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// ExponentialSingle.mod

import nsrunit; unit conversion on;
/*
Enter only the bold face text for your model.
This is a mathematical model expressing clearance as exponential decay
The Ordinary Differential Equation (ODE) for clearance is


$$dC/dt = -k \cdot C.$$


In JSim's Mathematical Modeling Language (MML) this is
expressed as


$$C:t = -k \cdot C;$$


Analytic Solution  $C(t) = C_0 \exp(-k \cdot t)$ 

Half Life:
Let  $C_0/2 = C_0 \exp(-k \cdot t_{half})$ 
Divide both sides by  $C_0$   $1/2 = \exp(-k \cdot t_{half})$ 
Take natural log of both sides  $\ln(1/2) = \ln(1) - \ln(2) = -\ln(2) = -k \cdot t_{half}$ 
Divide both sides by  $-t_{half}$   $\ln(2)/t_{half} = k$ 

We will write the equation in MML as


$$C:t = -\ln(2)/t_{half} \cdot C;$$


The initial condition in MML is given as
when(t=t.min) C=C0;
*/
math SalicylicAcidClearance {
realDomain t hour; t.min=0; t.max=16.0; t.delta=0.05;
// Independent Variable
real C(t) mg/L; // Time dependent variable
real C0 = 1 mg/L; // Initial Concentration
real thalf =5 hour; // Half life
when(t=t.min) C=C0; // Setting Initial Condition
C:t=-ln(2)/thalf*C; // Ordinary Differential Equation
} // Don't forget closing brace
/* Some syntax rules for a MML program

import nsrunit; unit conversion on; always include for unit checking
Units are never plural.

math ProgramName { // Mandatory (at least for now)
realDomain name units; name.min=0; name.max=10; name.delta=0.1;
/* Every statement terminates with a semi-colon.
Don't forget concluding bracket "}".

If the program says an error on line n, check line n-1 as well for
missing semicolon.
*/

```