures

(Safety continues on the following page.)
Appendix B – Nuclear Medicine Technology Exam Content Specifications

Safety (continued)

G. Radioactive Materials
1. inspection of incoming and outgoing materials (e.g., DOT and NRC regulations)
   a. shipping labels
   b. measurement of exposure rate
   c. measurement of surface contamination
   d. removable contamination limits/trigger levels
   e. documentation
2. storage
   a. radiopharmaceuticals
   b. sealed sources
   c. consequences of improper storage
3. disposal of radioactive waste
   a. release to environment
   b. decay in storage
   c. transfer to authorized recipient

H. Disposal of Pharmaceuticals
1. expired pharmaceuticals
2. partially used pharmaceuticals
Appendix B – Nuclear Medicine Technology Exam Content Specifications

NUCLEAR MEDICINE TECHNOLOGY EXAMINATION
CONTENT SPECIFICATIONS

ARRT® BOARD APPROVED: JANUARY 2016
IMPLEMENTATION DATE: JANUARY 2017

Image Production (38)

1. Instrumentation (38)

A. Survey Meter
   1. operating principles
      a. Geiger Müller
      b. ionization chambers (cutie pies)
   2. quality control
      a. frequency and types of checks
      b. interpretation and record keeping

B. Dose Calibrator
   1. operating principles
   2. quality control
      a. frequency and types of checks
      1. accuracy
      2. constancy
      3. linearity
      4. geometry
      b. interpretation and record keeping

C. Scintillation Detector System
   1. operating principles
      a. well counter
      b. uptake probe (e.g., thyroid, surgical)
   2. quality control
      a. radionuclide source
      1. energies
      2. type of source
      b. parameters
      1. energy resolution
      2. efficiency
      3. high voltage calibration
      4. resolving time
      5. sensitivity
      6. energy linearity
      7. chi-square
      c. interpretation and record keeping

D. Gas and Aerosol Delivery Systems
   1. operating principles
   2. exhaust system (e.g., negative pressure, gas traps)
   3. interpretation and record keeping

E. Gamma Camera
   1. operating principles
   2. quality control
      a. frequency and types of checks
      b. performance characteristics
      1. flood field uniformity
      2. high count uniformity correction
      3. spatial linearity
      4. spatial resolution
      5. energy resolution (e.g., FWHM)
      6. detector sensitivity
      7. extrinsic versus intrinsic methods
      8. center of rotation
      9. SPECT phantom measurements
      c. interpretation and record keeping

3. image acquisition
   a. detector system
      1. count or time mode
      2. detector orientation
      3. photopeak energy setting and window width
      4. multi-energy acquisition
   b. collimator selection
      1. types (e.g., parallel hole, pinhole)
      2. parameters (e.g., energy, resolution, sensitivity)
   c. dynamic/static acquisition
      1. matrix selection
      2. framing (e.g., number and length)
      3. gating
      4. list mode
   d. SPECT acquisition
      1. angular sampling/number of views (e.g., 180° versus 360°)
      2. matrix selection
      3. attenuation correction
      4. duration of acquisition

(Image Production continues on the following page.)
Image Production (continued)

F. PET/CT Scanner
1. PET operating principles
2. PET quality control
   a. frequency and types of checks
   b. characterization and correction calibration
      1. energy window calibration
      2. gain setting
   c. interpretation and record keeping
3. PET image acquisition
   a. 2D versus 3D
   b. list mode
   c. respiratory gating
   d. time-of-flight
4. CT operating principles*
5. CT quality control*
   a. tube warm-up
   b. CT number (water phantom)
6. CT image acquisition*
   a. kVp
   b. mA
   c. pitch
   d. slice thickness
   e. noise and uniformity
   f. artifacts

G. Data Processing
1. quantitative analysis (e.g., region of interest selection, ejection fraction, time activity curves, SUV)
2. reconstruction
   a. registration (image fusion)
   b. orientation
   c. filter parameters
   d. attenuation correction
   e. gated images
   f. motion correction
3. image management
   a. archiving
   b. PACS
   c. HIS/RIS

*Diagnostic CT is not assessed on the Nuclear Medicine Technology Examination. CT content is assessed for attenuation correction/anatomic localization.
Appendix B – Nuclear Medicine Technology Exam Content Specifications

NUCLEAR MEDICINE TECHNOLOGY EXAMINATION CONTENT SPECIFICATIONS

ARRT® BOARD APPROVED: JANUARY 2016
IMPLEMENTATION DATE: JANUARY 2017

Procedures (120)

1. Radionuclides and Radiopharmaceuticals (24)
   A. Production of Radionuclides
      1. methods
         a. reactor
         b. accelerator
         c. cyclotron
d. generator
      2. purity
         a. radionuclide
         b. chemical
      3. physical form (e.g., gas, solution, capsule)
   B. Radiopharmaceutical Characteristics
      1. method of localization
         a. capillary blockade
         b. active transport
c. phagocytosis
d. diffusion
e. compartmentalization
f. chemisorption
g. receptor binding
h. antigen antibody
   i. filtration
j. metabolism
   k. sequestration
      2. half-life
         a. physical
         b. biological
c. effective
   3. biodistribution
      a. pharmacokinetics
      b. critical organs
c. target organs
C. Preparation and Administration
   1. kit preparation
      a. labeling process
         1. principles
            a. oxidation/reduction
            b. pH
c. time for reaction
d. temperature
         2. compounding techniques
            a. venting
            b. heating
c. mixing
d. USP 797 regulations
      3. factors that affect labeling quality
         a. shelf life and storage
c. quality control
            1. radiochemical purity
            2. particle size
            3. specific activity (e.g., millicuries per mass)
            4. color and clarity
   2. calculation of radiopharmaceutical and pharmaceutical dosage
      a. units
      1. conversions
      2. calculations
      b. volume determination
         1. formula
         2. decay tables
         3. concentration
         4. activity
      3. pharmaceutical and radiopharmaceutical administration
         a. preparation
            1. syringe
            2. needle selection
            3. shielding
         b. radiopharmaceutical label
            1. name of radiopharmaceutical
            2. assay date and time
            3. lot number and expiration date
            4. concentration
            5. volume
            6. activity
         c. administration techniques
            1. routes
            2. aseptic
            3. uniform distribution
               (e.g., mixing, agitation)
            4. complications and reactions
            5. documentation

(Procedures continue on the following page.)
Procedures (continued)

TYPE OF STUDY

2. Cardiac Procedures (24)
   A. Gated Blood Pool
   B. Myocardial Perfusion
   C. Viability

3. Endocrine and Oncology Procedures (28)
   A. Endocrine
      1. thyroid uptake/imaging
      2. parathyroid
      3. neuroendocrine
      4. adrenal imaging
   B. Tumor
      1. whole body
      2. SPECT or SPECT/CT
      3. PET/CT
      4. lymphoscintigraphy
   C. Therapy
      1. procedures
         a. palliative bone
         b. thyroid ablation
         c. hyperthyroidism
         d. non-Hodgkin lymphoma
         e. selective internal radiation therapy with hepatic artery perfusion study (HAPS)
      2. regulations

FOCUS OF QUESTIONS

Questions about a specific study or procedure may address any of the following factors:

A. Instrumentation
   • detector system
   • data acquisition
   • data analysis
   • ancillary equipment

B. Radiopharmaceuticals and Pharmaceuticals
   • selection
   • dosage
   • administration
   • biodistribution

C. Patient Preparation, Monitoring, and Education
   • indications and contraindications
   • pregnancy and nursing
   • dietary restrictions
   • adverse reactions
   • medications
   • age specific considerations
   • lab values

D. Imaging Techniques
   • anatomical landmarks
   • views
   • patient-detector orientation
   • fusion imaging

E. Anatomy and Pathophysiology
   • general anatomy
   • cross-sectional anatomy

(Procedures continue on the following page.)
Appendix B – Nuclear Medicine Technology Exam Content Specifications

NUCLEAR MEDICINE TECHNOLOGY EXAMINATION CONTENT SPECIFICATIONS

ARRT® BOARD APPROVED: JANUARY 2016
IMPLEMENTATION DATE: JANUARY 2017

Procedures (continued)

TYPE OF STUDY

4. Gastrointestinal and Genitourinary Procedures (20)
   A. Gastric Emptying
   B. Gastroesophageal Reflux
   C. Meckel Diverticulum
   D. GI Bleed
   E. Hepatobiliary
   F. RBC Hemangioma
   G. Damaged RBC Spleen
   H. Liver/Spleen
   I. Renal Function
   J. Renal Cortical
   K. Radionuclide Cystogram

