

SBML Model Report

Model name: “Sriram2007_CellCycle”



May 6, 2016

1 General Overview

This is a document in SBML Level 2 Version 3 format. This model was created by Harish Dharuri¹ at August twelveth 2008 at 9:04 p. m. and last time modified at May 27th 2014 at 10:47 p. m. Table 1 provides an overview of the quantities of all components of this model.

Table 1: Number of components in this model, which are described in the following sections.

Element	Quantity	Element	Quantity
compartment types	0	compartments	1
species types	0	species	6
events	0	constraints	0
reactions	18	function definitions	0
global parameters	25	unit definitions	5
rules	0	initial assignments	0

Model Notes

The model reproduces the time profile of species depicted in Figure 12a and 12 b. The authors communicated to the curator that there is a typo in the paper, the values of kd1 and kd2 are reversed. Model successfully reproduced using MathSBML.

2 Unit Definitions

This is an overview of eight unit definitions of which three are predefined by SBML and not mentioned in the model.

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2.1 Unit substance

Name nano mole

Definition nmol

2.2 Unit time

Name minutes

Definition 60 s

2.3 Unit nM_min_1

Name nM_min_1

Definition $\text{nmol} \cdot \text{l}^{-1} \cdot (60 \text{ s})^{-1}$

2.4 Unit nM

Name nM

Definition $\text{nmol} \cdot \text{l}^{-1}$

2.5 Unit min_1

Name min_1

Definition $(60 \text{ s})^{-1}$

2.6 Unit volume

Notes Litre is the predefined SBML unit for volume.

Definition l

2.7 Unit area

Notes Square metre is the predefined SBML unit for area since SBML Level 2 Version 1.

Definition m^2

2.8 Unit length

Notes Metre is the predefined SBML unit for length since SBML Level 2 Version 1.

Definition m

3 Compartment

This model contains one compartment.

Table 2: Properties of all compartments.

Id	Name	SBO	Spatial Dimensions	Size	Unit	Constant	Outside
compartment			3	1	litre	<input checked="" type="checkbox"/>	

3.1 Compartment `compartment`

This is a three dimensional compartment with a constant size of one litre.

4 Species

This model contains six species. Section 7 provides further details and the derived rates of change of each species.

Table 3: Properties of each species.

Id	Name	Compartment	Derived Unit	Constant	Boundary Condi- tion
T1	T1	compartment	$\text{nmol} \cdot \text{l}^{-1}$	\square	\square
T2	T2	compartment	$\text{nmol} \cdot \text{l}^{-1}$	\square	\square
T3	T3	compartment	$\text{nmol} \cdot \text{l}^{-1}$	\square	\square
C1	C1	compartment	$\text{nmol} \cdot \text{l}^{-1}$	\square	\square
C2	C2	compartment	$\text{nmol} \cdot \text{l}^{-1}$	\square	\square
C3	C3	compartment	$\text{nmol} \cdot \text{l}^{-1}$	\square	\square

5 Parameters

This model contains 25 global parameters.

Table 4: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
j1			0.900	$\text{nmol} \cdot \text{l}^{-1} \cdot (60 \text{ s})^{-1}$	<input checked="" type="checkbox"/>
vd1			6.000	$\text{nmol} \cdot \text{l}^{-1} \cdot (60 \text{ s})^{-1}$	<input checked="" type="checkbox"/>
n			2.000	dimensionless	<input checked="" type="checkbox"/>
km1			5.000	$\text{nmol} \cdot \text{l}^{-1}$	<input checked="" type="checkbox"/>
kc1			0.200	$(60 \text{ s})^{-1}$	<input checked="" type="checkbox"/>
kd1			0.800	$(60 \text{ s})^{-1}$	<input checked="" type="checkbox"/>
j2			0.500	$\text{nmol} \cdot \text{l}^{-1} \cdot (60 \text{ s})^{-1}$	<input checked="" type="checkbox"/>
vd2			1.052	$\text{nmol} \cdot \text{l}^{-1} \cdot (60 \text{ s})^{-1}$	<input checked="" type="checkbox"/>
km2			5.000	$\text{nmol} \cdot \text{l}^{-1}$	<input checked="" type="checkbox"/>
kc2			0.220	$(60 \text{ s})^{-1}$	<input checked="" type="checkbox"/>
kd2			0.900	$(60 \text{ s})^{-1}$	<input checked="" type="checkbox"/>
j3			0.200	$\text{nmol} \cdot \text{l}^{-1} \cdot (60 \text{ s})^{-1}$	<input checked="" type="checkbox"/>
vd3			3.000	$\text{nmol} \cdot \text{l}^{-1} \cdot (60 \text{ s})^{-1}$	<input checked="" type="checkbox"/>
km3			5.000	$\text{nmol} \cdot \text{l}^{-1}$	<input checked="" type="checkbox"/>
kc3			0.600	$(60 \text{ s})^{-1}$	<input checked="" type="checkbox"/>
kd3			0.800	$(60 \text{ s})^{-1}$	<input checked="" type="checkbox"/>
v12			15.000	$\text{nmol} \cdot \text{l}^{-1} \cdot (60 \text{ s})^{-1}$	<input checked="" type="checkbox"/>
k120			10.000	$\text{nmol} \cdot \text{l}^{-1}$	<input checked="" type="checkbox"/>
kd4			0.160	$(60 \text{ s})^{-1}$	<input checked="" type="checkbox"/>
v11			15.000	$\text{nmol} \cdot \text{l}^{-1} \cdot (60 \text{ s})^{-1}$	<input checked="" type="checkbox"/>
k110			10.000	$\text{nmol} \cdot \text{l}^{-1}$	<input checked="" type="checkbox"/>
kd5			0.160	$(60 \text{ s})^{-1}$	<input checked="" type="checkbox"/>
v10			15.000	$\text{nmol} \cdot \text{l}^{-1} \cdot (60 \text{ s})^{-1}$	<input checked="" type="checkbox"/>
k100			10.000	$\text{nmol} \cdot \text{l}^{-1}$	<input checked="" type="checkbox"/>
kd6			0.160	$(60 \text{ s})^{-1}$	<input checked="" type="checkbox"/>

