Post-Lecture #9: Radiation Protection

1. While working as an awesome radiation therapist, Dr. Gregory House bursts into the room and states that your job is on the line. Some fool put various barrels of radioactive waste in the nursery; to prove that it was not you, explain how much shielding, if any, is necessary to protect these babes for each of the following barrels:

   - Tc-99m (γ emitter)
   - Am-241 (α emitter)
   - U-235 (neutron emitter)
   - Y-90 (β- emitter)
   - F-18 (β+ emitter)
   - Poison (death emitter)

2. Dr. House has decided that your answer is sufficient, but was ultimately not useful except for inciting one of his famous epiphanies. Dr. House saw a patient drinking poison earlier, and realizes they must have done it! He orders Dr. Cameron to get a radiograph of the patient's chest to prove it. Unfortunately, the radiography room is located next to the nursery! Calculate how much lead shielding would be necessary to reduce the transmission of the beam to 1% of its original value, given a μ of 22.8 cm^{-1}, such that Dr. Cameron's conscience is clean. How many HVLs and TVLs of lead is this?

3. After prescribing mouse-bites for the poison overdose, Dr. House remembers that Dr. Wilson's office is on the other side of the radiography room. He thinks that it would be funny to irradiate him through the wall just enough to stay below the limit. Calculate the weekly workload in mA-min that House must irradiate Wilson, assuming a transmission factor of 2E-4 Rm^2/mA min, a distance of 3.2 meters, and a use factor of 1. Use your knowledge to choose a reasonable occupancy factor (T) and the correct maximum permissible exposure rate (P).

House was fired for medical malpractice, and Wilson was ironically diagnosed with leukemia 10 years later.