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PART 1

- a) Radiation is used in numerous ways to maintain the high standard and safety of our daily lives. Applications of radiation for the benefit of society include smoke detectors that alert us to fires, x-ray machines that scan for weapons or other objects in luggage and cargo, and specific types of imaging that seek for diseases.
- b) To determine the half-life of a material whose quantity is reducing or decaying, one uses the half-life formula. The rate at which a chemical degrades varies depending on how much of the substance is present. Finding the life of a decaying substance is highly challenging since as the quantity of the substance decreases, the rate of decay likewise slows down. In order to define the life of decaying material, the half-life formula is utilized to provide the appropriate metrics. Below is an equation used to solve the problem in calculating the half-life of a substance.

$$A = P (.5)^{(t/h)}$$

A = amount remaining

P = initial amount

t = time elapsed

h = half-life

Moreover, it is useful to know a sample's half-life as it helps in determining how long radioactive material must be safely stored when radioactive material will be safe to handle, or how long a source will remain radioactive. For example, radioactive dye (called a tracer) and radioactive seeds are used in medical imaging and cancer treatment. Knowing the half-life helps doctors and patients know how long the radioactive material will be effective and when it will stop producing radiation.

PART 2

The half-life of a chemical is measured by scientists because it provides information on how much radiation a particular compound will emit. Every substance's half-life has a defined constant that enables experts to precisely forecast how long a material will last. Below are the links where one can get good examples to help understand this section.

https://nanelson.weebly.com/uploads/1/5/0/6/15064850/half-life_wk_answers.pdf

https://www.epa.gov/sites/default/files/2018-12/documents/half-life-data-worksheet-teacher-key-ra5_0.pdf

<https://pshs.psd202.org/documents/ssafe/1556910236.pdf>

PART 3

How long does it take a 100.00g sample of As-81 to decay to 6.25g?

A radioisotope decays from 150 mg to 120.2 mg in 5 days. Calculate the half-life of this isotope.

A radioactive source has a half-life of 80 s. How long will it take for 5/6 of the source to decay?