

Radiologic Technology II

8376 36 weeks

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Course Description

Suggested Grade Level: 12

Prerequisites: 8375

Students will identify the basic components and functions associated with radiologic equipment and develop a scientific understanding of the technical factors and physical concepts required to produce and evaluate quality images. They will practice the use of radiation protection

techniques, such as the as low as reasonably achievable (ALARA) principle, and explore imaging modalities. Students will also investigate career opportunities and the processes to obtain and maintain professional certifications within the field of imaging sciences.

NOTE: *This course has specific state laws and regulations from a governing medical board or agency. Please contact the Virginia Department of Education, Office of Career and Technical Education prior to implementing this course. All inquiries may be sent to cte@doe.virginia.gov.*

Task Essentials Table

- Tasks/competencies designated by plus icons (+) in the left-hand column(s) are essential
- Tasks/competencies designated by empty-circle icons (○) are optional
- Tasks/competencies designated by minus icons (−) are omitted
- Tasks marked with an asterisk (*) are sensitive.

8376	Tasks/Competencies
Examining Radiobiology	
(+)	Summarize the cell theory of human biology.
(+)	Evaluate the radiosensitivity of tissues and organs exposed to ionizing radiation.
(+)	Analyze physical factors that have an impact on the patient’s radiation exposure.
(+)	Describe the physical and biological factors that have an effect on radiation response.
(+)	Label dose-response relationship curves that emerge when radiation exposure/time intersects with response occurrences.
(+)	Explain the effects of radiation on deoxyribonucleic acid (DNA).
(+)	Explain the chemical reactions that occur when water is exposed to ionizing radiation.
(+)	Describe three acute radiation syndromes and their symptoms.
(+)	Differentiate between the early effects and late effects of radiation exposure.
(○)	Analyze occurrences of radiation-induced cancer.
Applying Radiation-Protection Procedures	
(+)	Explain the recommended radiation dose limits.
(+)	Describe the radiation-protection features included in the design of a medical imaging department.
(+)	Explain the purpose of the radiation-protection features of fluoroscopic and radiographic imaging equipment and the protective equipment used in the imaging area.
(+)	Describe the functions of personal and area radiation dosimetry devices used in medical imaging.
Exploring Radiologic Physics	
(○)	Describe mathematical units of radiation and radioactivity.
(+)	Analyze electromagnetic radiation and the electromagnetic spectrum.
(+)	Distinguish between the two types of ionizing radiation interactions.
(+)	Describe the interactions that occur at the tube target.
(+)	Compare the primary interactions of X-rays with matter.
(+)	Differentiate between positive and negative contrast agents.

8376	Tasks/Competencies
Examining Professional Standards for Patient Care	
+	Describe the basic needs of patients according to Maslow's hierarchy.
+	Demonstrate interpersonal communication skills and professional courtesy when interacting with patients, family members, and other healthcare workers.
+	Obtain a clinical history.
+	Identify immobilization techniques designed to reduce injury and radiation exposure.
+	Identify pediatric immobilization techniques designed to reduce radiation exposure.
+	Measure a radiologic patient's vital signs.
+	Demonstrate precautions as prescribed by health and regulatory agencies.
+	Demonstrate proper body mechanics and patient transfer.
+	Explain the basic equipment and precautions involved in oxygen therapy.
+	Examine safeguards to address the risk factors associated with oxygen therapy in medical imaging.
+	Outline the chain of infection.
+	Evaluate chemical and physical asepsis techniques.
+	Outline basic principles of sterile technique.
+	Evaluate the medical imaging work environment for medical emergency preparedness.
+	Identify complications resulting from the use of pharmacologic items in medical imaging.
+	Compare the methods of contrast administration used by medical imaging departments.
+	Describe documentation procedures related to pharmacologic administration.
Exploring Careers in Radiologic Technology	
+	Examine laws and regulations related to radiologic technology.
+	Prepare a sample application and associated forms for licensure.
+	Research requirements for continuing education and specializations in radiologic technology.
+	Complete a nationally recognized certification.
Describing the Opioid Crisis	
+	Describe the history and current state of the opioid crisis in the United States.
+	Describe the history and current state of the opioid crisis in Virginia.
+	Define the pharmacological components and common uses of opioids.
Examining the Key Factors of Drug Addiction	
+	Examine the science of addiction.
+	Explain prevention and early intervention strategies.
+	Identify addiction and its behavioral elements, as defined by the Diagnostic and Statistical Manual of Mental Disorders (DSM-5).
+	Describe the treatment models of addiction therapy.
+	Describe the medication management antidote used to prevent fatal opioid overdoses.
Understanding Pain Management Protocols	
+	Explain the science of physiological and mental pain.
+	Describe the diagnostic tools used in developing pain management plans.
+	Describe pain treatment options available to various populations of patients.
+	Describe the effects of opioid dependency on the human body systems.
+	Explain the mechanism and physical effects of opioids on the human body.

8376	Tasks/Competencies
+	Explain the use of opioids in practice settings, the role of opioids in pain management, and risk factors associated with the use of the medication.
+	Describe the withdrawal and tapering side effects of opioid use.
+	Describe storage and disposal options for opioids.
+	Explain community resources for education about opioid use.
Working with Patients and Caregivers	
+	Describe key communication topics involving opioids for patients.
+	Describe communication topics for caregivers and family members.

Legend: + Essential ○ Non-essential - Omitted

Curriculum Framework

Examining Radiobiology

Task Number 39

Summarize the cell theory of human biology.

Definition

Summary should include the following basic tenets:

- All living things are made up of cells.
- The cell is the structural and functional unit of all living things.
- All cells come from pre-existing cells by division.
- Cells contain hereditary information that is passed from cell to cell during cell division.
- All cells have essentially the same chemical composition.
- All energy flow (metabolism and biochemistry) of life occurs within cells.

Process/Skill Questions

- What is the structure of a human cell?
- What are the functions of a human cell?
- How are human cells different from plant and other animal cells?

HOSA Competitive Events (High School)

Teamwork Events

- HOSA Bowl
-

Task Number 40

Evaluate the radiosensitivity of tissues and organs exposed to ionizing radiation.

Definition

Evaluation should include

- blood cells
- bone cells
- nerve tissue
- reproductive organs
- the lens of the eye
- the thyroid gland.

The evaluation should be based on the law of Bergonié and Tribondeau, which established that radiation sensitivity levels vary by tissue and organ type.

Process/Skill Questions

- What is radiosensitivity?
 - How are human tissue and organs affected by radiation?
 - What is the law of Bergonié and Tribondeau? How does it relate to radiation treatment?
-

Task Number 41

Analyze physical factors that have an impact on the patient's radiation exposure.

Definition

Analysis should include physical factors such as

- body habitus

- status of pathology
- age
- osteopenia/osteoporosis
- arthritis
- disabilities.

