

3a)

$$I = 0.2I_o \text{ at } x = 50$$

$$I = I_o 10^{-kx}$$

Substituting and rearrange:

$$\frac{0.2I_o}{I_o} = 10^{-50k}$$

$$\begin{aligned}\ln(0.2) &= \ln(10^{-50k}) \\ &= -50k \ln(10)\end{aligned}$$

$$\begin{aligned}k &= \frac{\ln(0.2)}{-50 \ln(10)} \\ &= 0.01398\end{aligned}$$

b)

Find percentage of light at 20m i.e. $\frac{I}{I_o}$ at 20m

$$\begin{aligned}\frac{I}{I_o} &= 10^{-20k} \\ &\cong 10^{-0.279588} \\ &= 0.525\end{aligned}$$

c)

$$\frac{0.1I_o}{I_o} = 10^{-kx}, \text{ knowing } k$$

$$\begin{aligned}\ln(0.1) &= \ln(10^{-kx}) \\ &= -kx \ln(10)\end{aligned}$$

$$\begin{aligned}x &= \frac{\ln(0.1)}{-k \ln(10)} \\ &= 71.53m\end{aligned}$$

d)

$$\frac{0.5I_o}{I_o} = 10^{-kx}, \text{ knowing } k$$

$$\begin{aligned}\ln(0.5) &= \ln(10^{-kx}) \\ &= -kx \ln(10)\end{aligned}$$

$$\begin{aligned}x &= \frac{\ln(0.5)}{-k \ln(10)} \\ &= 21.53m\end{aligned}$$

- a) $w_o = 50$, given in question?
 b) Substituting and rearrange:

$$\frac{w}{w_o} = 10^{-kt}$$

$$0.6 = 10^{-10k}$$

$$\ln(0.6) = \ln(10^{-10k})$$

$$= -10k \ln(10)$$

$$k = \frac{\ln(0.6)}{-10 \ln(10)}$$

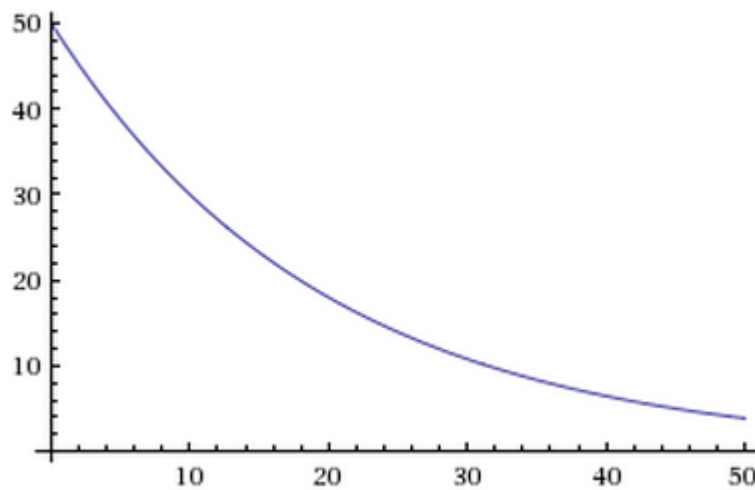
$$= 0.02218$$

$$w_{at\ 20hrs} = 50 * 10^{-20k}$$

$$\cong 50 * 10^{-0.4436}$$

$$= 18\ kg$$

c)

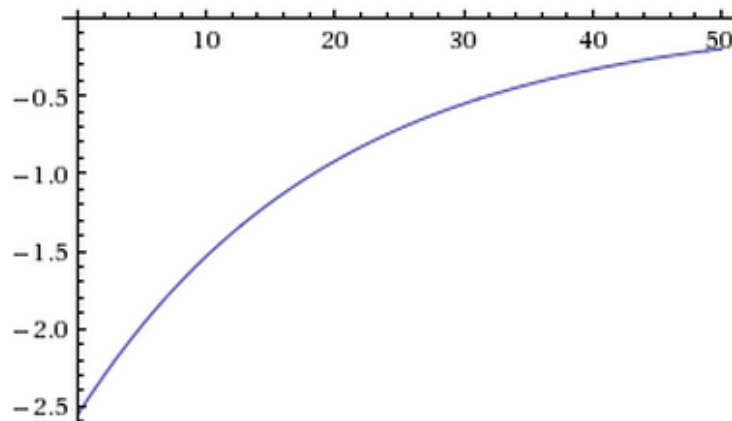


d)

need to find $\frac{dw}{dt}$, using chain rule:

$$\frac{d}{dt}(50 * 10^{-kt}) = 50(10^{-kt} * \ln 10 \left(\frac{d}{dt}(kt) \right))$$

$$= \frac{-50k \ln 10}{10^{kt}}$$



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a) $t_o = 15000$, given in question?

b) i)

$$t = 15000 * 10^{-0.1*t}$$

$$\begin{aligned} t_{1m} &= 15000 * 10^{-0.1*1} \\ &= 11914.92 \text{ } ^\circ\text{C} \end{aligned}$$

ii)

$$\begin{aligned} t_{10m} &= 15000 * 10^{-0.1*10} \\ &= 1500 \text{ } ^\circ\text{C} \end{aligned}$$

c)

$$\frac{0.5T_o}{T_o} = 10^{-0.1t}$$

$$\begin{aligned} \ln(0.5) &= \ln(10^{-0.1t}) \\ &= -0.1t \ln(10) \end{aligned}$$

$$\begin{aligned} t &= \frac{\ln(0.5)}{-0.1 \ln(10)} \\ &\cong 3.01 \text{ million years} \end{aligned}$$

d)

