Answer on Question 59428, Physics, Atomic and Nuclear Physics

Question:

The half-life of a certain radioactive isotope is 32 hours. What fraction of the sample would remain after 16 hours?

a) 0.50

b) 0.25

c) 0.62

d) 0.71

Solution:

Let's use the famous equation for the radioactive decay:

$$N = N_0 e^{-\lambda t},$$

here, N_0 is the amount of a certain radioactive isotope at time $t = 0$, N is the amount of the certain radioactive isotope in any given time interval Δt, $\lambda = 0.693/T_{1/2}$ is the radioactive decay constant, $T_{1/2} = 32\ hours$ is the half-life of the radioactive isotope, $t = 16\ hours$ is the elapsed time.

Then, from this equation, we can calculate the fraction of a sample (N/N_0) remaining after 16 hours:

$$\frac{N}{N_0} = e^{-\lambda t} = e^{-\left(\frac{0.693}{32}\right)\cdot 16} = e^{-0.3465} = 0.71.$$

Thus, the correct answer is d).

Answer:

d) 0.71