Based on these physical factors, the radiologic technologist should adjust technical factors to ensure delivery of the appropriate quantity and quality of radiation.

Process/Skill Questions

- What adjustments may be needed to accommodate special-needs patients?
- What technical factors would need to be adjusted when radiographing a young patient vs. an elderly patient?
- How would the patient's pathology affect radiation exposure?

Task Number 42

Describe the physical and biological factors that have an effect on radiation response.

Definition

Description should include

- the energy level of radiation
- the total amount administered
- the timeframe in which the dose is given
- the metabolic state of tissue
- tissue oxygenation
- disease progression
- the age of the patient
- skin pigmentation
- structural morphology.

Process/Skill Questions

- What are the physical factors that affect radiation response?
- What are the biological factors that affect radiation response?
- What is meant by metabolic state?
- What is meant by oxygenation?
- What is disease progression? How does that affect radiation treatment?

Task Number 43

Label dose-response relationship curves that emerge when radiation exposure/time intersects with response occurrences.

Definition

Labeling of graphs should specify the radiation exposure response type as

- linear or nonlinear
- threshold or nonthreshold

Labeling should also assess whether the dose response is indicative of the development of conditions such as

- cataracts
- leukemia
- erythema
- anemia
- breast cancer.

Process/Skill Questions

- What are the various dose-response relationships?
- What are the differences between linear and nonlinear responses?
- How can a pathology be measured by dose-response relationships?

Task Number 44

Explain the effects of radiation on deoxyribonucleic acid (DNA).

Definition

Explanation should include the structural changes that occur in DNA and the resultant genetic complications that can arise from radiation exposure.

Process/Skill Questions

- What is DNA?
- How does radiation affect human DNA?

- What genetic complications can arise from radiation exposure?

HOSA Competitive Events (High School)

Teamwork Events

- HOSA Bowl
-

Task Number 45

Explain the chemical reactions that occur when water is exposed to ionizing radiation.

Definition

Explanation should include the following concepts:

- The human body is 95 percent water.
- Ionizing radiation breaks down bonds between hydrogen atoms in the body, resulting in the potential formation of free radicals, which are responsible for aging, tissue damage, and possibly some diseases.

Process/Skill Questions

- What percentage of the human body is comprised of water?
- What is radiolysis?
- What are free radicals?

Task Number 46

Describe three acute radiation syndromes and their symptoms.

Definition

Description should include the concurrent symptom progression of

- hematological syndrome—lowered peripheral blood counts due to bone marrow damage
- gastrointestinal syndrome—diarrhea, fever, dehydration, and electrolyte imbalance due to damage to gastrointestinal (GI) tract
- cardiovascular—(CV)/central nervous system (CNS)—convulsions, seizures, coma, death.

Process/Skill Questions

- What are the symptoms of hematological syndrome?
- What are the symptoms of gastrointestinal syndrome?
- What are the symptoms of neurological syndrome?
- How do acute radiation syndromes occur?

Task Number 47

Differentiate between the early effects and late effects of radiation exposure.

Definition

Differentiation should consider the patient's radiation history and distinguish between

- early-effect symptoms, such as
 - anemia
 - erythema
- late-effect symptoms, such as
 - cataracts
 - thyroid disease.

Process/Skill Questions

- What is anemia, and at what stage of radiation treatment does it occur?
- What are some indicators of thyroid disease?
- What are early symptoms of radiation exposure?
- What are late symptoms of radiation exposure?

Task Number 48

Analyze occurrences of radiation-induced cancer.

Definition

Analysis should explore

- the incidence rates of radiation-induced cancers (e.g., leukemia, skin cancer, bone cancer)
- potential overuse of radiation as a diagnostic tool and diagnostic alternatives.

Process/Skill Questions

- What effect does a patient’s radiation history have on the development of radiation-induced cancer and leukemia?
- What are some concerns related to overuse of radiation?
- How is an overuse of radiation diagnosed in patients?

Applying Radiation-Protection Procedures

Task Number 49

Explain the recommended radiation dose limits.

Definition

Explanation should cite National Council of Radiation Protection and Measurements (NCRP) reports and exposure guidelines for the

- student radiographer
- pregnant student radiographer
- pregnant technologist
- pregnant patient
- occupational use (e.g., dosage units per patient, dosage units per employee).

Process/Skill Questions

- Why are time, distance, and shielding key safety factors in radiologic technology?
- Why should pregnant technologists and pregnant patients limit their exposure to radiation?
- Why should imaging personnel monitor their lifetime radiation accumulation?

Task Number 50

Describe the radiation-protection features included in the design of a medical imaging department.

Definition

Description should include

- the primary use of each room
- workflow patterns

- patient accessibility
- equipment positioning
- wall, ceiling, and floor thicknesses
- construction materials
- background equivalent radiation time (BERT).

Process/Skill Questions

- What are possible consequences if medical imaging departments lack radiation-protection features?
- Why is patient accessibility important in a medical imaging department?
- Why should room workflow be a consideration in crisis planning?

Task Number 51

Explain the purpose of the radiation-protection features of fluoroscopic and radiographic imaging equipment and the protective equipment used in the imaging area.

Definition

Explanation should include

- grids
- collimator
- dead-man switch
- leaded curtain
- glass shield (i.e., primary and secondary barrier)
- five-minute timer with audible warning system
- personal protective equipment (PPE), such as lead gloves, aprons, thyroid shields, and glasses.

Process/Skill Questions

- Why is radiation-protection equipment necessary?
- What are some examples of personal protective equipment and their purposes?
- What is a collimator? How does it work?

Task Number 52

Describe the functions of personal and area radiation dosimetry devices used in medical imaging.

Definition

Description should include

- film badge dosimeter—consists of two pieces of film that darken as badge is exposed to ionizing radiation
- pocket dosimeter—uses an air chamber to provide an immediate readout of radiation exposure but no long-term record
- thermoluminescent dosimeter—stores absorbed radiation energy in thermoluminescent chips that give off visible, measurable light when heated
- optically stimulated luminescence (OSL) badge—measures radiation that passes through a thin strip of aluminum oxide using a laser light
- ring dosimeter—contains a radiation-sensitive lithium fluoride crystal that gives off visible, measurable light when heated
- ionization chamber-type meter (Cutie Pie) and Geiger-Müller counter—field survey instruments used to measure radiation in the air.

Process/Skill Questions

- What is the purpose of dosimeters?
- Who should wear dosimeters?
- How does a thermoluminescent dosimeter (TLD) work?

Exploring Radiologic Physics

Task Number 53

Describe mathematical units of radiation and radioactivity.

Definition

Description should cite base and derived units of scientific systems of radiation measurement to include

- mass, length, and time
- exposure, dose, effective dose, and radioactivity.

The description should also distinguish between standard units and the International System of Units (SI).

**SI=Systeme Internationale*

Process/Skill Questions

- Why is measurement of radiation exposure important?
- What is radioactivity?
- What are the basic units of measurement?
- How do units relate to the decimal system?

