(Home works lecture 2)

Q2: Calculate the activity of ^{137}Cs after: (a) 2 years, (b) 15 years, (c) 30 years; if its activity at production was (10 μCi) and the half – life of ^{137}Cs is (30 years)?

A_o = 10 μCi (Activity at production)

$t_{1/2}$ = 30 y

(Activity at t) A = $A_o e^{-\lambda t}$

$\lambda = \frac{0.693}{t_{1/2}} = \frac{0.693}{30\ y} = 0.0231\ y^{-1}$

(a) (At t = 2 y) A= 10 μCi × $e^{-0.0231\ y^{-1} \times 2\ y}$ = 9.5 μCi

(b) (At t = 15 y) A= 10 μCi × $e^{-0.0231\ y^{-1} \times 15\ y}$ = 7 μCi

(c) (At t = 30 y) A= 10 μCi × $e^{-0.0231\ y^{-1} \times 30\ y}$ = 5 μCi

Q3: Radioactive element was produced at 8 – 1 – 2022 with radioactivity 5 mci half-life of this source is 5.6 y. calculate its activity in 28 – 2 – 2026?

A_o = 5 mCi (Activity at production)

$t_{1/2}$ = 5.6 y

$\lambda = \frac{0.693}{t_{1/2}} = \frac{0.693}{5.6\ y \times 365.25} = 0.00034\ day^{-1}$

t = (28 – 2 – 2026) – (8 – 1 – 2022) = 20 day + 1 month + 4 year

t = 20 day + 1 × 30 day + 4 × 365.25 = 1511 day

A = $A_o e^{-\lambda t}$

A= 5 mCi × $e^{-0.00034\ day^{-1} \times 1512\ day}$ = 5 mCi × 0.59 = 2.9 mCi