5. Other Imaging Procedures (24)
   A. Abscess/Infection
   B. Bone
      1. planar
      2. 3-phase
      3. whole body
      4. SPECT or SPECT/CT
      5. PET/CT
   C. Central Nervous System
      1. brain death
      2. SPECT or SPECT/CT
      3. PET/CT
      4. cisternography/CSF leak
      5. shunt patency
   D. Lung
      1. perfusion
      2. ventilation – gas and aerosol
      3. quantitative
   FOCUS OF QUESTIONS

Questions about a specific study or procedure may address any of the following factors:

A. Instrumentation
   • detector system
   • data acquisition
   • data analysis
   • ancillary equipment

B. Radiopharmaceuticals and Pharmaceuticals
   • selection
   • dosage
   • administration
   • biodistribution

C. Patient Preparation, Monitoring, and Education
   • indications and contraindications
   • pregnancy and nursing
   • dietary restrictions
   • adverse reactions
   • medications
   • age specific considerations
   • lab values

D. Imaging Techniques
   • anatomical landmarks
   • views
   • patient-detector orientation
   • fusion imaging

E. Anatomy and Pathophysiology
   • general anatomy
   • cross-sectional anatomy
Attachment A: Nuclear Medicine Pharmaceuticals*

Radiopharmaceuticals
1. Tc-99m sodium pertechnetate
2. Tc-99m HDP
3. Tc-99m MDP
4. Tc-99m sestamibi
5. Tc-99m tetrofosmin
6. Tc-99m labeled RBCs
7. Tc-99m DTPA
8. Tc-99m DMSA
9. Tc-99m MAG3
10. Tc-99m HMPAO (Ceretec™)
11. Tc-99m ECD (Neurolite®)
12. Tc-99m HMPAO (Ceretec™)
tagged WBCs
13. Tc-99m MAA
14. Tc-99m sulfur colloid
15. Tc-99m disofenin
16. Tc-99m mebrofenin (Choletec®)
17. In-111 DTPA
18. In-111 oxine labeled WBCs
19. In-111 pentetreotide (Octreoscan™)
20. TI-201 thallous chloride
21. Xe-133 gas
22. I-123 sodium iodide
23. I-131 sodium iodide
24. I-123 ioflupane (DaTscan™)
25. I-123 MIBG
26. Ga-67 gallium citrate
27. F-18 fluorodeoxyglucose (FDG)
28. F-18 sodium fluoride (F-18 NaF)

Therapeutic Radiopharmaceuticals
29. Y-90 ibritumomab tiuxetan (Zevalin®)
30. Ra-223 dichloride (Xofigo®)
31. I-131 MIBG
32. I-131 sodium iodide
33. Y-90 microspheres (Therasphere®, Sir-Spheres®)

Interventional Pharmaceuticals
34. Adenosine
35. Aminophylline
36. Dipyridamole (Persantine®)
37. Dobutamine
38. Captopril
39. Furosemide (Lasix®)
40. Sincalide (Kinevac®)
41. Morphine
42. Regadenoson (Lexiscan®)
43. Lugol solution
44. Heparin
45. Recombinant TSH (Thyrogen®)
46. Oral CT contrast media

*This is a list of commonly used pharmaceuticals that may appear on the exam. However, other pharmaceuticals may appear as practice changes.
Radiation Therapy Examination

The purpose of The American Registry of Radiologic Technologists® (ARRT®) Radiation Therapy Examination is to assess the knowledge and cognitive skills underlying the intelligent performance of the tasks typically required of radiation therapists at entry into the profession. 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 radiation therapists.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](http://arrt.org).

The following table presents the three 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 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.

<table>
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<tr>
<th>Content Category</th>
<th>Number of Scored Questions²</th>
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<td>Patient Care</td>
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</tr>
<tr>
<td>Patient Interactions</td>
<td></td>
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<tr>
<td>Patient and Medical Record Management</td>
<td></td>
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<tr>
<td>Safety</td>
<td>49</td>
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<tr>
<td>Radiation Physics, Equipment, and Quality Assurance</td>
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<tr>
<td>Radiation Protection³</td>
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<tr>
<td>Procedures</td>
<td>104</td>
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<td>Treatment Sites and Tumors</td>
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<td>Treatment Volume Localization</td>
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<td>Prescription and Dose Calculation</td>
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<td><strong>Total</strong></td>
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</table>

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.
³ SI units are the primary (principal) units of radiation measurement used on the radiation therapy examination.
Patient Care (47)

1. Patient Interactions (25)
   A. Ethical and Legal Aspects
      1. patient’s rights
         a. informed consent
            (*e.g., written, oral, implied)
         b. confidentiality (HIPAA)
         c. American Hospital Association (AHA)
            Patient Care Partnership (Patient’s
            Bill of Rights)
            1. privacy
            2. goal of care
               (e.g., definitive, palliative)
            3. access to information
            4. living will, advanced directive
               (e.g., DNR), health care proxy
            5. research participation
      2. legal issues
         a. verification (e.g., patient
            identification, treatment site,
            prescription)
         b. common terminology (e.g., battery,
            negligence, malpractice,
            beneficence)
         c. legal doctrines (e.g., respondeat
            superior, res ipsa loquitur)
         d. restraints versus immobilization
      3. ARRT Standards of Ethics
   B. Interpersonal Communications
      1. modes of professional communication
         a. verbal/written
         b. nonverbal (e.g., eye contact,
            touching)
      2. challenges in communication
         a. interaction with others
            1. language barriers
            2. cultural and social factors
            3. physical or sensory impairments
            4. age
            5. emotional status, acceptance of
               condition (e.g., stage of grief)
         b. explanation of medical terms
      3. patient education
         a. explanation of treatment
         b. strategies to improve understanding
         c. treatment compliance
            (e.g., positioning, skin marks)
      4. support services
         a. hospice
         b. other professionals
            (e.g., dietitian, clergy, social services)
   C. Physical Assistance
      1. patient transfer and movement
         a. body mechanics (e.g., balance,
            alignment, movement)
         b. patient transfer techniques
      2. fall prevention
      3. assisting patients with medical
         equipment
         a. infusion catheters and pumps
         b. oxygen delivery systems
         c. other (e.g., nasogastric tubes,
            urinary catheters, tracheostomy
            tubes)
   D. Medical Emergencies
      1. allergic reactions
         a. contrast media
            1. contraindications
            2. adverse reactions
         b. other (e.g., latex)
      2. cardiac or respiratory arrest
         (e.g., CPR)
      3. physical injury or trauma
      4. other medical disorders
         (e.g., seizures, diabetic reactions)

*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.

(Patient Care continues on the following page.)
Patient Care (continued)

E. Infection Control
   1. cycle of infection
      a. pathogen
      b. reservoir
      c. portal of exit
      d. mode of transmission
         1. direct
            a. direct contact
            b. droplet
         2. indirect
            a. airborne
            b. vehicle-borne – fomite
            c. vector-borne – mechanical or biological
      e. portal of entry
      f. susceptible host
   2. asepsis
      a. equipment disinfection
      b. equipment sterilization
      c. medical aseptic technique
      d. sterile technique
   3. CDC Standard Precautions
      a. hand hygiene
      b. use of personal protective equipment (e.g., gloves, gowns, masks)
      c. safe needle practices
      d. safe handling of contaminated materials
      e. disposal of contaminated materials
         1. linens
         2. needles
         3. patient supplies
         4. blood and body fluids
   4. transmission-based precautions
      a. contact
      b. droplet
      c. airborne
   5. additional precautions
      a. neutropenic precautions (reverse isolation)
      b. healthcare associated (nosocomial) infections

F. Handling and Disposal of Toxic or Hazardous Material
   1. types of materials
      a. metals (e.g., block alloy)
      b. chemicals
      c. chemotherapy
   2. material safety data sheet (MSDS)

(Patient Care continues on the following page.)
Appendix C – Radiation Therapy Exam Content Specifications

Patient Care (continued)

2. Patient and Medical Record Management (22)

A. Evaluation
   1. epidemiology and etiology
      a. cancer risk factors
      b. prevalence and incidence
   2. cancer screening
   3. signs and symptoms
   4. history and physical examination
   5. imaging studies (e.g., CT, MRI, PET/CT)
   6. other diagnostic studies
      a. lab results
      b. surgical reports
      c. pathology reports