Task Number 54

Analyze electromagnetic radiation and the electromagnetic spectrum.

Definition

Analysis should

- explore the relationship between wavelength and frequency across the electromagnetic spectrum
- include the application of the inverse square law to electromagnetic radiation
- differentiate between wave theory and particulate theory.

Process/Skill Questions

- How are wavelength, energy, and frequency related?
- What is the difference between radio waves and X-rays?
- How does the frequency for an AM radio station vary from an FM station?
- When would you apply Planck's constant?
- When would you apply Einstein's theory?

Task Number 55

Distinguish between the two types of ionizing radiation interactions.

Definition

Distinction should include an evaluation of electron activity in

- Brems radiation
- characteristic radiation.

Process/Skill Questions

- How is the energy of an electron measured?
- What are the key differences between Brems radiation and characteristic radiation?
- Which form of radiation has the highest probability of occurring?

Task Number 56

Describe the interactions that occur at the tube target.

Definition

Description should indicate the influence of the following factors on the X-ray emission spectrum:

- Milliamperage
- Kilovoltage
- Filtration
- Source-image distance
- Target material

Process/Skill Questions

- What are the different types of energy?
- How does an automobile represent multiple energy conversions?
- X-rays are what form of energy?

Task Number 57

Compare the primary interactions of X-rays with matter.

Definition

Comparison should address the differences and similarities among

- the Compton effect
- photoelectric absorption and attenuation
- coherent scatter
- photodisintegration
- pair production.

Process/Skill Questions

- What is the difference between attenuation and absorption?
- What causes scatter radiation?
- How can scatter radiation be reduced?

Task Number 58

Differentiate between positive and negative contrast agents.

Definition

Differentiation should include how the chemical properties of radiologic contrast agents (positive and negative) are used to enhance images.

Process/Skill Questions

- How does density affect radiation visibility and penetration?
- What is the atomic weight of barium? Iodine?
- What anatomical parts are not visible without a contrast agent?
- What is meant by contrast?
- How does air serve as a contrast agent?
- What are the chemical properties of barium?
- What are the chemical properties of iodine?
- When would air be used vs. barium?

Examining Professional Standards for Patient Care

Task Number 59

Describe the basic needs of patients according to Maslow's hierarchy.

Definition

Description should include the five-tier model of human needs, including

- physiological
- safety
- social (i.e., love and belonging)
- esteem
- self-actualization.

Process/Skill Questions

- How can the radiologic technologist make the patient feel safe?
- What techniques could the radiologic technologist use to involve patients in their own care?
- What environmental factors affect a patient's physical comfort?

HOSA Competitive Events (High School)

Health Science Events

- Knowledge Test: Human Growth and Development
-

Task Number 60

Demonstrate interpersonal communication skills and professional courtesy when interacting with patients, family members, and other healthcare workers.

Definition

Demonstration should include

- verbal vs. nonverbal communication
- subjective vs. objective assessment
- private vs. public consultation with patients, families, and colleagues to protect patient confidentiality
- appropriate interactions with patients based on patient's age and abilities across cognitive, affective, and psychomotor spectrums.

Process/Skill Questions

- How can nonverbal communication be used effectively in the patient setting?
- What is the difference between a subjective and objective assessment?
- What techniques could the radiologic technologist use with a dementia patient?
- What techniques could the radiologic technologist use to explain an MRI to a four-year-old?
- What techniques could the radiologic technologist use to explain a CT scan to a person with hearing loss?

Task Number 61

Obtain a clinical history.

Definition

The clinical history should be

- taken directly from the patient or guardian and relevant to the medical complaint
- correlated with the patient's existing medical record.

Process/Skill Questions

- What are the components of a clinical history?
- What information is critical to gather from a patient's existing record?
- Why would information concerning allergies be important?

Task Number 62

Identify immobilization techniques designed to reduce injury and radiation exposure.

Definition

Identification should include the purposes of specialty equipment (e.g., backboards, cervical collars, lifts, draw sheets).

Process/Skill Questions

- What situation would require the removal of a cervical collar?
- What technique should one use to move a patient with a fractured hip onto the X-ray table?
- What are the consequences if a fracture is not properly immobilized?

Task Number 63

Identify pediatric immobilization techniques designed to reduce radiation exposure.

Definition

Identification should include

- Pigg-O-Stat
- papoose
- sheets
- compression bands

- towels
- tape
- sponges.

Process/Skill Questions

- What is a Pigg-O-Stat? When should it be used?
- How would you immobilize a toddler using the papoose technique?
- What precautions should you take when immobilizing a child for a radiologic procedure?

Task Number 64

Measure a radiologic patient's vital signs.

Definition

Measurement should include

- the use of equipment and the ability to read results
- the need to assess, record, and detect variations from the norm in the patient's vital signs, such as
 - pulse oximetry
 - temperature
 - blood pressure
 - pulse
 - respiration.

Process/Skill Questions

- When might a radiologic technologist need to take vital signs?
- How should a radiologic technologist respond in the case of abnormal vital signs?
- What is a normal heart rate for a child?
- What is a normal respiration rate for an adult?

Task Number 65

Demonstrate precautions as prescribed by health and regulatory agencies.

Definition

Demonstration should include the

- identification of the primary roles of
 - Occupational Safety and Health Administration (OSHA)
 - Centers for Disease Control and Prevention (CDC)
 - The Joint Commission regarding safety and health precautions for patients and employees in the healthcare environment.

Demonstration of Standard Precautions should include the

- use of protective barriers, such as gloves, gowns, aprons, masks, or protective eyewear
- implementation of precautions to prevent injuries caused by needles, scalpels, and other sharp instruments or devices.

Demonstration of Transmission-Based Precautions should include the following precautions:

- To prevent airborne transmission
 - special air handling and ventilation systems
 - particulate respirators
- To prevent droplet transmission
 - single-patient room or curtained space for patient
 - mask for patient during transport
 - change of mask and other protective attire and performance of hand hygiene between contact with infected patient and contact with other patients
- To prevent contact transmission
 - hand hygiene
 - donning of PPE before room entry and discarding before exiting the patient's room
 - cleaning and disinfection of patient-care devices and instruments and other sources of indirect transmission after patient contact

Process/Skill Questions

- What is the difference between Standard Precautions and universal precautions?
- What is the role of the CDC in protecting healthcare personnel and patients?
- What are examples of airborne infections and of infections transmitted by droplets? How do the transmission precautions differ for these two types of infections?
- What is the difference between direct and indirect contact transmission of infection? What are examples of each? What precautions are necessary for each?

Task Number 66

Demonstrate proper body mechanics and patient transfer.

Definition

Demonstration should reflect proper body mechanics in the handling of patients and equipment and in-patient transfer (e.g., wheelchair to table, stretcher to table), and include the following back protection precautions:

- Keep feet shoulder-width apart.
- Keep knees properly bent.
- Use appropriate body mechanics per procedure.
- Use appropriate equipment (e.g., specialty lifts, draw sheets, transfer boards or sliders).
- Seek help when necessary.