6 Reactions

This model contains 18 reactions. All reactions are listed in the following table and are subsequently described in detail. If a reaction is affected by a modifier, the identifier of this species is written above the reaction arrow.

Table 5: Overview of all reactions

Nº	Id	Name	Reaction Equation	SBO
1	R1		$\emptyset \longrightarrow T1$	
2	R2		$\emptyset \xrightarrow{T3} T1$	
3	R3		$\emptyset \xrightarrow{C1} T1$	
4	R4		$T1 \longrightarrow \emptyset$	
5	R5		$\emptyset \longrightarrow T2$	
6	R6		$\emptyset \xrightarrow{T1} T2$	
7	R7		$\emptyset \xrightarrow{C2} T2$	
8	R8		$T2 \longrightarrow \emptyset$	
9	R9		$\emptyset \longrightarrow T3$	
10	R10		$\emptyset \xrightarrow{T2} T3$	
11	R11		$\emptyset \xrightarrow{C3} T3$	
12	R12		$T3 \longrightarrow \emptyset$	
13	R13		$\emptyset \xrightarrow{T1, C2} C1$	
14	R14		$C1 \longrightarrow \emptyset$	
15	R15		$\emptyset \xrightarrow{T2, C3} C2$	
16	R16		$C2 \longrightarrow \emptyset$	
17	R17		$\emptyset \xrightarrow{T3, C1} C3$	
18	R18		$C3 \longrightarrow \emptyset$	

6.1 Reaction R1

This is an irreversible reaction of no reactant forming one product.

Reaction equation



Product

Table 6: Properties of each product.

Id	Name	SBO
T1	T1	

Kinetic Law

Derived unit $\text{nmol} \cdot (60 \text{ s})^{-1}$

$$v_1 = \text{vol}(\text{compartment}) \cdot j_1 \quad (2)$$

6.2 Reaction R2

This is an irreversible reaction of no reactant forming one product influenced by one modifier.

Reaction equation



Modifier

Table 7: Properties of each modifier.

Id	Name	SBO
T3	T3	

Product

Table 8: Properties of each product.

Id	Name	SBO
T1	T1	

Kinetic Law

Derived unit $1.00000000000000038 \cdot 10^{-9} \text{ mol} \cdot (60 \text{ s})^{-1}$

$$v_2 = \frac{\text{vol}(\text{compartment}) \cdot \text{vd1} \cdot [\text{T3}]^n}{\text{km1}^n + [\text{T3}]^n} \quad (4)$$

6.3 Reaction R3

This is an irreversible reaction of no reactant forming one product influenced by one modifier.

Reaction equation



Modifier

Table 9: Properties of each modifier.

Id	Name	SBO
C1	C1	

Product

Table 10: Properties of each product.

Id	Name	SBO
T1	T1	

Kinetic Law

Derived unit $(60 \text{ s})^{-1} \cdot \text{nmol}$

$$v_3 = \text{vol}(\text{compartment}) \cdot \text{kc1} \cdot [\text{C1}] \quad (6)$$

6.4 Reaction R4

This is an irreversible reaction of one reactant forming no product.

Reaction equation



Reactant

Table 11: Properties of each reactant.

Id	Name	SBO
T1	T1	

Kinetic Law

Derived unit $(60\text{ s})^{-1} \cdot \text{nmol}$

$$v_4 = \text{vol}(\text{compartment}) \cdot \text{kd1} \cdot [\text{T1}] \quad (8)$$

6.5 Reaction R5

This is an irreversible reaction of no reactant forming one product.