B. Assessment
   1. treatment side effects
      a. signs and symptoms
      b. causes
      c. management
   2. blood studies
      a. types of studies
         (e.g., CBC, BUN, creatinine)
      b. factors affecting blood values
   3. dietary counseling
      a. common problems
      b. causes
      c. dietary management
   4. routine monitoring
      a. weight
      b. vital signs
      c. signs and symptoms
      d. documentation

C. Documentation
   1. information included in treatment record
      a. prescription
      b. monitor units
      c. target dose (daily and accumulated)
      d. energy and type of radiation
      e. date
      f. time of day for b.i.d. treatment
      g. fraction
      h. elapsed days
      i. field number and description
      j. doses to other regions of interest
      k. set-up instructions
   2. elements of record keeping
      a. patient identification
      b. accountability (e.g., signatures)
      c. accuracy and legibility
      d. variance from prescription (errors, prescription changes)
      e. medical events (definition and required documentation)
   3. charge capture terminology
      a. professional and technical components
      b. CPT® principles
Safety (49)

1. Radiation Physics, Equipment, and Quality Assurance (20)
   A. Sources of Radiation
      1. radioactive material
      2. machine-produced radiation
   B. Basic Properties of Radiation
      1. wave characteristics
      2. attenuation
      3. inverse-square law
      4. x-ray beam quality
   C. Interactions with Matter
      1. photon interactions
         (e.g., Compton, photoelectric effect)
      2. electron interactions
      3. particle interactions
         (e.g., proton, neutron)
   D. Components and Operation
      1. linear accelerator
      2. CT simulator
   E. Quality Control Procedures
      1. warm-up and inspection of linear accelerators and CT simulators
         a. interlock systems
         b. safety lights
         c. emergency switches
         d. critical machine parameters
            (e.g., pressure, temperature)
         e. electrical and mechanical hazards
         f. imaging systems
      2. radiation output verification
         a. methods
         b. frequency
         c. effect of environment (e.g., humidity) on measurements
      3. light and treatment field checks
         a. light and radiation field agreement
         b. collimator indicator agreement
         c. multileaf collimator performance
         d. sidelight/laser accuracy check
            (isocenter)
      4. rotation check
         a. safety procedures
         b. operation of gantry/console
      5. evaluation of quality assurance results
         a. interpretation
         b. course of action
         c. documentation

2. Radiation Protection (29)
   A. Biological Effects of Radiation
      1. radiosensitivity
      2. dose-response relationships
      3. somatic effects
         a. cellular
         b. tissue (e.g., hemopoietic, skin, reproductive organs)
         c. embryonic and fetal risks
         d. carcinogenesis
         e. early versus late effects
         f. acute versus chronic effects
   B. Radiation Tissue Tolerance
      1. tolerance levels (TD_{5/5})
      2. adverse effects
      3. dose to critical structures
      4. radiobiological factors
         (e.g., dose, fractionation, volume)
      5. biological factors
         (e.g., age, anatomic variation, medical conditions)
      6. medical factors
         (e.g., prior surgery, pacemakers)
      7. other factors (e.g., radiosensitizers, radioprotectors)
      8. contribution from other sources
         a. chemotherapy
         b. brachytherapy
         c. other fields (e.g., prior or abutting)
         d. radiation effect modifiers

1 Only basic concepts related to common uses of brachytherapy are covered, including dose to surrounding tissue and radiation protection issues. Specific procedures and isotope characteristics are not covered.

(Safety continues on the following page.)
Safety (continued)

C. Measurement of Radiation
   1. units of measurement
      a. absorbed dose
      b. dose equivalent
      c. exposure
   2. instrumentation
      a. ionization chamber
      b. Geiger-Müller detector
      c. TLD/OSL (optically stimulated luminescence)
      d. diodes
      e. neutron detectors

D. Fundamental Principles
   1. ALARA
   2. basic methods of protection
      (time, distance, shielding)

E. Personnel Monitoring
   1. NCRP recommendations for personnel monitoring (report #116)
      a. occupational exposure
      b. public exposure
      c. embryo/fetus exposure
   2. maintenance and evaluation of personnel dosimetry records

F. Facilities and Area Monitoring
   1. NRC regulations
      (10 CFR, parts 20 and 35)
      a. classification of areas (restricted, controlled, unrestricted)
      b. required postings (signs)
      c. area monitoring devices
   2. barrier requirements
      a. primary
      b. secondary

G. Handling and Disposal of Radioactive Materials
Procedures (104)

1. Treatment Sites and Tumors (26)
   A. Anatomy, Pathophysiology, Lymphatic Drainage, and Metastatic Patterns
      1. brain and spinal cord
      2. head and neck (includes thyroid and salivary glands)
      3. breast
      4. lung
      5. abdomen, pelvis, GI, and GU
         a. esophagus, stomach, small bowel, large bowel, rectum, and anus
         b. pancreas, adrenals, liver, and gallbladder
         c. ureters, kidneys, bladder, and urethra
      6. reproductive
         a. prostate, testes
         b. endometrium, cervix, ovaries, uterus, vagina, and vulva
      7. skeletal
      8. miscellaneous
         a. lymphoma (Hodgkin and non-Hodgkin)
         b. sarcomas (bone and soft tissue)
         c. multiple myeloma
         d. skin
         e. leukemia
         f. mycosis fungoides
         g. bone marrow transplant
         h. benign (e.g., heterotopic bone, keloid, AVM)
         i. oncologic emergencies (e.g., whole brain, SVC, cord compression)
   B. Tumor Classification
      1. histopathologic types
         (e.g., benign, sarcomas, carcinomas)
      2. histopathologic grade
         a. purpose (differentiation and growth rate)
         b. grading system (e.g., GX, G1-G4)
   3. staging (basic concepts; not specific sites)
      a. purpose
      b. components (e.g., TNM, I-IV)

2. Treatment Volume Localization (18)
   A. Treatment Techniques and Anatomic Relationships
      1. radiation therapy techniques
      2. sectional and topographic anatomy
      3. critical organs
      4. patient positioning and immobilization
      5. types and uses of contrast media
   B. CT Simulation
      1. CT image acquisition (e.g., mA, slice thickness, and spacing)
      2. CT image processing and display (e.g., reconstruction, window level, field of view, CT number)
      3. contour volume and isocenter determination
      4. image transmission, storage, and retrieval
      5. programmable lasers
   C. Documentation of Simulation Procedure
      1. anatomic position
      2. equipment orientation
      3. accessory equipment
      4. field parameters
      5. set-up diagrams or photographs
      6. temporary and/or permanent reference marks

(Procedures continues on the following page.)
Procedures (continued)

3. Prescription and Dose Calculation (24)
   A. Treatment Prescription
      1. total target dose
      2. fractionation schedules
      3. beam energy
      4. types of radiation
      5. treatment volume (e.g., GTV, CTV, PTV)
      6. number of fields
      7. fixed/rotational fields
      8. field weighting
      9. field orientation
     10. treatment unit capabilities and limitations
     11. plan modifications
     12. beam modifiers
   B. Geometric Parameters and Patient Measurements
      1. field size and shape
      2. target depth
      3. patient thickness
      4. SSD, SAD
      5. collimator setting
      6. abutting fields (e.g., gap calculations)
      7. fusion with outside diagnostic studies
   C. Dose Calculation and Verification
      1. selection of energy
      2. equivalent square (open and blocked field)
      3. scatter factors (e.g., collimator, phantom)
      4. D_{\text{max}}
      5. percentage depth dose
      6. TAR, TMR
      7. SSD, SAD
      8. inverse square
      9. extended distance factors
     10. wedges (e.g., wedge angle or factor)
     11. off-axis calculation
     12. isodose curve characteristics (e.g., penumbra, DVH)
     13. factors for beam modifiers (e.g., tray factor, bolus, compensator)
     14. inhomogeneity correction factors
     15. rotational factors
     16. machine output data
     17. verification and documentation

4. Treatments (36)
   A. Treatment Options (indications, benefits, risks)
      1. chemotherapy
      2. surgery
      3. radiation therapy
         a. external beam
         b. brachytherapy
      4. multimodality treatment
   B. Verification and Application of the Treatment Plan
      1. patient position
      2. isocenter
      3. treatment parameters (e.g., beam orientation, energy)
      4. prescription
      5. modality
         a. 2D
         b. 3D
         c. 4D (e.g., respiratory gating)
         d. IMRT
         e. arc therapy
         f. stereotactic
      6. imaging procedures
         a. kV imaging
         b. cone beam CT (CBCT)
         c. MV imaging

* Only basic concepts related to common uses of brachytherapy are covered, including dose to surrounding tissue and radiation protection issues. Specific procedures and isotope characteristics are not covered.