Process/Skill Questions

- What can result from improper body mechanics?
 - How can the radiologic technologist recognize that the physical task at hand is too much for one person to handle?
 - How can the radiologic technologist assess which equipment is best for patient transfer and which equipment is best for other situations typically encountered in patient imaging?
-

Task Number 67

Explain the basic equipment and precautions involved in oxygen therapy.

Definition

Explanation should include

- the difference between high-volume and low-volume oxygen-delivery equipment and oxygen-monitoring equipment
- the procedure for monitoring the level of oxygen that the patient requires
- why oxygen is considered a pharmaceutical
- how the radiologic technologist interacts with the respiratory therapist
- patient safety precautions (e.g., transfer from portable oxygen to wall oxygen)
- hazards in storage, handling, and usage.

Process/Skill Questions

- Why is it important for a radiologic technologist to understand that oxygen is a pharmaceutical?
- What are some pathologies that would cause a patient to require oxygen therapy?

- What are potential consequences of failing to monitor a radiologic patient's oxygen level?
- When performing exams on a patient who is also receiving oxygen therapy, what precautions must be taken by the radiologic team?

Task Number 68

Examine safeguards to address the risk factors associated with oxygen therapy in medical imaging.

Definition

Examination should cite

- the need for caution when performing radiographic procedures on patients receiving oxygen therapy
- safety issues when oxygen is in use (e.g., no flames or high heat sources).

Examination should also consider patient-comfort aspects of oxygen therapy, to include ensuring

- the maintenance of physician-ordered oxygen flow rate
- the tubing is connected and free of kinks
- proper positioning of the mask.

Process/Skill Questions

- What precautions should a radiologic technologist take in performing a radiographic procedure on a patient receiving oxygen?
- Why is it important to compare the flow meter gauge on the oxygen tank against the doctor's order?
- Why is oxygen dangerous in a fire?

Task Number 69

Outline the chain of infection.

Definition

Outline should identify the source, host, and transmission vehicles for bacteria and viruses.

Process/Skill Questions

- What are some typical ways an infection is spread?

- What is a host?
- What is the difference between a bacterium and a virus?
- Why are airborne diseases a particular concern in an age of global travel?

HOSA Competitive Events (High School)

Health Science Events

- Knowledge Test: Pathophysiology
-

Task Number 70

Evaluate chemical and physical asepsis techniques.

Definition

Evaluation should include

- chemical techniques, such as
 - antibacterial cleansers
 - antiseptic cleansers
- physical techniques, such as
 - washing hands frequently
 - covering the mouth when coughing
 - covering open wounds
 - wearing a mask and gloves.

Process/Skill Questions

- When are masks most effective?
- Does length of time matter when washing hands?
- What is the difference between an antiseptic and an antibacterial cleanser? What are the appropriate uses of each?
- Why should standard precautions be strictly followed?

Task Number 71

Outline basic principles of sterile technique.

Definition

Outline should include how to establish and maintain a sterile field through the use of PPE, preparation of materials, and avoidance of contact with nonsterile items and surfaces.

Process/Skill Questions

- How is PPE used to ensure sterile environments?
- Why is a sterile field necessary in some instances of medical imaging?
- What could be a consequence of failure to maintain a sterile field?

Task Number 72

Evaluate the medical imaging work environment for medical emergency preparedness.

Definition

Evaluation should include

- preparedness of the crash cart and assurance that its location is known to all personnel
- established disposal procedures for contaminated material
- application of standard and transmission-based precautions.

Process/Skill Questions

- What supplies should always be on a crash cart?
- Why do radiologic technologists need to be prepared for medical emergencies?
- What could happen if contaminated medical materials are not disposed of properly?
- What is the universal color used for biohazard containers?

Task Number 73

Identify complications resulting from the use of pharmacologic items in medical imaging.

Definition

Identification should include the signs and symptoms of

- anaphylactic shock
- sudden onset of shortness of breath
- diabetic crisis

- seizure.

Process/Skill Questions

- What are symptoms of anaphylactic shock?
- What could be the cause of a patient's sudden onset of shortness of breath?
- What steps should be taken if a patient suffers a grand mal seizure during medical imaging?

Task Number 74

Compare the methods of contrast administration used by medical imaging departments.

Definition

Comparison should include the following forms of contrast:

- oral
- intravenous
- rectal.

Process/Skill Questions

- What are the advantages of oral administration of drugs?
- When is it necessary to administer drugs intravenously?
- What instances would require rectal administration of drugs?

Task Number 75

Describe documentation procedures related to pharmacologic administration.

Definition

Description should include

- guidelines for safe administration and usage
- attending technologist/signatory.

Process/Skill Questions

- Why is documentation a key component of pharmacologic administration?

- What are some typical mistakes that can be made in administering pharmacologics?
- Why is the time and date of drug administration essential information for responding to a medical crisis?
- Why is it important to double-check the labels on pharmacologics before administering to the patient?
- Why is the expiration date on pharmacologics significant?

HOSA Competitive Events (High School)

Health Science Events

- Knowledge Test: Pharmacology

Exploring Careers in Radiologic Technology

Task Number 76

Examine laws and regulations related to radiologic technology.

Definition

Examination should include a review of

- licensing requirements and regulations governing the practice of radiologic technologists through the [Virginia Department of Health Professions \(VDHP\)](#)
- national certification requirements from [The American Registry of Radiologic Technologists \(ARRT\)](#).

Process/Skill Questions

- How does one get licensed?
- Whose responsibility is it to get licensed?
- Why would one need to know about licensing?
- What is the difference between certification and licensure?
- What is the difference between a limited and a full license?

HOSA Competitive Events (High School)

Health Science Events

- Knowledge Test: Medical Law and Ethics
-

Task Number 77

Prepare a sample application and associated forms for licensure.

Definition

Preparation for new graduates should include

- verification of certification (Form E)
- verification of education (Form L)
- a completed sample application (VDHP website)
- any other documentation pertaining to criminal history, if necessary.

Forms and applications are available at the [Virginia Department of Health Professions](#).

Process/Skill Questions

- Where should one send forms once they are complete?
- What is the cost to apply for licensure?
- What forms would need to be notarized?
- What types of crimes would prevent you from obtaining certification or licensure?

Task Number 78

Research requirements for continuing education and specializations in radiologic technology.

Definition

Research should include

- review of the accreditation requirements as outlined by the ARRT
- review of the programmatic accreditation requirements from the Joint Review Committee on Education in Radiologic Technology (JRCERT)
- the difference between attending an accredited and a nonaccredited program

- academic and clinical requirements
- special modalities
- postgraduate programs
- maintenance of continuing education requirements after licensure.

