Chapter 25 questions

8 Why are X-rays not a 4th category of radiation? Like \( \gamma \)-rays, they are part of the EM spectrum.

9 What determines the chemical interactions of an atom? The number of protons in the nucleus.

14 What is the name of the elements a) \( _{13}^{27}X \), b) \( _{96}^{245}X \), c) \( _{79}^{197}X \) a) aluminum, b) curium, c) gold

20 Which is the more common isotope: \( \frac{35}{17}\text{Cl} \) or \( \frac{37}{17}\text{Cl} \)? The atomic mass of chlorine is 35.45 so \( \frac{35}{17}\text{Cl} \).

26 What is the parent nucleus in \( \beta^- \) decay? Parent has one less proton, same number of nucleons. a) \( _{6}^{14}\text{C} \rightarrow \frac{1}{2}_7\text{N} \) b) \( _{29}^{64}\text{Cu} \rightarrow \frac{1}{30}\text{Zn} \)

28 What is the parent isotope in electron capture? Parent has one more proton, same number of nucleons. a) \( _{29}^{65}\text{Cu} \rightarrow \frac{1}{28}_7\text{Ni} \) b) \( _{99}^{253}\text{Es} \rightarrow \frac{1}{98}\text{Cf} \)

32 Why is there no reaction that is the “mirror” of \( \beta^- \) decay. The mirror reaction is \( \beta^+ \) (positron) capture. Positrons are not naturally occurring.

42 What is the daughter element after \( _{92}^{253}\text{U} \) undergoes neutron capture followed by 2 successive \( \beta^- \) decays? \( _{94}^{254}\text{Pu} \) – plutonium with a half-life of 24,100 years

50 Why does carbon-dating not work on old-growth forests? Live trees are still absorbing carbon from the atmosphere.

56 Why external source is more damaging, X-rays or \( \alpha \) particles? External \( \alpha \) particles are stopped by the dead layers of surface skin and do no damage. X-rays are highly penetrating and do damage when absorbed inside the body.

Chapter 25 exercises

10 What is the activity of 40 Ci source with a 200 year half-life after 200 years? After two half-lives, the activity is 10 Ci.

14 The ratio of carbon-14 to carbon-12 in parchment is 1/16 of that in the atmosphere. How old is it? The ratio of 1/16 = (1/2)^4, so 4 half-lives or 4 \times 5715 years or 22,860 years. This is way too old for parchment which was invented by the Greeks about 2200 years ago. This is more like the age of neanderthal cave paintings.