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Reg no : L1S22BSCS0075

Section : E7

Subject : DE

Assignment : 02

$$A = A_o e^{kt}$$

$$A = \frac{1}{2} A_o$$

$$\frac{1}{2} A_o = A_o e^{kt}$$

$$\frac{1}{2} = e^{k(5730)}$$

$$\ln\left(\frac{1}{2}\right) = k(5730)$$

$$\frac{-0.6931}{5730} = k$$

$$k = -1.20 \times 10^{-4}$$

$$k = -0.000120$$

$$0.145 \, A_o = A_o e^{-0.000120 t}$$

$$\ln(0.145) = -0.000120 \, t$$

$$\frac{-1.93}{-0.000120} = t$$

$$t = 15957 \text{ years}$$

(a)

$A(t) = A_0 e^{kt}$

$A(t/2) = \frac{1}{2} A_0$

$\frac{1}{2} A_0 = A_0 e^{kt}$

$\frac{1}{2} = e^{kt}$

$\ln\left(\frac{1}{2}\right) = kt$

$-\ln 2 = kt$

$\frac{-\ln 2}{k} = t$

$t = \frac{-\ln 2}{k}$

(b)

$$T = -\frac{\ln 2}{K}$$

$$K = -\frac{\ln 2}{T}$$

$$A(t) = A_o e^{Kt}$$

$$= A_o e^{-\frac{\ln 2}{T} t}$$

$$= A_o e^{-\ln 2 \cdot \frac{1}{T} t}$$

$$= A_o 2^{-\frac{t}{T}}$$

(c)

$$\frac{1}{8} A_o = A_o 2^{-\frac{t}{T}}$$

$$\frac{1}{8} = 2^{-\frac{t}{T}}$$

$$\ln\left(\frac{1}{8}\right) = -\frac{t}{T}(\ln 2)$$

$$\cancel{+}\ln(8) = \cancel{+}\frac{t}{T}(\ln 2)$$

$$T\frac{\ln(8)}{\ln(2)} \le t$$

$$T(3) \le t$$

$$3T \le t$$

Question no: 3

$$T = T_m + c\,e^{kt}$$

$$20 = 100 + c\,e^{k(0)}$$

$$20 - 100 = c\,e^{k(0)}$$

$$-80 = c\,e^0$$

$$-80 = c(1)$$

$$-80 = c$$

$$22 = 100 - 80\,e^{k}$$

$$-78 = -80\,e^{k}$$

$$\frac{-78}{-80} = e^{k}$$

$$\ln\left(\frac{78}{80}\right) = k$$

$$k = -0.0253$$

$$T = T_m + ce^{kt}$$

$$90 = 100 - 80e^{-0.0253t}$$

$$-10 = -80e^{-0.0253t}$$

$$\frac{+10}{+80} = e^{-0.0253t}$$

$$\ln\left(\frac{10}{80}\right) = -0.0253t$$

$$\ln\left(\frac{1}{8}\right) = -0.0253t$$

$$-2.079 = -0.0253t$$

$$\frac{-2.079}{-0.0253} = t$$

$$t = 82.19 \text{ sec}$$