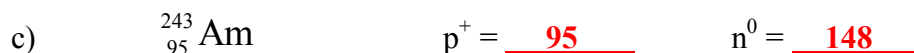
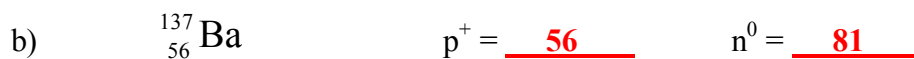
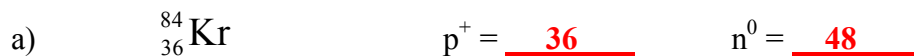


REVIEW QUESTIONS

## Chapter 18

1. For each element below, use the information given to determine the number of protons, neutrons and electrons in its nucleus.



2. Complete each equation below, and classify the type of decay:



3. Half-life of a radionuclide is 5 days. How many days will it require for a 160-g sample of this radionuclide to decay to 5 grams?

$$160 \text{ g} \xrightarrow{1} 80 \text{ g} \xrightarrow{2} 40 \text{ g} \xrightarrow{3} 20 \text{ g} \xrightarrow{4} 10 \text{ g} \xrightarrow{5} 5 \text{ g}$$

$$5 \text{ half-lives} \times \frac{5 \text{ days}}{1 \text{ half-life}} = 25 \text{ days}$$

4. A sample of a particular radionuclide starts with a mass of 32 g. Twelve hours later, 0.5 g of this isotope remains. What is the half-life of this radionuclide?

$$32 \text{ g} \xrightarrow{1} 16 \text{ g} \xrightarrow{2} 8 \text{ g} \xrightarrow{3} 4 \text{ g} \xrightarrow{4} 2 \text{ g} \xrightarrow{5} 1 \text{ g} \xrightarrow{6} 0.5 \text{ g}$$

$$\frac{12 \text{ hours}}{6 \text{ half-lives}} = 2 \text{ hrs/half-life}$$

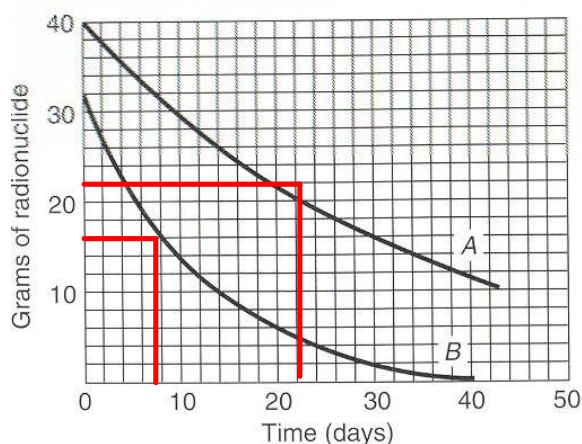
5. For each pair of nuclides given, determine which is radioactive, and give a reason for your choice:

a)  ${}_{9}^{17}\text{F}$  and  ${}_{16}^{32}\text{S}$  Reason: less neutrons (8) than protons (9)

b)  ${}_{26}^{56}\text{Fe}$  and  ${}_{88}^{226}\text{Ra}$  Reason: atomic number greater than 83

c)  ${}_{11}^{23}\text{Na}$  and  ${}_{9}^{20}\text{F}$  Reason: odd number of neutrons (11) and protons (9)

6. Use the graph provided below to find the half-life of radionuclides A and B.



**A = 22 days**

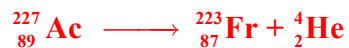
**B = 8 days**

7. Write equations for the following decays:

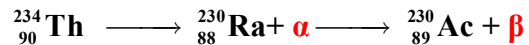
a) Beta decay of  ${}_{26}^{56}\text{Fe}$



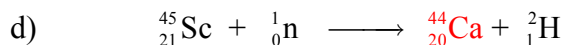
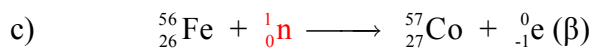
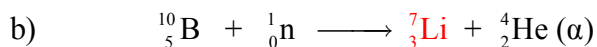
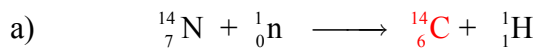
b) Alpha decay of  ${}_{89}^{227}\text{Ac}$



8. Determine the type of radiation given off in the following decay:



9. Complete the following equations:



10. Calculate the nuclear binding energy of  ${}_{26}^{56}\text{Fe}$  (in J/mol) from the following mass data:

$${}_{26}^{56}\text{Fe} = 55.9349 \text{ g/mol}$$

**Mass of nucleus = atomic mass – mass of 26 electrons**

$$\text{n}^0 = 1.0087 \text{ g/mol}$$

$$55.9349 \text{ g} - 26(0.00055 \text{ g}) = 55.9206 \text{ g}$$

$$\text{p}^+ = 1.0073 \text{ g/mol}$$

**Mass of protons + neutrons = 26(p<sup>+</sup>) + 30(n<sup>0</sup>)**

$$[26(1.0073 \text{ g}) + 30(1.0087 \text{ g})] = 56.4508 \text{ g}$$

$$\text{e}^- = 0.00055 \text{ g/mol}$$

$$\text{Mass defect} = 56.4508 \text{ g} - 55.9206 \text{ g} = 0.5302 \text{ g}$$

**Binding energy = E = mc<sup>2</sup>**

$$E = (5.302 \times 10^{-4} \text{ kg})(3.00 \times 10^8 \text{ m/s})^2 = 4.77 \times 10^{13} \text{ J}$$