(Procedures continues on the following page.)
Appendix C – Radiation Therapy Exam Content Specifications

RADIATION THERAPY EXAMINATION
CONTENT SPECIFICATIONS

ARRT® BOARD APPROVED: JANUARY 2016
IMPLEMENTATION DATE: JANUARY 2017

Procedures (continued)

C. Treatment Machine Set-Up
   1. auxiliary set-up devices
      a. couch indexing
      b. positioning aids
      c. alignment lasers
   2. machine operations
      a. SSD, SAD
      b. collimator or cone settings
      c. optical or mechanical distance indicator
      d. gantry angle
      e. collimator angle
      f. field light
      g. treatment couch
      h. console controls
      i. pendant controls

D. Treatment Accessories
   1. beam modifiers
      a. compensating filters
      b. shielding
      c. blocks (e.g., thickness, half value layer (HVL), half-value thickness (HVT))
      d. multileaf collimation
      e. bolus
      f. wedges (enhanced dynamic wedge, physical wedge)
   2. immobilization devices
      a. custom
      b. standard
   3. parameters
      a. SSD, SAD, depth
      b. gantry, collimator, and field size settings
      c. beam energy and type

E. Treatment Administration
   1. patient monitoring
      a. visual (mirror, TV monitor)
      b. two-way voice communication system
      c. back-up systems
      d. monitoring regulations
      e. emergency situations
   2. record and verify systems
   3. image acquisition and registration
   4. site verification
   5. dose verification (e.g., diodes, film)
   6. equipment malfunctions
      a. types (e.g., radiation, electrical, mechanical, software)
      b. troubleshooting and correction
      c. documentation and reporting
Computer-Based Testing Overview

After you have completed check-in procedures, test-center staff will show you to a work station and will make sure the computer is ready to deliver your exam. The testing session consists of four segments:

1. **Introduction, Tutorial, and Non-Disclosure Agreement:** During this segment, the computer will verify your name and allow you to complete a tutorial if you choose. We strongly urge candidates to spend the few minutes to take the tutorial. You will also be asked to read and accept a non-disclosure agreement – it requires that all candidates agree to not copy any test questions or otherwise disclose the content of the exam. You must accept the terms of the non-disclosure agreement; if you do not respond within 2 minutes your exam session will end. The entire introductory segment will take anywhere from a few minutes up to 20 minutes, depending on how much time you spend reviewing the tutorial.

2. **Examination Session:** You will be given the exam during this period. In addition to answering questions, you can mark questions for later review or comment on questions. The clock will be running, so pace yourself. Most questions are in the standard multiple-choice format and require you to select one best answer. In addition, a small portion of the exam may consist of the question formats noted below:
   a. **Select Multiple:** This format consists of a question or statement followed by a list of 4 to 10 response options. You are required to select all options that are correct.
   b. **Sorted List:** This format presents a list of 4 to 8 options and requires you to place them in correct sequence. You accomplish this by using the mouse to “click-and-drag” the options into a box so that they end up in a specified order, such as numerical, alphabetical or chronological.
   c. **Items with Hot Areas or Videos:** This format consists of a question accompanied by a medical image, drawing, graphic, or video.

      To answer a ‘hot area’ question, place the cursor over the selected area and click the mouse; the highlighted areas are possible answers to the question. When selected, the area will become outlined and change color. To change your answer, move the mouse to another shaded area and click the mouse. The final selected shaded area will be recorded as your final answer.

      For video items, you will need to read the question, open the exhibit, press the play arrow on the video, watch the video in its entirety, and then answer the question. You will not be able to move forward on the exam until you have opened and watched the entire video. The video controls are shown and described below. **Note:** The videos are silent (no sound).

   ![Video Controls]

   Sample questions illustrating these formats can be obtained from the ARRT website (Examinations>Exam Format and Length), or by contacting the ARRT. In addition, the tutorial at the test center presents an example of each format.

3. **Item Review and End Review:** After responding to all questions, you will have the opportunity to go back and review questions in the time remaining. You can change answers during the review. Once you select the “End Review” button you will no longer be able to go back to the exam. A sample review screen appears later in this Appendix.

4. **Survey:** After the exam a short survey consisting of 13 questions will appear. Most people complete it in just a few minutes. The survey is important because it gives you the opportunity to let ARRT know about the quality of your testing experience. If something went wrong – or exceptionally right – this is the place to tell us.

The following pages illustrate the approximate appearance of a few of the more important computer screens. Taking a few minutes now to review these pages will help prepare you for exam day.
Appearance of Test Questions

When the examination starts, the clock will be reset to the time allowed for the exam you are taking (see Exam Timing under the Exam Administration Day Section of the handbook to find the time allotted for your exam). Exam questions are presented in random order. The exam consists of a set number of scored questions plus several unscored pilot questions. The content specifications provide additional information about the number of questions and topics covered.

You can comment on specific exam questions by clicking on the “Comment” button. The “Calculator” button gives access to an on-screen calculator (see next page).

This button allows you to mark questions for later review. If uncertain of the best answer, then choose your best guess and flag the question for later review by clicking on the flag icon.

The clock indicates the time left to complete the exam.

The counter indicates which question you are on and the total number of questions on the exam.

The Alamo is located in the state labeled as number.

- [ ] A 1
- [ ] B 2
- [ ] C 3
- [ ] D 4

Here is the exam question. Choose one best answer by clicking the appropriate oval or letter (A, B, C, D). If the question requires a graphic, it will also appear on the screen.

Click on these buttons to go back to the previous question or ahead to the next one.
Online Calculator

To use the calculator, click on the “Calculator” button at the upper left side of the exam screen. You can operate the calculator by using the mouse to click on numbers or arithmetic operations. Alternatively, the keyboard can be used. **Note:** Please make sure to check the display screen on the calculator to verify the correct entry of numbers.

The “Modes” button on the calculator allows you to toggle between the Standard and Scientific calculators. Note that most calculations on the exam can be done with the Standard calculator. However, some candidates may wish to use the Scientific calculator for certain calculations.

Some calculations may require the use of the natural logarithm function (“ln” key) or the $e^x$ function (“2nd” key, then “ln” key). First press the key for the function that you would like, then enter the relevant number for the calculation.
Exam Review

After you have completed all questions on the exam, a screen appears that allows you to go back to review questions. A filled-in flag icon appears next to any questions that you selected for review.

After the Examination

After you click “End Review” and confirm that you will not be able to return to the exam, a screen will appear to remind you not to discuss questions and/or answers with anyone.

A short survey appears on the screen. It asks a few important questions about the quality of the test administration and provides a place for you to type any general comments. We appreciate your feedback.

This button ends the exam. When you are done with your review, click this button to exit.

Once you click “End Review” you will no longer be able to review questions or change answers, so be sure you are really ready to stop!

You can return and review all questions on the exam by clicking on the “Review All” button.

You can return to the questions you selected for review by clicking on the “Review Flagged” button. To review all items on the exam, just click on “Review All.”

If you click this button you will see that you have no incomplete questions, because skipping of questions is not an option on ARRT exams.
Sample Questions for Examinations in Radiography, Nuclear Medicine Technology and Radiation Therapy

The following questions are similar in format to those in the examinations, but they do not represent the full range of content or levels of difficulty. An answer key is provided at the end.

DIRECTIONS: Each of the questions or incomplete statements below is followed by four suggested answers or completions. Select the one that is best in each case.

001. Which of the following sets of technical factors will produce the radiograph with the greatest density?

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<tr>
<th>mA</th>
<th>msec</th>
<th>SID</th>
<th>kVp</th>
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<tbody>
<tr>
<td>100</td>
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<td>48&quot;</td>
<td>80</td>
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<tr>
<td>500</td>
<td>100</td>
<td>40&quot;</td>
<td>76</td>
</tr>
</tbody>
</table>

002. Grid cut-off on a radiograph may be caused by all of the following EXCEPT:

a. a tube that is off-center
b. a tube that is angled perpendicular to the lead strips
c. grid motion being started before the exposure is made
d. improper distance being used with a focused grid

003. The NCRP recommends that the effective dose to an occupational worker should NOT exceed how many mSv in one year?

a. 5 mSv
b. 15 mSv
c. 50 mSv
d. 150 mSv

004. A radioactive solution is known to contain 5 mCi in a volume of 100 ml. One ml of this solution counts 11,000 cpm. If a second sample of 0.15 mCi is counted under the same conditions, the count will be:

a. 3.3 x 10^2 cpm
b. 3.3 x 10^3 cpm
c. 3.3 x 10^4 cpm
d. 3.3 x 10^5 cpm

005. The radionuclidic purity of an imaging agent produced from a generator can be checked by:

a. gamma spectroscopy
b. paper chromatography
c. ion exchange chromatography
d. measuring radiation intensity

006. The exposure rate from a radioactive source is 16 mR/hr. What is the exposure rate if a shield equal to 5 half-value layers is used?

a. 0.2 mR/hr
b. 0.5 mR/hr
c. 1.0 mR/hr
d. 2.0 mR/hr

007. The most likely immediate effect of a whole body radiation dose of 250 cGy is:

a. nausea
b. erythema
c. diarrhea
d. hair loss
008. Which of the following are common side effects of external beam radiation for treatment of prostrate cancer?:
   1. penile edema
   2. proctitis
   3. cystourethritis
      a. 1 & 2 only
      b. 1 & 3 only
      c. 2 & 3 only
      d. 1, 2 & 3

009. The most common side effect of treatment with chemotherapy is:
   a. neuropathy
   b. skin pigmentation
   c. myelosuppression
   d. sterility

Item 010 refers to the illustration on the right.