Process/Skill Questions

- What is the difference between national and regional accreditation?
- How many hours of continuing education are needed for recertification?
- Who would approve continuing education credits?
- What are the requirements for clinical and academic courses?

Task Number 79

Complete a nationally recognized certification.

Definition

Completion should result in successful fulfillment of the course requirements of a nationally recognized program, such as the American Heart Association (AHA), in

- cardiopulmonary resuscitation (CPR)
- CPR/automated defibrillator (AED)
- basic life support (BLS).

Process/Skill Questions

- Why is it necessary to regularly update one's training for BLS?
- What are the ABCDs of BLS? Why must they be done in a certain order?
- Why must everyone stand clear when a defibrillator is in use?

Describing the Opioid Crisis

Task Number 80

Describe the history and current state of the opioid crisis in the United States.

Definition

Description should include

- the relationship between opioid prescribing and illicit opioid use to overall opioid overdose deaths
- the prevalence of co-occurring mental health disorders
- the shift in attitudes in the 1990s toward pain management and use of opioids, including the role of pharmaceutical marketing
- the stigma associated with addiction and the changing view of addiction from a moral failing to a chronic, relapsing disease
- statistics, trends, and demographics surrounding the crisis
- population health and other public health aspects of the crisis, including its effects on family and neonates, as well as overall health costs.

Process/Skill Questions

- How are opioids created?
- Can opioids be safely prescribed to patients taking psychotropic drugs?
- How does society stereotype individuals with a history of drug addiction?
- What are the current trends that have contributed to the nationwide opioid crisis?
- How has the opioid epidemic affected emergency rooms and the first responder system?

HOSA Competitive Events (High School)

Health Science Events

- Medical Spelling
- Medical Terminology

Teamwork Events

- Creative Problem Solving
- Public Service Announcement

Task Number 81

Describe the history and current state of the opioid crisis in Virginia.

Definition

Description should include

- the relationship between opioid prescribing and illicit opioid use to overall opioid overdose deaths
- the prevalence of co-occurring mental health disorders
- the shift in attitudes in the 1990s toward pain management and use of opioids, including the role of pharmaceutical marketing
- the stigma associated with addiction and the changing view of addiction from a moral failing to a chronic, relapsing disease
- statistics, trends, and demographics surrounding the crisis
- population health and other public health aspects of the crisis, including its effects on family and neonates, as well as overall health costs
- the Virginia Department of Health’s [Declaration of a Public Health Emergency](#) on November 21, 2016
- proposed legislation to address the crisis in Virginia (i.e., [House Bill 2161](#) and [Senate Bill 1179](#), which require the secretary of health and human resources to convene a workgroup to establish educational guidelines for training healthcare providers in the safe prescribing and appropriate use of opioids)
- the development of curricula and educational standards regarding opioid addiction.

Resource: [The Opioid Crisis Among Virginia Medicaid Beneficiaries](#)

Process/Skill Questions

- What agencies participated in the governor’s task meeting on the opioid crisis?
- What educational organizations will be tasked with providing opioid training to their students?
- What is the benefit of educating future medical professionals about opioid addiction?
- What is the current attitude in society about opioid use and addiction?
- How is the local community affected by the opioid epidemic?

HOSA Competitive Events (High School)

Health Science Events

- Medical Spelling
- Medical Terminology

Teamwork Events

- Creative Problem Solving
- Public Service Announcement

Task Number 82

Define the pharmacological components and common uses of opioids.

Definition

Definition should include

- plant-based opioids (e.g., opium from poppy seeds)
- names of legal and illegal opioids
- [heroin](#)
- names of the most common opioids
- [fentanyl](#)
- medical diagnoses and injuries associated with opioid prescriptions
- [commonly used terms](#).

Resource: [Prescription Pain Medications](#), National Institute on Drug Abuse for Teens

Process/Skill Questions

- For what illnesses are opioids commonly prescribed?
- What is the current medical protocol when opioids are prescribed?

HOSA Competitive Events (High School)

Health Science Events

- Medical Spelling
- Medical Terminology
- Knowledge Test: Pharmacology

Health Professions Events

- Clinical Nursing

Examining the Key Factors of Drug Addiction

Task Number 83

Examine the science of addiction.

Definition

Examination should include

- biopsychosocial aspects of addiction
- the role of endorphins and dopamine
- the role of religious beliefs
- behavioral aspects of addiction
- life cycle of addiction
- misuse of opioids.

Process/Skill Questions

- How will understanding the physiological absorption of opioids in the body provide a holistic assessment?
 - What spiritual characteristics might be observed in the science of addiction?
 - What are some genetic explanations for some family members being more prone to addiction?
-

Task Number 84

Explain prevention and early intervention strategies.

Definition

Explanation should include

- risk and protective factors in opioid addiction
- specific populations at risk of addiction
- motivational interviewing and other communication strategies
- naloxone co-prescribing
- roles of family and social institutions in prevention and early intervention.

Resources:

- [Prevention Tip Card](#), Office of the Attorney General of Virginia
- [Prescription Opioids: Even When Prescribed by a Doctor](#) (video), Centers for Disease Control and Prevention (CDC)

Process/Skill Questions

- What are the physiological characteristics of opioid addiction?
 - What demographic is most affected by the opioid epidemic? What are some explanations for this?
 - How can provision of naloxone and training in its use be sustained financially?
 - What obligations do families and society as a whole have in preventing and providing early intervention related to drug addiction?
-

Task Number 85

Identify addiction and its behavioral elements, as defined by the Diagnostic and Statistical Manual of Mental Disorders (DSM-5).

Definition

Identification should include

- DSM-5 Criteria for Substance Use Disorders
- American Society of Addiction Medicine (ASAM) Criteria (i.e., The Six Dimensions of Multidimensional Assessment)
- CONTINUUM, The ASAM Criteria Decision Engine
- clinical and behavioral aspects of addiction
- practice-appropriate screening tools, including co-morbidity screening.

Process/Skill Questions

- What are DSM-5 and ASAM and what information do they provide to healthcare professionals?
- What are clinical and behavioral elements of addiction that should be recognized by healthcare professionals?
- Who is responsible for providing the necessary screening tools and training?

HOSA Competitive Events (High School)

Health Science Events

- Knowledge Test: Behavioral Health
- Knowledge Test: Medical Law and Ethics

Health Professions Events

- Clinical Nursing

Task Number 86

Describe the treatment models of addiction therapy.

Definition

Description should include

- a recognition that addiction is a chronic disease
- evidence-based treatment models for addiction in general and opioid addiction in particular
- medication-assisted treatment
- the continuum of care in opioid addiction treatment
- how and when to make a referral for treatment
- the roles in an interdisciplinary addiction team
- the role of peers in the treatment of addiction
- the difference between a drug culture and recovery culture
- the management of patients in recovery, including factors contributing to relapse.

