

## CHAPTER 17

### RADIOACTIVITY AND NUCLEAR CHEMISTRY

#### Practice Problems

1. (a) Write a nuclear equation for alpha decay of  $\text{Po-210}$ .



- (b) Write a nuclear equation for the beta decay of  $\text{Th-232}$ .



- (c) Write a nuclear equation for positron emission by  $\text{Co-58}$ .



2. A 68-mg sample of a radioactive nuclide is administered to a patient to obtain an image of her thyroid. If the nuclide has a half-life of 12 hours, how much of the nuclide remains in the patient after 48 days?

$$48 \text{ days} \times \frac{24 \text{ hours}}{1 \text{ day}} = \frac{2880 \text{ hours}}{12 \text{ hours}} = 240 \text{ half-lives}$$

$$68 \text{ mg} \times \left(\frac{1}{2}\right)^{240} = 68 \text{ mg} \times \frac{1}{2^{240}} = 68 \text{ mg} \times \frac{1}{1.32922 \times 10^{72}} = 5.116 \times 10^{-71} \text{ mg}$$

There would be  $5.116 \times 10^{-71}$  mg of  ${}^{232}\text{Th}$  remaining in the patient.

3. A mammoth skeleton has a carbon-14 content of 15.0% of that found in living organisms. When did the mammoth live?

The age of the mammoth is equal to three half-lives of  ${}^{14}\text{C}$ , which approximately

$$\frac{11,430 \text{ yrs} \times 3}{1000} = 34,290 \text{ yrs}$$