010. A calyx is identified as:
   a. 1
   b. 2
   c. 3
   d. 4
EXAMINATIONS IN RADIOLOGIC TECHNOLOGY

CANDIDATE STATUS REPORT

Please review the following information very carefully and contact your state licensing agency with any corrections.

Please read your handbook for complete examination details.

YOU MUST USE THE ID NUMBER BELOW WHEN SCHEDULING YOUR APPOINTMENT WITH PEARSON VUE

DATE: 04/189/2019

JOHN Q PUBLIC
APARTMENT 1
MAIN STREET
ANYTOWN, USA 00000

ID#: 999999

SOCIAL SECURITY NUMBER: 123-45-6789
BIRTHDATE: 05/17/1979
EXAMINATION CATEGORY: RADIOGRAPHY

FOR THE STATE OF: YOUR STATE
DIRECT QUESTIONS TO: (555) 999-9999

WINDOW START DATE: 04/24/2019
WINDOW END DATE: 07/22/2019

NUMBER OF PRIOR STATE ATTEMPTS COUNTED
IN ARRT THREE-ATTEMPT LIMIT: 1

You have been assigned to take the examination indicated above based upon information you supplied to your state licensing agency. Please review the above information carefully and contact your state licensing agency at the number listed above if there are any corrections or changes before scheduling your exam.

At the test center, you will be required to show two forms of identification. One must be a government-issued ID which contains a permanently affixed photo along with a signature and must not be expired. The second ID must contain your signature and must not be expired. The names appearing on both IDs must match the name appearing at the top of this status report. Please see the list of acceptable IDs and name requirements in your Examination Handbook. Test center administrators have been instructed not to admit anyone to the test center not having the required suitable IDs. Fees will not be refunded if you are denied admission to the test center for failure to provide suitable identification.

Exam attempts as a state licensing candidate count toward the three-attempt limit for ARRT certification and registration in the same discipline (e.g., radiography, nuclear medicine technology, radiation therapy, or a postprimary exam). Passing an exam as a state candidate counts as an attempt, but the passing score cannot be considered for ARRT certification and registration. Contact ARRT for further information at (651) 687-0048 ext. 8560.

- Please direct all questions and personal information changes to your state licensing agency at the number listed above.
- Your score from this examination cannot be used for current or future certification and registration by the ARRT.
- Your score from this examination is valid only for state licensing purposes.
- Your exam results will be provided by your state licensing agency. Do not contact ARRT for your exam results.

See Reverse Side for Instructions on Scheduling Your Appointment

(12/18)
Appendix F – Sample Candidate Status Report

To schedule, confirm, change, or cancel your examination date, time, or location
Call Pearson VUE at 1-800-632-9055

Record Your Exam Scheduling Information Here

- Call Center Representative: Confirmation Number:
- Date: Time:
- Test Center Address:

Scheduling the Appointment
It is your responsibility to contact Pearson VUE to schedule the date, time, and location of your exam. Your exam must be completed between the assigned window dates printed on this Candidate Status Report. If you fail to complete your exam during your assigned exam window, your file will close and you will need to contact your state licensing agency to reapply.

Please call the Pearson VUE Call Center at 1-800-632-9055 to schedule your appointment. You may also schedule your appointment via the Internet at www.pearsonvue.com/arrt, where you will have to provide a return e-mail address. Shortly after scheduling your appointment, Pearson VUE will send an email confirmation letter to you listing your appointment time and date, testing center location and directions to the testing center. See your Examination Handbook for appointment scheduling and confirmation information.

Changing the Examination Appointment
If you find it necessary to change your examination appointment, you must first call Pearson VUE to cancel your existing appointment in accordance with the guidelines printed in your Examination Handbook before requesting a new exam date or making changes in the test center location. Pearson VUE will charge a fee for each canceled or rescheduled appointment. (See your Examination Handbook for complete details.)

Changing Your ARRT 90-Day Examination Window Dates
If it is necessary to change your ARRT 90-day examination window, you must first call Pearson VUE to cancel your existing appointment BEFORE requesting an examination window change with your state licensing agency. Window dates cannot be changed if an appointment is scheduled. Requests for changes in the examination window dates must be submitted to your state licensing agency (not ARRT) for approval on or before the last day of your current 90-day exam window.

Government-issued ID and Second ID with Signature Required
At the test center, you will be required to show two forms of identification. One must be a government-issued ID containing a permanently affixed photo, along with a signature, and must not be expired. The second ID must contain your signature and must not be expired. Please see the list of acceptable IDs in your Examination Handbook. The name on your IDs must match the name appearing on your Candidate Status Report. Test center supervisors have been instructed not to admit anyone to the test center not having suitable IDs. Your fee will not be refunded if you are denied admission to the test center for failure to provide suitable identification.

Calculators
Personal calculators are prohibited for examinations in all disciplines. You may use the basic 4-function calculator or scientific calculator provided on the computer or you may request a hand-held, basic 4-function calculator from the test center administrator.

Results
Examination results are not given at the test center or provided by the ARRT under any circumstances. Examination results will be mailed to you by your state licensing agency. Please allow four weeks for delivery of examination scores. If results are not received within four weeks, please contact your state licensing agency at the number on the front of this CSR, not the ARRT.

Appeals
You must notify ARRT in writing of any negative situations that may have affected your exam performance by submitting a completed Test Administration Appeal Form (located at StateRHC.org) within two days of your exam. ARRT will not investigate complaints it receives after results have been processed and sent to your state licensing agency. You must fax your appeal to (651) 687-0349. (See Examination Handbook for complete details.)

Notice of Possible Changes to Exam Content Specifications
If you delay taking the exam after you receive this CSR, be aware that we periodically update the exam content specifications. You might need to prepare for new content on the exam. You can find the current exam content specifications at www.StateRHC.org.

ALL CHANGES OR REQUESTS MUST BE MADE DIRECTLY TO YOUR STATE LICENSING AGENCY AT THE PHONE NUMBER LISTED ON THE FRONT OF THIS STATUS REPORT

(12/18)
Appendix G – Testing Centers

Pearson VUE Test Centers

This list may change after publication in this handbook. For an up-to-date list at any time, check the www.pearsonvue.com/arrt website.

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<th>Alabama</th>
<th>Florida</th>
<th>Maine</th>
<th>New Mexico</th>
<th>New York</th>
<th>Rhode Island</th>
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<th>Texas</th>
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<td>Frankfurt, Germany</td>
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<td>Istanbul, Turkey</td>
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Website: www.pearsonvue.com/arrt

www.pearsonvue.com/arrt
# State Licensing Agencies

This list may change after publication in this handbook. For an up-to-date list at any time, check the [www.arrt.org](http://www.arrt.org) website.