Process/Skill Questions

- How many treatment models exist for addiction therapy? Why is one model better than the other?
- What are the advantages of evidence-based treatments and models?
- What medication-assisted treatment programs are available? Who provides them?

HOSA Competitive Events (High School)

Health Science Events

- Knowledge Test: Behavioral Health
- Knowledge Test: Medical Law and Ethics

Health Professions Events

- Clinical Nursing

Task Number 87

Describe the medication management antidote used to prevent fatal opioid overdoses.

Definition

Description should include

- availability and use of naloxone
- naloxone training (e.g., [REVIVE!](#))
- naloxone training agencies
- monitoring of concurrent prescriptions.

Resources:

- [Frequently Asked Questions about Naloxone](#), Virginia Department of Health
- [How to prepare naloxone for administration](#), Virginia Department of Behavioral Health and Developmental Services

Process/Skill Questions

- What is naloxone?
- How much does naloxone cost with health insurance? How much does naloxone cost without health insurance?
- Who should receive naloxone training?

HOSA Competitive Events (High School)

Health Science Events

- Medical Spelling
- Medical Terminology
- Knowledge Test: Pharmacology

Understanding Pain Management Protocols

Task Number 88

Explain the science of physiological and mental pain.

Definition

Explanation should include

- definition of pain from the International Association for the Study of Pain (IASP)
- neurobiological basis of pain
- biopsychosocial model of pain
- types of pain (e.g., neuropathic)
- acute, sub-acute, and chronic pain, including pain generation
- spinal and brain modulation, behavioral adaptation and maladaptation, and the continuum from acute to chronic disabling pain
- the underlying science of pain relief.

Process/Skill Questions

- What is the IASP definition of pain?
- How can a medical professional get a patient to describe physiological pain?
- What assessment tools can be used to help patients describe physiological pain? How do tools differ for describing mental pain?
- How are pain and levels of pain categorized?

HOSA Competitive Events (High School)

Health Science Events

- Knowledge Test: Nutrition
- Knowledge Test: Transcultural Health Care

Teamwork Events

- Community Awareness
- Creative Problem Solving
- HOSA Bowl

Task Number 89

Describe the diagnostic tools used in developing pain management plans.

Definition

Description should include

- pain-related health history and examination
- understanding the role of family in supporting individuals in need of pain management
- practice-appropriate screening tools that include aspects such as mood and function
- the use and limitations of pain scales
- differential diagnosis of pain and its placement on the pain continuum.

Resource: [Promoting Safer and More Effective Pain Management](#), CDC

Process/Skill Questions

- What are the Wong-Baker, LEGO, and Hospice assessment tools?
- How do pain assessment tools vary across the life span?
- When completing an assessment, is pain considered subjective or objective?

HOSA Competitive Events (High School)

Health Science Events

- Knowledge Test: Nutrition
- Knowledge Test: Transcultural Health Care

Teamwork Events

- Community Awareness
- Creative Problem Solving
- HOSA Bowl

Task Number 90

Describe pain treatment options available to various populations of patients.

Definition

Description should include

- special populations in pain management, such as palliative/end-of-life care patients, patients with cancer, pediatric patients, and geriatric populations
- non-pharmacologic treatment of pain, including active care and self-care, evidence- and non-evidence-based approaches, and multimodal pain management
- non-opioid pharmacologic management of pain

- the challenges in discussing the psychological aspects of pain and the role of the central nervous system
- adverse drug event prevention for all pain medications
- the roles in an interdisciplinary pain management team
- the significance of issues such as anxiety, depression, and sleep deprivation in pain management
- the placebo effect
- goals and expectations in the treatment of pain, based on diagnosis and pain continuum
- when to make a pain referral and to whom.

Resources:

- [CDC Fact Sheet for Prescribing Opioids for Chronic Pain](#)
- [CDC Guidelines for Prescribing Opioids for Chronic Pain](#)

Process/Skill Questions

- What pain management resources are available for special populations?
- What are alternative forms of pain management?
- What role does the mind play in pain management?

HOSA Competitive Events (High School)

Health Science Events

- Knowledge Test: Nutrition
- Knowledge Test: Transcultural Health Care

Teamwork Events

- Community Awareness
- Creative Problem Solving
- HOSA Bowl

Task Number 91

Describe the effects of opioid dependency on the human body systems.

Definition

Description should include the short- and long-term effects of opioids on the following:

- Nervous system
- Respiratory system
- Circulatory system
- Digestive system
- Skeletal system

Resource: [Drugs and Your Body](#), Scholastic

Process/Skill Questions

- How does the misuse of opioids affect nutrition and weight loss?
- How might opioid misuse be evident in a person's vital signs?
- How do opioids affect the brain as the control center for homeostasis?

HOSA Competitive Events (High School)

Health Science Events

- Medical Spelling
- Medical Terminology

Teamwork Events

- HOSA Bowl

Task Number 92

Explain the mechanism and physical effects of opioids on the human body.

Definition

Explanation should include the following:

- Mechanism of action and metabolism of opioids
- Development of tolerance, dependence, and addiction
- Health consequences of drug misuse
 - HIV, hepatitis, and other infectious diseases
 - Cancer
 - Cardiovascular effects
 - Respiratory effects
 - Gastrointestinal effects

- Musculoskeletal effects
- Kidney damage
- Liver damage
- Neurological effects
- Hormonal effects
- Prenatal effects
- Other health effects
- Mental health effects
- Death
- Withdrawal
 - Causes
 - Timeframe (i.e., peaks of withdrawal symptoms)
 - Physical signs (e.g., nausea, diarrhea, vomiting, cold flashes)

Process/Skill Questions

- What are the short- and long-term effects of withdrawal dependence symptoms?
- How long can the human body function while exhibiting the symptoms of withdrawal?
- What are other medical conditions that may arise because of the symptoms of physical dependence?

HOSA Competitive Events (High School)

Health Science Events

- Medical Spelling
- Medical Terminology

Teamwork Events

- HOSA Bowl

Task Number 93

Explain the use of opioids in practice settings, the role of opioids in pain management, and risk factors associated with the use of the medication.

Definition

Explanation should include

- appropriate use of different opioids in various practice settings
- the interactions, risks, and intolerance of prescription opioids
- the role and effectiveness of opioids in acute, sub-acute, and chronic pain
- a reassessment of opioid use based on stage of pain
- contemporary treatment guidelines, best practices, health policies, and government regulations related to opioid use
- use of opioids in pain management of patients with substance abuse disorders, in recovery, and in palliative/end-of-life care.

Process/Skill Questions

- When should risk factors regarding opioids be reviewed with the patient?
- What are the options when treating patients with a history of substance abuse?
- What government regulations and policies are in place to improve the safe administration of opioids?

HOSA Competitive Events (High School)

Health Science Events

- Medical Spelling
- Medical Terminology
- Knowledge Test: Pharmacology

Teamwork Events

- Creative Problem Solving
- HOSA Bowl

Task Number 94

Describe the withdrawal and tapering side effects of opioid use.