Reaction equation



Product

Table 12: Properties of each product.

Id	Name	SBO
T2	T2	

Kinetic Law

Derived unit $\text{nmol} \cdot (60\text{ s})^{-1}$

$$v_5 = \text{vol}(\text{compartment}) \cdot \text{j2} \quad (10)$$

6.6 Reaction R6

This is an irreversible reaction of no reactant forming one product influenced by one modifier.

Reaction equation



Modifier

Table 13: Properties of each modifier.

Id	Name	SBO
T1	T1	

Product

Table 14: Properties of each product.

Id	Name	SBO
T2	T2	

Kinetic Law

Derived unit $1.0000000000000038 \cdot 10^{-9} \text{ mol} \cdot (60 \text{ s})^{-1}$

$$v_6 = \frac{\text{vol}(\text{compartment}) \cdot \text{vd2} \cdot [\text{T1}]^n}{\text{km2}^n + [\text{T1}]^n} \quad (12)$$

6.7 Reaction R7

This is an irreversible reaction of no reactant forming one product influenced by one modifier.

Reaction equation



Modifier

Table 15: Properties of each modifier.

Id	Name	SBO
C2	C2	

Product

Table 16: Properties of each product.

Id	Name	SBO
T2	T2	

Kinetic Law

Derived unit $(60\text{ s})^{-1} \cdot \text{nmol}$

$$v_7 = \text{vol}(\text{compartment}) \cdot \text{kc2} \cdot [\text{C2}] \quad (14)$$

6.8 Reaction R8

This is an irreversible reaction of one reactant forming no product.

Reaction equation



Reactant

Table 17: Properties of each reactant.

Id	Name	SBO
T2	T2	

Kinetic Law

Derived unit $(60\text{ s})^{-1} \cdot \text{nmol}$

$$v_8 = \text{vol}(\text{compartment}) \cdot \text{kd2} \cdot [\text{T2}] \quad (16)$$

6.9 Reaction R9

This is an irreversible reaction of no reactant forming one product.

Reaction equation



Product

Table 18: Properties of each product.

Id	Name	SBO
T3	T3	

Kinetic Law

Derived unit $\text{nmol} \cdot (60 \text{ s})^{-1}$

$$v_9 = \text{vol}(\text{compartment}) \cdot j_3 \quad (18)$$

6.10 Reaction R10

This is an irreversible reaction of no reactant forming one product influenced by one modifier.

Reaction equation



Modifier

Table 19: Properties of each modifier.

Id	Name	SBO
T2	T2	

Product

Table 20: Properties of each product.

Id	Name	SBO
T3	T3	

Kinetic Law

Derived unit $1.0000000000000038 \cdot 10^{-9} \text{ mol} \cdot (60 \text{ s})^{-1}$

$$v_{10} = \frac{\text{vol}(\text{compartment}) \cdot \text{vd3} \cdot [\text{T2}]^n}{\text{km3}^n + [\text{T2}]^n} \quad (20)$$

6.11 Reaction R11

This is an irreversible reaction of no reactant forming one product influenced by one modifier.

Reaction equation



Modifier

Table 21: Properties of each modifier.

Id	Name	SBO
C3	C3	

Product

Table 22: Properties of each product.

Id	Name	SBO
T3	T3	

Kinetic Law

Derived unit $(60\text{ s})^{-1} \cdot \text{nmol}$

$$v_{11} = \text{vol}(\text{compartment}) \cdot \text{kc3} \cdot [\text{C3}] \quad (22)$$

6.12 Reaction R12

This is an irreversible reaction of one reactant forming no product.

Reaction equation



Reactant

Table 23: Properties of each reactant.

Id	Name	SBO
T3	T3	

Kinetic Law

Derived unit $(60\text{ s})^{-1} \cdot \text{nmol}$

$$v_{12} = \text{vol}(\text{compartment}) \cdot \text{kd3} \cdot [\text{T3}] \quad (24)$$

6.13 Reaction R13

This is an irreversible reaction of no reactant forming one product influenced by two modifiers.

Reaction equation



Modifiers

Table 24: Properties of each modifier.

Id	Name	SBO
T1	T1	
C2	C2	

Product

Table 25: Properties of each product.

Id	Name	SBO
C1	C1	

Kinetic Law

Derived unit $1.00000000000000038 \cdot 10^{-9} \text{ mol} \cdot (60 \text{ s})^{-1}$

$$v_{13} = \frac{\text{vol}(\text{compartment}) \cdot v_{12} \cdot [T1]^n}{k_{120}^n + [T1]^n + [C2]^n} \quad (26)$$

6.14 Reaction R14

This is an irreversible reaction of one reactant forming no product.