<table>
<thead>
<tr>
<th>State</th>
<th>Phone Number</th>
<th>Address Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arizona</td>
<td>602.364.2079</td>
<td>Arizona Department of Health Services&lt;br&gt;Bureau of Special Licensing&lt;br&gt;150 N 18th Avenue, Suite 410&lt;br&gt;Phoenix, AZ 85007</td>
</tr>
<tr>
<td>Arkansas</td>
<td>501.661.2301</td>
<td>Arkansas Department of Health&lt;br&gt; Radiologic Technology Licensure Program&lt;br&gt; Freeway Medical Building, Suite 100&lt;br&gt;5800 W 10th St.&lt;br&gt;Little Rock, AR 72204</td>
</tr>
<tr>
<td>California</td>
<td>916.327.5106</td>
<td>CDPH, Radiological Health Branch – Certification&lt;br&gt;PO Box 997414, MS #7610&lt;br&gt;Sacramento, CA 95899-7414</td>
</tr>
<tr>
<td>Colorado</td>
<td>303.692.3448</td>
<td>Colorado Department of Public Health and Environment&lt;br&gt; Radiation Control Program HMWMD – X-Ray Certification Unit&lt;br&gt;4300 Cherry Creek Dr. S., #B1&lt;br&gt;Denver, CO 80246-1530</td>
</tr>
<tr>
<td>Connecticut</td>
<td>860.509.7603</td>
<td>Department of Public Health – Radiographer Licensure&lt;br&gt;410 Capitol Ave, MS #12APP&lt;br&gt;Hartford, CT 06134-0308</td>
</tr>
<tr>
<td>Delaware</td>
<td>302.744.4546</td>
<td>Division of Public Health – Office of Radiation Control&lt;br&gt;417 Federal St.&lt;br&gt;Dover, DE 19901</td>
</tr>
<tr>
<td>Florida</td>
<td>850.488.0595</td>
<td>Florida Department of Health – Radiologic Technology Certification&lt;br&gt;4052 Bald Cypress Way, Bin C85&lt;br&gt;Tallahassee, FL 32399-3285</td>
</tr>
<tr>
<td>Hawaii</td>
<td>808.586.4700</td>
<td>Hawaii Radiologic Technology Board&lt;br&gt;591 Ala Moana Blvd., Room #133&lt;br&gt;Honolulu, HI 96813-4921</td>
</tr>
<tr>
<td>Illinois</td>
<td>217.785.9913</td>
<td>IEMA&lt;br&gt;1035 Outer Park Dr.&lt;br&gt;Springfield, IL 62704</td>
</tr>
<tr>
<td>Indiana</td>
<td>317.233.7565</td>
<td>IDPH, Medical Radiology Services&lt;br&gt;2 North Meridian St., 4 Selig&lt;br&gt;Indianapolis, IN 46204-3003</td>
</tr>
<tr>
<td>Iowa</td>
<td>515.281.0415</td>
<td>Iowa Department of Public Health, Bureau of Radiological Health&lt;br&gt;Lucas State Office Bldg., 5th floor&lt;br&gt;321 E 12th St&lt;br&gt;Des Moines, IA 50319</td>
</tr>
<tr>
<td>Kentucky</td>
<td>502.782.5687</td>
<td>Kentucky Board of Medical Imaging &amp; Radiation Therapy&lt;br&gt;125 Holmes St, Suite 320&lt;br&gt;Frankfort, KY 40601</td>
</tr>
</tbody>
</table>
### Appendix H – *State Licensing Centers*

<table>
<thead>
<tr>
<th>State</th>
<th>Phone Number</th>
<th>Address</th>
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</thead>
<tbody>
<tr>
<td>Louisiana</td>
<td>504.838.5231</td>
<td>Louisiana State Radiologic Technology, Board of Examiners</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3108 Cleary Ave., Suite 207</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Metairie, LA 70002</td>
</tr>
<tr>
<td>Maine</td>
<td>207.624.8626</td>
<td>Radiologic Technology Board of Examiners</td>
</tr>
<tr>
<td></td>
<td></td>
<td>State House Station #35</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Augusta, ME 04333-0035</td>
</tr>
<tr>
<td>Maryland</td>
<td>410.764.4777</td>
<td>Maryland Board of Physicians</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4201 Patterson Ave. / PO Box 2571</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Baltimore, MD 21215-0002</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>617.242.3035</td>
<td>MA Dept. of Public Health – Radiation Control Program</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Schrafft Center, Suite 1M2A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>529 Main St. Charlestown, MA 02129</td>
</tr>
<tr>
<td>Minnesota</td>
<td>651.201.4545</td>
<td>Department of Health</td>
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<tr>
<td></td>
<td></td>
<td>Indoor Environments and Radiation Section, X-Ray Unit</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PO Box 64497</td>
</tr>
<tr>
<td></td>
<td></td>
<td>St. Paul, MN 55164</td>
</tr>
<tr>
<td>Mississippi</td>
<td>601.987.6893</td>
<td>State Department of Health, Div of Radiological Health</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PO Box 1700</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Jackson, MS 39215-1700</td>
</tr>
<tr>
<td>Montana</td>
<td>406.841.2300</td>
<td>Montana Board of Radiologic Technologists</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PO Box 200513, 301 South Park, 4th floor</td>
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<tr>
<td></td>
<td></td>
<td>Helena, MT 59620-0513</td>
</tr>
<tr>
<td>Nebraska</td>
<td>402.471.2118</td>
<td>DHHS Licensure Unit</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PO Box 94986</td>
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<tr>
<td></td>
<td></td>
<td>Lincoln, NE 68509</td>
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<tr>
<td>New Jersey</td>
<td>609.984.5890</td>
<td>New Jersey Dept. of Environmental Protection</td>
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<tr>
<td></td>
<td></td>
<td>Bureau of X-ray Compliance</td>
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<tr>
<td></td>
<td></td>
<td>PO Box 420, Mail Code 25-01</td>
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<tr>
<td></td>
<td></td>
<td>Trenton, NJ 08625</td>
</tr>
<tr>
<td>New Mexico</td>
<td>505.476.8633</td>
<td>Medical Imaging and Radiation Therapy Program</td>
</tr>
<tr>
<td>ext. 1009</td>
<td></td>
<td>PO Box 5469</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Santa Fe, NM 87502-5469</td>
</tr>
<tr>
<td>New York</td>
<td>518.402.7580</td>
<td>Bureau of Environmental Radiation Protection</td>
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<td>NY Dept. of Health</td>
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<tr>
<td></td>
<td></td>
<td>Empire State Plaza, Corning Tower, 12th floor</td>
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<tr>
<td></td>
<td></td>
<td>Albany, NY 12237</td>
</tr>
<tr>
<td>North Dakota</td>
<td>701.425.0861</td>
<td>North Dakota Medical Imaging &amp; Rad Therapy Board</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PO Box 398</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bismarck, ND 58502</td>
</tr>
<tr>
<td>Ohio</td>
<td>614.752.4319</td>
<td>Ohio Dept. of Health, Radiologic Technology Section</td>
</tr>
<tr>
<td></td>
<td></td>
<td>246 N. High St.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Columbus, OH 43215</td>
</tr>
<tr>
<td>Oregon</td>
<td>971.673.0215</td>
<td>Oregon Board of Medical Imaging</td>
</tr>
<tr>
<td></td>
<td></td>
<td>800 NE Oregon St., Suite 1160A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Portland, OR 97232</td>
</tr>
<tr>
<td>Pennsylvania</td>
<td>717.783.1400</td>
<td>State Board of Medicine/ State Board of Osteopathic Medicine</td>
</tr>
<tr>
<td>(Medicine)</td>
<td></td>
<td>PO Box 2649</td>
</tr>
<tr>
<td></td>
<td>717.783.4858</td>
<td>Harrisburg, PA 17105-2649</td>
</tr>
<tr>
<td>(Osteopathic)</td>
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### Appendix H – State Licensing Agencies