Definition

Description should include

- characteristics of acute and protracted withdrawal from opioid dependence or addiction
- tapering
- pain contracts or agreements.

Process/Skill Questions

- What are the stages of withdrawal in opioid abuse transition?
- What medications might be needed in the withdrawal stage?
- What information should be included in the pain management contract?

HOSA Competitive Events (High School)

Health Science Events

- Knowledge Test: Pharmacology

Health Professions Events

- Clinical Nursing

Task Number 95

Describe storage and disposal options for opioids.

Definition

Description should include

- medicine take-back options (e.g., [National Drug Take Back Day](#))
- disposal in the household trash and flushing certain potentially dangerous medicines down the toilet.

Resources:

- [Disposal of Unused Medicines: What You Should Know](#), Food and Drug Administration (FDA)
- [Prescription Drug Abuse and Tips for Proper Disposal](#), Office of the Attorney General of Virginia

Process/Skill Questions

- How should medications be stored in the house?
- What is National Prescription Drug Take Back Initiative?
- What is the *black box*?

HOSA Competitive Events (High School)

Health Science Events

- Knowledge Test: Pharmacology

Health Professions Events

- Clinical Nursing
-

Task Number 96

Explain community resources for education about opioid use.

Definition

Explanation should include key components of and resources for patient education in the use of opioids, including

- risks
- benefits
- side effects
- tolerance
- signs of sedation or overdose
- naloxone, including its storage and disposal.

Process/Skill Questions

- What resources for opioid education are available locally, statewide, and nationally?
- Where should the patient first be informed about the resources available?
- How does social media aid in patient education on opioid addiction?

HOSA Competitive Events (High School)

Health Science Events

- Knowledge Test: Pharmacology

Health Professions Events

- Clinical Nursing
-

Working with Patients and Caregivers

Task Number 97

Describe key communication topics involving opioids for patients.

Definition

Description should include

- benefits and risks of opioids
- opioid risk screening (i.e., taking a social, medical, and financial history)
- risk mitigation (e.g., naloxone, safe storage, pain contracts)
- medication tapers and/or discontinuation of therapy.

Process/Skill Questions

- What are the benefits of using opioids in medicine?
- What is the relationship between demographics and risk of opioid addiction?
- How does culture influence risk factors in opioid abuse?

HOSA Competitive Events (High School)

Health Science Events

- Medical Spelling
- Medical Terminology

Health Professions Events

- Clinical Nursing

Task Number 98

Describe communication topics for caregivers and family members.

Definition

Description should include

- basic knowledge about opioids
- signs of addiction
- treatment options for addiction
- naloxone training for caregivers
- legal issues related to misuse.

Process/Skill Questions

- What rights do caregivers have in regard to medical information of the abuser?
- What legal steps might the caregiver or family have to take for treatment?
- Where can the caregiver or family members receive naloxone training? Are children of opioid abusers eligible for training?

HOSA Competitive Events (High School)

Health Science Events

- Medical Spelling
- Medical Terminology

Health Professions Events

- Clinical Nursing

SOL Correlation by Task

Summarize the cell theory of human biology.	English: 12.5 Science: BIO.3
Evaluate the radiosensitivity of tissues and organs exposed to ionizing radiation.	
Analyze physical factors that have an impact on the patient's radiation exposure.	English: 12.5
Describe the physical and biological factors that have an effect on radiation response.	English: 12.5
Label dose-response relationship curves that emerge when radiation exposure/time intersects with response occurrences.	English: 12.5, 12.6
Explain the effects of radiation on deoxyribonucleic acid (DNA).	English: 12.5

	Science: BIO.5
Explain the chemical reactions that occur when water is exposed to ionizing radiation.	English: 12.5
	Science: BIO.2
Describe three acute radiation syndromes and their symptoms.	English: 12.5
Differentiate between the early effects and late effects of radiation exposure.	English: 12.5
Analyze occurrences of radiation-induced cancer.	English: 12.5
	Mathematics: AFDA.4
Explain the recommended radiation dose limits.	English: 12.5
Describe the radiation-protection features included in the design of a medical imaging department.	English: 12.5
Explain the purpose of the radiation-protection features of fluoroscopic and radiographic imaging equipment and the protective equipment used in the imaging area.	English: 12.5
Describe the functions of personal and area radiation dosimetry devices used in medical imaging.	English: 12.5
Describe mathematical units of radiation and radioactivity.	English: 12.5
Analyze electromagnetic radiation and the electromagnetic spectrum.	English: 12.5
	Mathematics: T.3, AII.10
	Science: PH.9, PH.10
Distinguish between the two types of ionizing radiation interactions.	English: 12.5
	Science: PH.9
Describe the interactions that occur at the tube target.	English: 12.5
Compare the primary interactions of X-rays with matter.	English: 12.5
Differentiate between positive and negative contrast agents.	English: 12.5
	Science: CH.1
Describe the basic needs of patients according to Maslow's hierarchy.	English: 12.5
Demonstrate interpersonal communication skills and professional courtesy when interacting with patients, family members, and other healthcare workers.	English: 12.1, 12.5
	History and Social Science: GOVT.16
Obtain a clinical history.	English: 12.1
Identify immobilization techniques designed to reduce injury and radiation exposure.	English: 12.5
Identify pediatric immobilization techniques designed to reduce radiation exposure.	English: 12.5
Measure a radiologic patient's vital signs.	

Demonstrate precautions as prescribed by health and regulatory agencies.	English: 12.8 History and Social Science: VUS.13, VUS.14
Demonstrate proper body mechanics and patient transfer.	
Explain the basic equipment and precautions involved in oxygen therapy.	English: 12.5
Examine safeguards to address the risk factors associated with oxygen therapy in medical imaging.	Science: CH.2
Outline the chain of infection.	English: 12.6, 12.7 Science: BIO.4
Evaluate chemical and physical asepsis techniques.	
Outline basic principles of sterile technique.	English: 12.6, 12.7
Evaluate the medical imaging work environment for medical emergency preparedness.	
Identify complications resulting from the use of pharmacologic items in medical imaging.	English: 12.5
Compare the methods of contrast administration used by medical imaging departments.	English: 12.5
Describe documentation procedures related to pharmacologic administration.	English: 12.5
Examine laws and regulations related to radiologic technology.	History and Social Science: GOVT.8, GOVT.9
Prepare a sample application and associated forms for licensure.	English: 12.1, 12.6
Research requirements for continuing education and specializations in radiologic technology.	English: 12.8
Complete a nationally recognized certification.	English: 12.5
Describe the history and current state of the opioid crisis in the United States.	English: 12.5
Describe the history and current state of the opioid crisis in Virginia.	English: 12.5, 12.8
Define the pharmacological components and common uses of opioids.	English: 12.3, 12.8
Examine the science of addiction.	English: 12.5
Explain prevention and early intervention strategies.	English: 12.5, 12.8
Identify addiction and its behavioral elements, as defined by the Diagnostic and Statistical Manual of Mental Disorders (DSM-5).	English: 12.5
Describe the treatment models of addiction therapy.	English: 12.5
Describe the medication management antidote used to prevent fatal opioid overdoses.	English: 12.5, 12.8
Explain the science of physiological and mental pain.	English: 12.3, 12.5

