Professional Organizations

- American Society of Radiologic Technologist (ASRT)
  - Oldest & largest radiologic science organization
  - Focus: education, advocacy, professional growth
- American Registry of Radiologic Technologist (ARRT)
  - Provides certification exams
  - Sets professional standards
- Joint Review Committee on Education in Radiologic Technology (JRCERT)
  - Accredits radiography programs
  - Began accrediting limited programs in 2012

Scope of Practice & Roles

- Limited Operator CAN:
  - Perform basic x-rays
  - Explain procedures
- Limited Operator CANNOT:
  - Use contrast media
  - Perform CT or mammography
- Specialist
  - Physician with advanced training in a specific area

Radiation Basics

- Central Ray
  - Center of x-ray beam
- Primary Radiation
  - Travels from tube → patient
- Scatter Radiation
  - Lower energy
  - Travels in many directions
  - Produced in the patient
- Attenuation
  - Absorption of x-rays by matter
- Remnant Radiation
  - Exits patient → forms image

Imaging Systems

- Computed Radiography (CR)
  - Eliminates darkroom
  - Requires CR reader for processing

Patient Care & Safety

- Most common incident: Patient falls
- Trendelenburg Position
  - Head lowered ≥15°

X-ray Tube & Components

- Tube housing:
  - Absorbs radiation
  - Provides shielding
- Tungsten
  - Main target material
- K-shell
  - Most important for x-ray production
  - Highest binding energy

Atomic & Radiation Physics

- Ionization
  - Atom gains/loses electron → becomes charged
- X-rays are:
  - Electromagnetic energy
  - Invisible
  - Travel in straight lines
  - Cause biological effects

Electricity Basics

- Ampere (A) = current
- Household voltage = 120 V
- Electromagnetic Induction
  - Produces electricity using magnet + conductor

X-ray Production

4 Requirements:

- Electron source
- Target
- Vacuum
- High voltage
- Space Charge
  - Electron cloud at cathode

Exposure Factors

- mAs = mA × time
  - Controls density (brightness)
- Doubling mA:
  - Doubles photons
  - Increases density
- Example:
  - 400 mA × 0.02 sec = 8 mAs

Beam Properties

- Anode Heel Effect
  - Cathode side = stronger beam
  - Place thicker anatomy toward cathode

Heat & Tube Function

- High-speed anode:
  - Helps dissipate heat
- Heat capacity measured in:
  - Heat Units (HU)

Transformers & Circuits

- Autotransformer
  - Adjusts kVp
  - Compensates voltage
- Step-up transformer
  - Increases voltage
- Step-down transformer
  - Heats filament
- Rectification
  - Converts AC → DC
- Diode
  - Allows one-way current

Generators & Exposure Control

- High-Frequency Generators
  - More efficient
  - Shorter exposure time
  - More x-rays
- Timers
  - Electronic timer = shortest exposure time
- AEC (Automatic Exposure Control)
  - Stops exposure automatically
  - You set kVp, NOT time
- APR (Anatomically Programmed Radiography)
  - Selects mA, kVp, sometimes grid automatically

AEC Important Points

- Must have:
  - Accurate positioning
  - Correct central ray
- Density Control
  - Adjusts image brightness
- Backup Timer
  - Prevents overexposure

Equipment & Technique

- Tube Rating Chart
  - Determines safe exposure limits
- Steeper Target Angle
  - Smaller focal spot
  - Less heel effect

Quick Memory Tips

- ASRT = Education
- ARRT = Registry (certification)
- JRCERT = Program approval
- mAs = Density
- kVp = Penetration/contrast
- Cathode = Negative / Electron source
- Anode = Positive / Target