Reaction equation



Reactant

Table 26: Properties of each reactant.

Id	Name	SBO
C1	C1	

Kinetic Law**Derived unit** $(60\text{ s})^{-1} \cdot \text{nmol}$

$$v_{14} = \text{vol}(\text{compartment}) \cdot \text{kd4} \cdot [\text{C1}] \quad (28)$$

6.15 Reaction R15

This is an irreversible reaction of no reactant forming one product influenced by two modifiers.

Reaction equation**Modifiers**

Table 27: Properties of each modifier.

Id	Name	SBO
T2	T2	
C3	C3	

Product

Table 28: Properties of each product.

Id	Name	SBO
C2	C2	

Kinetic Law**Derived unit** $1.0000000000000038 \cdot 10^{-9} \text{ mol} \cdot (60\text{ s})^{-1}$

$$v_{15} = \frac{\text{vol}(\text{compartment}) \cdot v_{11} \cdot [\text{T2}]^n}{k_{110}^n + [\text{T2}]^n + [\text{C3}]^n} \quad (30)$$

6.16 Reaction R16

This is an irreversible reaction of one reactant forming no product.

Reaction equation



Reactant

Table 29: Properties of each reactant.

Id	Name	SBO
C2	C2	

Kinetic Law

Derived unit $(60\text{ s})^{-1} \cdot \text{nmol}$

$$v_{16} = \text{vol}(\text{compartment}) \cdot \text{kd5} \cdot [C2] \quad (32)$$

6.17 Reaction R17

This is an irreversible reaction of no reactant forming one product influenced by two modifiers.

Reaction equation



Modifiers

Table 30: Properties of each modifier.

Id	Name	SBO
T3	T3	
C1	C1	

Product

Table 31: Properties of each product.

Id	Name	SBO
C3	C3	

Kinetic Law

Derived unit $1.0000000000000038 \cdot 10^{-9} \text{ mol} \cdot (60 \text{ s})^{-1}$

$$v_{17} = \frac{\text{vol}(\text{compartment}) \cdot v_{10} \cdot [\text{T3}]^n}{k_{100}^n + [\text{T3}]^n + [\text{C1}]^n} \quad (34)$$

6.18 Reaction R18

This is an irreversible reaction of one reactant forming no product.

Reaction equation



Reactant

Table 32: Properties of each reactant.

Id	Name	SBO
C3	C3	

Kinetic Law

Derived unit $(60 \text{ s})^{-1} \cdot \text{nmol}$

$$v_{18} = \text{vol}(\text{compartment}) \cdot k_{d6} \cdot [\text{C3}] \quad (36)$$

7 Derived Rate Equations

When interpreted as an ordinary differential equation framework, this model implies the following set of equations for the rates of change of each species.

7.1 Species T1

Name T1

Initial concentration $6 \text{ nmol} \cdot \text{l}^{-1}$

This species takes part in six reactions (as a reactant in [R4](#) and as a product in [R1](#), [R2](#), [R3](#) and as a modifier in [R6](#), [R13](#)).

$$\frac{d}{dt}T1 = v_1 + v_2 + v_3 - v_4 \quad (37)$$

7.2 Species T2

Name T2

Initial concentration 5 nmol · l⁻¹

This species takes part in six reactions (as a reactant in [R8](#) and as a product in [R5](#), [R6](#), [R7](#) and as a modifier in [R10](#), [R15](#)).

$$\frac{d}{dt}T2 = v_5 + v_6 + v_7 - v_8 \quad (38)$$

7.3 Species T3

Name T3

Initial concentration 1 nmol · l⁻¹

This species takes part in six reactions (as a reactant in [R12](#) and as a product in [R9](#), [R10](#), [R11](#) and as a modifier in [R2](#), [R17](#)).

$$\frac{d}{dt}T3 = v_9 + v_{10} + v_{11} - v_{12} \quad (39)$$

7.4 Species C1

Name C1

Initial concentration 0 nmol · l⁻¹

This species takes part in four reactions (as a reactant in [R14](#) and as a product in [R13](#) and as a modifier in [R3](#), [R17](#)).

$$\frac{d}{dt}C1 = v_{13} - v_{14} \quad (40)$$

7.5 Species C2

Name C2

Initial concentration 0 nmol · l⁻¹

This species takes part in four reactions (as a reactant in [R16](#) and as a product in [R15](#) and as a modifier in [R7](#), [R13](#)).

$$\frac{d}{dt}C2 = v_{15} - v_{16} \quad (41)$$

7.6 Species C3

Name C3

Initial concentration 0 nmol · l⁻¹

This species takes part in four reactions (as a reactant in R18 and as a product in R17 and as a modifier in R11, R15).

$$\frac{d}{dt}C3 = v_{17} - v_{18} \quad (42)$$

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