Before we begin, are there any questions from last day's work?

Today's Learning Goal(s):

By the end of the class, I will be able to:

a) use a half-life formula to determine the amount of substance at a given time.

MBF 3CI

7.6 Solve Problems Involving Half-Life

Date: Dec.6/16

Radioactive materials break down in a process known as *radioactive decay*.
The rate of decay varies from substance to substance.
The ***TIME*** it takes for one half (½) of a substance to decay is known as the ***half-life***.
For example, if the half-life of a substance is 20 minutes, then a 6 kg mass will decay to 3 kg in 20 minutes.

An alternative model is to express the number of atoms remaining, ***y***, after ***x*** days is:

$y = a\left(\frac{1}{2}\right)^{\frac{x}{h}}$, where a is the initial quantity, h is the half-life and the base $\frac{1}{2}$ indicates half-life.

Ex.1 A scientist has 70 g of three different radioactive substances, each decaying at different rates. The first has a half-life of 1 day, the second has a half-life of 2 days, and the third has a half-life of 8 days.

Create a formula that models the number of atoms remaining, ***y***, after ***x*** days.

a) Half-life = 1 day

$y = 70\left(\frac{1}{2}\right)^{\frac{x}{1}}$

or $y = 70\left(\frac{1}{2}\right)^{x}$

b) Half-life = 2 days

$y = 70\left(\frac{1}{2}\right)^{\frac{x}{2}}$

c) Half-life = 8 days

$y = 70\left(\frac{1}{2}\right)^{\frac{x}{8}}$

Ex.2 If the half-life of iodine is about 4 days, create a formula that models the number of atoms remaining, ***y***, after ***x*** days. Assume that 100 atoms are originally present.

- $y = 100\left(\frac{1}{2}\right)^{\frac{x}{4}}$

How much is left after 10 days?

$y = 100\left(\frac{1}{2}\right)^{\frac{10}{4}}$

≈ 17.67

≈ 17 atoms

In theory, will any sample of iodine ever completely decay to zero atoms? Explain your answer.

- In theory, the iodine will **never** completely decay to zero atoms.

Entertainment: pp. 411-412 #4, 7, 8
p. 415 #10