Recurrence Relations

1. It is known that in a one hour period, 35% of a certain drug will be absorbed completely by the body. If a patient is given 50 mg of the drug each hour, will the level of drug ever reach the 145 mg danger level.

2. A patient is given an initial dose of 60 mg of a drug. Each hour the patient is given a 30 mg tablet of the drug.

   The drug has a decay factor of 70% every 20 minutes. i.e. after 20 minutes, 70% of the drug remains in the body.

   Set up a recurrence relation and use it to determine the long term state of the drug in the body.

3. A patient is given an initial dose of 100 mg of a drug. This drug is Given in tablet form as 20mg tablets every hour.

   The drug has a decay factor of 65% every 15 minutes

   Set up a recurrence relation and use it to determine the long term state of the drug in the body.

4. Initial dose : 120mg

   Tablet : 40 mg tablet given every hour.

   Decay factor : 72 % every 30 minutes

   If the danger level for the drug is 80 mg, determine whether or not it is safe to give this dose over a long period of time.

Answers

1. $D_{n+1} = 0.65D_n + 50$ leading to $L = 143\,\text{mg}$

   Since 143 < 145 the drug is safe to use

2. $d_3 = 0.7^3 d_0 = 0.343d_0$

   $D_{n+1} = 0.343D_n + 30$ leading to $L = 45.7\,\text{mg}$

3. $d_4 = 0.65^4 d_0 = 0.179d_0$

   $D_{n+1} = 0.179D_n + 20$ leading to $L = 24.4\,\text{mg}$

4. $d_2 = 0.72^2 d_0 = 0.518d_0$

   $D_{n+1} = 0.518D_n + 40$ leading to $L = 83.0\,\text{mg}$

   Since 83.0 > 80 the drug will become dangerous if given long term.