REVIEW: Bremsstrahlung vs Characteristic Radiation

BREMSSTRAHLUNG ("Braking Radiation")

- happens when electron from filament is **slowed or deflected** by nucleus in target (tungsten)
- produces the **majority** of diagnostic X-ray beam (80–90% at 80 kVp)
- energy produced is **variable** (not specific #) because depends on how much slowing down occurs

KEY WORDS: braking / slowing / nucleus / majority of beam / continuous spectrum

CHARACTERISTIC Radiation

- happens when there is a **K shell vacancy** in tungsten
- an outer electron drops to fill it → produces characteristic energy
- energy produced is **specific** based on shell binding energies of tungsten (K shell tungsten ~ 69 keV)
- only about **5–10%** of beam at 80 kVp

KEY WORDS: shell drop / vacancy / binding energy / specific energy

FAST DIFFERENCE MEMORIZE STATEMENT:

Type	**Majority or minority of beam**	**Energy type**	**Mechanism**
Brems	MAJORITY	continuous spectrum	slowing near nucleus
Characteristic	MINORITY	discrete / specific	shell drop (vacancy)

Brems vs Characteristic

1. The primary type of radiation produced in the diagnostic x-ray tube is:
   A) Photoelectric
   B) Characteristic
   C) Bremsstrahlung
   D) Compton

2. Bremsstrahlung radiation occurs when:
   A) An electron fills an inner shell vacancy
   B) The filament overheats
   C) Electrons are slowed down near the nucleus
   D) The patient absorbs all photons

3. The energy level of characteristic radiation is determined by:
   A) Patient thickness
   B) Tungsten binding shell energies
   C) SID
   D) Grid ratio

4. Characteristic radiation is typically what percent of the primary beam at 80 kVp?
   A) 5–10%
   B) 20–30%
   C) 40–50%
   D) 60–80%

5. Bremsstrahlung produces:
   A) Specific energy photons
   B) Continuous spectrum photons
   C) Only high energy photons
   D) Only low energy photons