KEY

First Name:_____ Last Name:_____

L10 - Formative Quiz – Radioactivity

Use the following information to answer Q1:

Radioactive Decays

A scientist is conducting research into radioactive decay. Four different sources are allowed to decay. A variety of sensors are placed 4.25 meters away to detect the various forms of radioactive emissions.

Astatine-218 undergoes Alpha decay, emitting alpha radiation.

Lead-214 undergoes Beta-negative decay, emitting beta radiation.

Francium-222 undergoes Beta-positive decay, emitting beta radiation.

Polonium-210 undergoes gamma decay, emitting gamma radiation.

Q1: Which radioactive emission will reach the detectors first?

a. Alpha radiation emitted from Astatine-218. → Helium nuclei
b. Beta-negative radiation emitted from Lead-214. → Electron
c. Beta-positive radiation emitted from Francium-222. → Positron

} All particles travel less than the speed of light.

(d.) Gamma radiation emitted from Polonium-210. → EMR travels at the speed of light.

Q2: The half-life of iodine-131 is 8.04 days. What percentage of an iodine-131 sample will remain after 30 days?

*(Record your **three digit** answer in the Numerical Response boxes below)*

7	.	5	3

$N = N_0 \left(\frac{1}{2}\right)^n$

$= 100 \left(\frac{1}{2}\right)^{30 \div 8.04}$

$= 100 (0.07529\ldots)$

$= 7.529285\ldots$

$\approx 7.53\%$

KEY

Q3: The half-life of thorium-227 is 18.72 days. How many days are required for three-fourths of a given amount to decay?

a. 7.77 days
b. 14.04 days
c. 18.72 days
(d.) 37.44 days

$\frac{3}{4}$ decays? So $\frac{1}{4}$ left. It halved twice.

$2 \times (18.72 \text{ days}) = 37.44 \text{ days}$

Alternate method

$25\% = 100\% \left(\frac{1}{2}\right)^n$

$0.25 = \left(\frac{1}{2}\right)^n$

$n = \log_{0.5}(0.25) = \frac{\log_{10}(0.25)}{\log_{10}(0.5)} = 2$

$2 \times (18.72 \text{ days}) = 37.44 \text{ days}$

Q4: Carbon-14 is used to determine the age of ancient objects. If a sample today contains 0.060 mg of carbon-14, then ***b*** x 10^{-w} mg of carbon-14 must have been present in the sample 11,430 years ago.

*(Record your **three digit** answer in the Numerical Response boxes below)*

2	.	3	9

NOTE: 2|3|9|1 is wrong.

$N = N_0 \left(\frac{1}{2}\right)^n$

$0.06 = N_0 \left(\frac{1}{2}\right)^{11{,}430 \div 5730}$

$0.06 = N_0 (0.250908908944)$

$N_0 = 0.23913 \text{ mg}$

$= 2.39 \times 10^{-1} \text{ mg}$

MARKING

Beginning	0
Progressing	1
Competent	2 – 3
Exemplary	4