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<thead>
<tr>
<th>State</th>
<th>Phone Number</th>
<th>Agency/Address/Contact Information</th>
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<tbody>
<tr>
<td>Rhode Island</td>
<td>401.222.4998</td>
<td>Rhode Island Dept. of Health / Radiologic Health Program 3 Capitol Hill, Rm 206 Providence, RI 02908</td>
</tr>
<tr>
<td>South Carolina</td>
<td>803.771.6141</td>
<td>South Carolina Radiation Quality Standards Association PO Box 7515 Columbia, SC 29202</td>
</tr>
<tr>
<td>Tennessee</td>
<td>615.292.5006</td>
<td>Limited Scope Testing, Inc. 420 E Iris Drive Nashville, TN 37204</td>
</tr>
<tr>
<td>Texas</td>
<td>512.305.7030</td>
<td>Texas Medical Board PO Box 2029 Mail code 240 Austin, TX 78768</td>
</tr>
<tr>
<td>Utah</td>
<td>800.733.9267</td>
<td>PSI Exams LLC (for Limited Scope and Bone Densitometry Equipment Operator exams) 3210 E Tropicana Ave Las Vegas, NV 89121</td>
</tr>
<tr>
<td></td>
<td>801.530.6628</td>
<td>Division of Occupational and Professional Licensing 160 East 300 South / PO Box 146741 Salt Lake City, UT 84114-6741</td>
</tr>
<tr>
<td>Vermont</td>
<td>802.828.3228</td>
<td>Board of Radiologic Technology 89 Main St., 3rd floor Montpelier, VT 05620</td>
</tr>
<tr>
<td>Virginia</td>
<td>804.367.3051</td>
<td>Commonwealth of Virginia Dept. of Health Professions Board of Medicine Perimeter Center, Ste. 300 9960 Mayland Dr. Richmond, VA 23233</td>
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<tr>
<td>Washington</td>
<td>360.236.4700</td>
<td>Department of Health Radiologic Technology Program PO Box 47852 Olympia, WA 98504-7852</td>
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<tr>
<td>West Virginia</td>
<td>304.558.4012</td>
<td>WV MI &amp; RTT Board of Examiners 1124 Smith Street, Suite B300 Charleston, WV 25301</td>
</tr>
<tr>
<td>Wisconsin</td>
<td>608.266.2112</td>
<td>Wisconsin Department of Safety and Professional Services 1400 Washington Ave PO Box 8935 Madison WI 53708</td>
</tr>
<tr>
<td>Wyoming</td>
<td>307.777.5403</td>
<td>Wyoming State Board of Radiologic Technologist Examiners Emerson Bldg., Rm. 104 2001 Capitol Ave Cheyenne, WY 82002</td>
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<tr>
<td>Scenario</td>
<td>When it’s OK</td>
<td>When it’s not OK</td>
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<td>Educator asking candidates to “stop by” after the exam to “let me know how it went.”</td>
<td>If the invitation and the feedback to the educator relates to their general experience (“I thought the test was not as difficult as I expected…”)</td>
<td>This type of invitation from an educator may be misinterpreted by the candidate — and the student may think that the educator is asking the candidate to reveal copyrighted information.</td>
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<tr>
<td>Candidate tells another candidate, “The test was very difficult — I felt like I didn’t have enough time.”</td>
<td>The candidate is simply telling another candidate how they felt about the exam. This is all right because the candidate is not revealing any of ARRT’s items or the answer options.</td>
<td>One candidate (or potential candidate) asks another candidate questions about the specific items.</td>
</tr>
<tr>
<td>Candidate to educator: “You didn’t teach me about this item that asked [specific item]. I felt unprepared.”</td>
<td>Never.</td>
<td>It is not all right and it will never be all right to reveal ARRT’s copyrighted items (or answer options) to anyone.</td>
</tr>
<tr>
<td>Candidate tells a potential candidate that there were multiple-choice and sorted-list items on the test.</td>
<td>This is public information, noted in the handbook.</td>
<td>It’s not all right to reveal anything beyond what’s in the handbook.</td>
</tr>
<tr>
<td>Candidate asks another candidate, “I don’t think that I understood this question…[relates question]… Do you know what they were asking?”</td>
<td>Never.</td>
<td>It is not all right and it will never be all right to reveal ARRT’s copyrighted items (or answer options) to anyone.</td>
</tr>
<tr>
<td>Candidate says to a potential candidate, “If I were you, I would bring a sweater — it was cold at the test site.”</td>
<td>This candidate is simply telling another candidate about their surroundings at the test site. This is all right because the candidate is not revealing any of ARRT’s items or the answer options.</td>
<td>If it leads a candidate (or potential candidate) to ask another candidate questions about the specific items.</td>
</tr>
<tr>
<td>Potential candidate says to a candidate, “Were there a lot of questions on [specific topic]?”</td>
<td>Never.</td>
<td>This candidate should be aware of the topics that are contained in the exam from the content specifications published in the handbook and should not be asking for more specific information than is contained in that publication.</td>
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Appendix I – Potential Exam Disclosure Scenarios
FAQs: State Licensing and Exam Procedures

Question: How do I become licensed to work in my state?

Answer: ARRT contracts with more than 25 states for administering ARRT exams to state license/permit candidates. Each state has rules and regulations that identify the qualifications required for a person to become licensed in that specific state. Contact your state licensing agency to find out more information. The list of radiologic technologist state licensing agencies is provided at www.staterhc.org.

Question: I sent my exam application to the state. How long does it take to process?

Answer: States vary on how long it takes to process an application. Please allow up to four weeks for processing. If you have not heard from your state agency after that time, you may want to give them a call.

Question: I received my Candidate Status Report (CSR) and some of the information is incorrect.

Answer: The information on your CSR was provided to the ARRT by your state licensing agency. Contact your state licensing agency to make sure they have all of your correct information. After you contact your state, they will notify the ARRT of any corrections that should be made to your file. ARRT will make the correction(s) and send a new CSR to you. ARRT cannot update your information (i.e., name, address, SS#, and date of birth) without notification from your state licensing agency.

Question: I have an ADA-qualifying disability and require testing accommodations. What do I need to do?

Answer: The ARRT provides reasonable testing accommodations in accordance with the Americans with Disabilities Act (ADA). Candidates needing testing accommodations are required to submit appropriate documentation demonstrating that they have an ADA-qualifying disability. Complete information regarding required ADA documentation can be found in this handbook and at staterhc.org.
Question: English is my second language and I need more time for taking my exam. What do I need to do?

Answer: English as a second language is not covered by the Americans with Disabilities Act; therefore, testing accommodations cannot be provided.

Question: I called Pearson VUE to schedule my appointment but they said they don’t have a record for me. What happened?

Answer: When calling Pearson VUE to schedule your appointment, you must have a current CSR indicating you have a current exam window. You must also provide Pearson VUE with the 6-digit ID number (starting with a 9) that is located on your current CSR. If you do not provide this ID#, VUE will not be able to locate your test file.

Question: Where can I find study material?

Answer: ARRT does not provide specific lists of study materials or textbooks, nor does it recommend or endorse any review programs, mock registries, or study guides. ARRT exams are developed using many references. Please review the appropriate exam content specifications for an outline of the topics included on the exam. Content specifications can be found at www.staterhc.org and in the handbook appendix.

Question: Due to unforeseen circumstances, I am unable to schedule my exam during my current 90-day exam window. How can I change my state examination window?

Answer: You must request a window extension from your state licensing agency. Not all state agencies will allow a candidate to extend the 90-day exam window due to temporary license expiration dates. If your state approves a window extension for you, the state will notify ARRT via email. It is important to note that you must cancel an existing exam appointment before requesting an extension. In addition, window extension requests must be made before your current exam window expires. ARRT cannot extend an exam window if there is an appointment appearing on your file or if your window has expired. ARRT will send a new CSR with a new exam window to you after we have processed your window extension request.

Question: My exam appointment is scheduled for tomorrow afternoon but I can’t make it. What do I do?

Answer: Appointments must be cancelled at least 24 hours (one business day) prior to the scheduled appointment. If less than 24 hours remain until your scheduled appointment, you will be required to keep the appointment. If you do not show up for the appointment, you will lose your exam fee, your file will be closed and your exam window will end. Please note that appointments for Monday must be canceled no later than the appointment time on Friday.
**Question:** The weather was bad, causing me to arrive 30 minutes late for my exam appointment, and the test center administrator wouldn’t let me take my exam.

**Answer:** Candidates are responsible for showing up for their appointments on time, even if the weather is bad. If bad weather is forecast for your area, plan extra time for your commute. It’s better to arrive early and have time to sit and relax than to rush to get there on time and be stressed out. If bad weather is forecast, it might even be easier to cancel your appointment in advance and reschedule it for a later date when the bad weather has passed.

**Question:** The name on my government-issued driver’s license has an extra name which is not on my Candidate Status Report (CSR), so I was not able to take my exam. Why not? What now?

**Answer:** Security at the test centers is strictly enforced – which includes making sure the name on your government-issued photo ID matches the name you submitted on your application to the state. Play it safe. When you receive your CSR, verify that the name matches exactly the way it appears on the identification documents you will use at the test center. It’s better to be prepared than be turned away at the test center, causing your exam fee to be forfeited and your exam window to be closed. Candidates turned away due to a name discrepancy are required to contact their state licensing agency to find out the process to again become eligible for the exam.

**Question:** The test center would not let me use my own calculator for my exam.

**Answer:** Scientific and basic 4-function calculators are embedded in the exam for your use. If you don’t feel comfortable using one of the embedded calculators, test centers are equipped with basic 4-function, hand-held calculators. You may request a hand-held calculator when you check in. Personal calculators are not allowed under any circumstance.

**Question:** The Pearson VUE test center administrator told me I couldn’t write on my note board until my exam started. I don’t understand.

