3. Smoking one “joint” of cannabis puts 5000μg of THC into a person’s bloodstream on average.

The body starts to eliminate such toxins at a rate proportional to the amount present at any time.

A person’s blood was tested after 1 hour and found to contain 4800 μg of THC.

(a) Find a formula for the amount of THC in the body at any time t hours after

smoking one “joint”.

(b) If the effects experienced can still be felt 5 hours after smoking a “joint”

find the amount of THC in the blood at this time.

(c) If cannabis can still be detected in the blood when the amount of THC has

reduced to 100 μg, find how long it would take for this to happen.

***dM = kM***

***dt***

dM

M

***so* ∫  *=* ∫ *k dt***

***ln(M) = kt + c (subs t = 0, M = 5000)***

***ln(5000) = c***

***ln M = kt (subs t = 1, M = 4800)***

***5000***

***ln 4800 = k***

***5000***

***k = - 0.04082***

***ln M = - 0.04082t EQU 1***

***5000***

***M = 5000 e - 0. 04082t EQU 2***

***(b) subs t = 5 in EQU 2 so M = 5000 e - 0. 04082×5 ≈ 4100 μg***

***(c) subs M = 100 μg in EQU 1 so ln 100 = - 0.04082t***

***5000***

***t ≈ 96 hours = 4 days***

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