Describe the diagnostic tools used in developing pain management plans.	English: 12.5
Describe pain treatment options available to various populations of patients.	English: 12.5, 12.8
Describe the effects of opioid dependency on the human body systems.	English: 12.5
Explain the mechanism and physical effects of opioids on the human body.	English: 12.5
Explain the use of opioids in practice settings, the role of opioids in pain management, and risk factors associated with the use of the medication.	English: 12.5
Describe the withdrawal and tapering side effects of opioid use.	English: 12.5
Describe storage and disposal options for opioids.	English: 12.5, 12.8
Explain community resources for education about opioid use.	English: 12.5
Describe key communication topics involving opioids for patients.	English: 12.5
Describe communication topics for caregivers and family members.	English: 12.5

Teacher Resources

Texts

- Greathouse, JS. 2006. *Radiographic Positioning & Procedures: A Comprehensive Approach*. Clifton Park, N.Y.: Thomson Delmar Learning. ISBN: 1401841163
- Carlton, RR & Adler, AR. 2006. *Principles of Radiographic Imaging: An Art and a Science*. Clifton Park, N.Y.: Thomson Delmar Learning. ISBN: 1401871941
- Carlton, RR, Greathouse, JS, & Adler, A. 2006. *Principles of Radiographic Positioning and Procedures Pocket Guide*. Clifton Park, N.Y.: Thomson Delmar Learning. ISBN: 0766862461

Professional Associations

American College of Radiology

www.acr.org

The 32,000 members of the American College of Radiology include radiologists, radiation oncologists, medical physicists, interventional radiologists, and nuclear medicine physicians. For over three-quarters of a century, the ACR has devoted its resources to making imaging safe, effective, and accessible to those who need it.

American Registry for Diagnostic Medical Sonography

www.ardms.org

ARDMS is an independent, nonprofit organization that administers examinations and awards credentials in the areas of diagnostic medical sonography, diagnostic cardiac sonography, vascular interpretation, and vascular technology.

American Registry of Radiologic Technologists

www.arrt.org

ARRT seeks to ensure high-quality patient care in radiologic technology. The organization tests and certifies technologists and administers continuing education and ethics requirements for their annual registration.

American Society of Radiologic Technicians

www.asrt.org

ASRT seeks to foster the professional growth of radiologic technologists by expanding knowledge through education, research and analysis; promoting exceptional leadership and service; and developing the radiologic technology community through shared ethics and values.

Standard Precautions

Centers for Disease Control and Prevention

www.cdc.gov

The Centers for Disease Control and Prevention (CDC) serves as the national focus for developing and applying disease prevention and control, environmental health, and health promotion and health education activities designed to improve the health of the people of the United States.

The Joint Commission

www.jointcommission.org

An independent, not-for-profit organization, The Joint Commission accredits and certifies more than 16,000 healthcare organizations and programs in the United States. Joint Commission accreditation and certification is recognized nationwide as a symbol of quality that reflects an organization's commitment to meeting certain performance standards.

Radiologic Technology Careers

Bureau of Labor Statistics Occupational Outlook Handbook

Radiologic technologists and technicians

www.bls.gov/ooh/healthcare/radiologic-technologists.htm

O*Net Online

www.onetonline.org/link/summary/29-2099.06

Summary report for radiologic technicians

Opioid Abuse Prevention Education

This [Opioid Abuse Prevention](#) document includes resources for opioid abuse prevention education from kindergarten to 12th grade.

Other Opioid Resources

Virginia Department of Behavioral Health and Developmental Services. Revive! Opioid Overdose and Naloxone Education for Virginia. [Naloxone Fact Sheet](#) (PDF).

Virginia Department of Behavioral Health and Developmental Services. [Revive! Opioid Overdose and Naloxone Education for Virginia](#) (website).

Office of National Drug Control Policy, White House. [Fentanyl: Safety Recommendations for First Responders](#) (PDF).

National Institute on Drug Abuse, National Institutes of Health. [Easy to Read Drug Facts: Alcohol](#) (website; PDF available)

National Institute on Drug Abuse, National Institutes of Health. [Easy to Read Drug Facts: Bath Salts](#) (website; PDF available)

National Institute on Drug Abuse, National Institutes of Health. [Easy to Read Drug Facts: Cocaine](#) (website; PDF available)

National Institute on Drug Abuse, National Institutes of Health. [Easy to Read Drug Facts: E-Cigarette](#) (website; PDF available)

National Institute on Drug Abuse, National Institutes of Health. [Easy to Read Drug Facts: Heroin](#) (website; PDF available)

National Institute on Drug Abuse, National Institutes of Health. [Easy to Read Drug Facts: Marijuana](#) (website; PDF available)

National Institute on Drug Abuse, National Institutes of Health. [Easy to Read Drug Facts: MDMA](#) (website; PDF available)

National Institute on Drug Abuse, National Institutes of Health. [Easy to Read Drug Facts: Meth](#) (website; PDF available)

National Institute on Drug Abuse, National Institutes of Health. [Easy to Read Drug Facts: Pain Medicine](#) (website; PDF available)

National Institute on Drug Abuse, National Institutes of Health. [Easy to Read Drug Facts: Spice \(K2\)](#) (website; PDF available)

National Institute on Drug Abuse, National Institutes of Health. [Easy to Read Drug Facts: Tobacco and Nicotine](#) (website; PDF available)

National Institute on Drug Abuse, National Institutes of Health. [Easy to Read Drug Facts: Other Drugs People Use and Misuse](#) (website; PDF available)

Appendix: Credentials, Course Sequences, and Career Cluster Information

Industry Credentials: Only apply to 36-week courses

- College and Work Readiness Assessment (CWRA+)
- Limited Licensed Radiology Technologist (LLRT) Examination
- National Career Readiness Certificate Assessment
- Workplace Readiness Skills for the Commonwealth Examination

Concentration sequences: *A combination of this course and those below, equivalent to two 36-week courses, is a concentration sequence. Students wishing to complete a specialization may take additional courses based on their career pathways. A program completer is a student who has met the requirements for a CTE concentration sequence and all other requirements for high school graduation or an approved alternative education program.*

- Introduction to Health and Medical Sciences (8302/36 weeks)
- Introduction to Health and Medical Sciences (8301/18 weeks)
- Radiologic Technology I (8375/36 weeks)

Career Cluster: Health Science	
Pathway	Occupations
Diagnostics Services	Radiologic Technologist, Radiographer Radiologist
Therapeutic Services	Dental Assistant