**Answer:** It is in your best interest to follow the instructions of the test center administrator. Candidates may hurry to start writing notes on their note boards and not pay attention to the exam screen in front of them. A Non-Disclosure Agreement (NDA) appears after the tutorial and candidates have two minutes to respond to the NDA. Anxious candidates may start writing on their note boards and not pay attention to the computer screen prompts. If a candidate doesn’t respond to the NDA within the allotted two minutes, the exam shuts down and cannot be restarted. When this happens, the exam fee is forfeited, the candidate file is closed and the 90-day exam window ends. Play it safe and follow the screen prompts until the exam begins.
Question: I had to use the rest room and my exam time clock did not stop while I was gone. Was it supposed to?

Answer: Candidates are allowed to take breaks; however, the exam continues running. Exam appointments allow established times for the tutorial, the exam, and a satisfaction survey. Timed breaks are not built into the exam appointment. It's best to take care of personal business before your exam and to keep comfort breaks to a minimum.

Question: The power went out briefly during my exam and I was able to complete my exam from where it stopped. I think I should be able to complete the exam over at no cost. Can I?

Answer: On rare occasions, a candidate may experience a technical difficulty while completing the exam. Test center personnel are trained to correct any difficulty encountered as quickly as possible. Test centers are equipped with backup systems, so every reasonable effort will be made to retrieve testing data. In most cases, the test center personnel are able to restart the exam administration without loss of any responses already made. In instances where a restart is not successful, the test will be re-scheduled at no cost. If the test center is able to restart your exam and you are able to continue where you left off, your exam will be scored and will count as an attempt.

Question: The person next to me was typing loudly. I feel this affected the way I tested and do not feel my score is accurate. What are my options?

Answer: You should have alerted the test center supervisor immediately when you felt something or someone was affecting your test experience and asked the test center administrator to file a report before leaving the test center. You must also notify ARRT in writing within two days of your exam date. ARRT will investigate each issue reported and respond to your appeal in writing. If ARRT finds any deviation unfairly interfered with your ability to complete your exam to the best of your ability, the original score will be canceled and you will be allowed to retake the exam at no cost. Under no circumstances will a candidate’s score be adjusted.

Question: I was in the middle of the review portion of my exam and the exam ended. I don’t feel all of my responses were counted. How do I have my exam reviewed and rescored?

Answer: A candidate may request a review of score accuracy if s/he feels an error has occurred. Send a letter of request to the ARRT within 30 days of your exam date – detailing the specific reason a scoring error is suspected. Requests must be accompanied by a $25 fee, payable to ARRT. ARRT will review your response to each question, compare those responses to the answer key, and recalculate raw scores. Passing scores are determined by your state.
**Question:** I took my exam three weeks ago but I haven’t received my results. Did they get lost?

**Answer:** ARRT processes candidate results every week and provides your scores to your state licensing agency. Your state licensing agency will then review the scores and determine whether you passed or failed; the ARRT does not make that determination. Some states mail a notice to the candidate; other states require the candidate to check online. Either way, please allow up to four weeks for your state to provide you with your score information. After four weeks you should contact your state licensing agency.
ARRT Candidate Rules Agreement

Please review the following information and ask the Test Administrator if you have questions.

1. ARRT has a zero tolerance policy regarding possession of cell phones and other electronic devices at the test center. If you are found in possession of one of these devices, you will not be allowed to resume your exam or assessment, you will forfeit your exam or assessment fee, and your score will be canceled.
   Should you bring an electronic device into the test center alert the test administrator, exit the test center, and store the device in your vehicle. If you cannot store the device in your vehicle for whatever reason, then you must turn off the device and store it in one of the test center’s lockers before you enter the testing room.
   If you store a device in one of the test center’s lockers, you will be barred from accessing the locker until you have completed your exam.
   **Note:** During scheduled breaks, RA and sonography candidates may still access the locker in order to retrieve snacks.

2. Do not use the notebook provided by the Test Administrator until after you have responded to the Non-Disclosure Agreement. If you need a clean notebook during the exam or assessment, you should raise your hand to get the Test Administrator’s assistance. Return all items to the Test Administrator after completing your exam or assessment.

3. Eating, drinking, smoking, chewing gum, and making noise that creates a disturbance for other candidates is prohibited during the exam or assessment.

4. The Test Administrator will monitor you continuously while you complete your exam or assessment. The session may be videotaped or otherwise recorded for security or other purposes.

5. If you experience problems that affect your ability to complete your exam or assessment, notify the Test Administrator immediately by raising your hand. The Test Administrator cannot answer questions related to exam or assessment content and performance.

6. To request an unscheduled break, you must raise your hand to get the Test Administrator’s attention. The exam or assessment timer will not stop while you are on an unscheduled break. The Test Administrator will sign you in, after being signed in you may resume your exam or assessment.

7. You may not remove any items from your secure locker. The only items you will be permitted to access are emergency personal items that have been pre-approved by ARRT—for example, if you need to take medication at a specific time.

8. You may not leave the building for any reason (unless directed to leave by test center staff). If you leave the building you will not be allowed to resume your exam or assessment, you will forfeit your exam or assessment fee, and your score will be canceled.

9. Do not remove copies of exam or assessment questions and answers from the testing room. Do not share the questions or answers seen in your exam or assessment with other candidates. Reproduction of copyrighted material, in whole or part, is a federal offense.

10. After completing your exam or assessment, raise your hand. The Test Administrator will come to your workstation to ensure your exam or assessment has ended properly and will escort you from the testing room.

11. If you do not follow the rules, are suspected of cheating or tampering with the computer, or demonstrate irregular behavior the issue will be reported to Pearson VUE, the ARRT, and your state licensing agency (if applicable). Your exam or assessment may be invalidated, the ARRT may take other action such as canceling your score, and you will not be refunded your exam or assessment fee.

**Candidate Statement:** By providing a digital signature, I give Pearson VUE my explicit consent to retain and transmit my personal data and test responses to the Pearson VUE corporate office and the ARRT (either of which may be outside of the country in which I am testing). I understand the information provided above and agree to abide by the ARRT Candidate Rules Agreement. In addition, I understand that if I am found to be in violation of any rule listed above, this will constitute grounds for the ARRT to take appropriate punitive action up to and including terminating my participation in the exam or assessment, invalidating the results of this exam or assessment and any prior exam or assessment, and permanently barring me from all future exams or assessments. In addition, I understand I may be subject to an ARRT ethics investigation or even a federal court lawsuit for copyright infringement and/or breach of contract. Any information collected by an ARRT investigation may be forwarded to my state licensing agency for review of state ethics violations.

ARRT Candidate Rules Agreement Version 3.4 / October 2016
State Examination Handbook Checklist

When you receive your Candidate Status Report (CSR) from ARRT…and before scheduling your exam you will want to check…

• Does your name on your CSR match the name appearing on your two forms of required ID?
  – If your names do not match, do not schedule an appointment. Contact your state licensing agency to make the necessary changes and have them notify ARRT so we can mail you a new CSR with your updated info.
  – Once you verify the changes to your CSR are correct, go ahead and schedule your exam.

• Name or address change after you receive your information from ARRT?
  – All changes must be made via your state licensing office.

• Be sure to note the dates of your 90-day exam window.
  – You must schedule your exam for a time within the 90-day exam window printed on your CSR.

• If you can’t take your exam within your 90-day exam window, you are allowed up to 3 extensions – but they must be approved by your state licensing agency.
  – Cancel any existing appointment.
  – Contact your state licensing agency directly to request a window extension.
  – A new CSR will be mailed to you once ARRT has been notified and processed the request.

• Required IDs at the test center.
  – Make sure your IDs meet ARRT’s requirements listed in the handbook to prevent being turned away from the test center and losing your fee.
  – If you are unsure, cancel your appointment and reschedule when you are certain your IDs will be acceptable.

• Questions on exam results?
  – ARRT processes results each week and provides your score information to your state licensing agency.
  – Your state licensing agency determines your pass/fail status, not ARRT.
  – Please allow up to 45 days for your state licensing agency to notify you of your results.
  – Contact information for your state licensing agency is in the upper right-hand side on the front of your CSR.
State Licensing Examinations Administered by ARRT in 2019

Important Notice: *State Licensing is Not ARRT Credentialing*

A passing score on a state licensing examination does not make a candidate eligible for ARRT certification and registration. If the six-digit ID number on your Candidate Status Report begins with a “9,” you are a state candidate only. Candidates seeking ARRT certification and registration must have submitted an application directly to ARRT and must have met all other criteria for ARRT certification and registration. Those seeking only state licensing must meet criteria established by the state. Test scores earned as a state candidate may not be used for ARRT certification and registration.