SBML Model Report

Model name: "Zeilinger2006_PRR7-PRR9light-Yprime"

May 6, 2016

1 General Overview

This is a document in SBML Level 2 Version 1 format. This model was created by Harish Dharuri[1] at December eleventh 2006 at 5:12 p. m. and last time modified at July fifth 2012 at 2:41 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	2
species types	0	species	19
events	2	constraints	0
reactions	46	function definitions	0
global parameters	93	unit definitions	5
rules	0	initial assignments	0

Model Notes

The model reproduces the time profile of TOC1 and Y mRNA for a 8:16 cycle as depicted in Fig7A and 7B. A simple algorithm in the event section accomplishes the 8 hour light and 16 hour dark cycle. The model was successfully tested on MathSBML

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2 Unit Definitions

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

2.1 Unit `substance`

Name nanomoles

Definition nmol

2.2 Unit `time`

Name hour

Definition 3600 s

2.3 Unit `Hr_inv`

Name Hour_inv

Definition $(3600\ \mathrm{s})^{-1}$

2.4 Unit `nM`

Name nM

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

2.5 Unit `nM_per_hour`

Name nM_per_hour

Definition $\mathrm{nmol} \cdot \mathrm{l}^{-1} \cdot (3600\ \mathrm{s})^{-1}$

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 Compartments

This model contains two compartments.

Table 2: Properties of all compartments.

Id	Name	SBO	Spatial Dimensions	Size	Unit	Constant	Outside
cytoplasm	cytoplasm		3	1	litre	☑	
nucleus	nucleus		3	1	litre	☑	cytoplasm

3.1 Compartment cytoplasm

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

Name cytoplasm

3.2 Compartment nucleus

This is a three dimensional compartment with a constant size of one litre, which is surrounded by cytoplasm (cytoplasm).

Name nucleus

4 Species

This model contains 19 species. Section 8 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 Condition
cLc	cLc	cytoplasm	$\mathrm{nmol} \cdot \mathrm{l}^{-1}$	⊟	⊟
cLm	cLm	nucleus	$\mathrm{nmol} \cdot \mathrm{l}^{-1}$	⊟	⊟
cLn	cLn	nucleus	$\mathrm{nmol} \cdot \mathrm{l}^{-1}$	⊟	⊟
cP7c	cP7c	cytoplasm	$\mathrm{nmol} \cdot \mathrm{l}^{-1}$	⊟	⊟
cP7m	cP7m	nucleus	$\mathrm{nmol} \cdot \mathrm{l}^{-1}$	⊟	⊟
cP7n	cP7n	nucleus	$\mathrm{nmol} \cdot \mathrm{l}^{-1}$	⊟	⊟
cP9c	cP9c	cytoplasm	$\mathrm{nmol} \cdot \mathrm{l}^{-1}$	⊟	⊟
cP9m	cP9m	nucleus	$\mathrm{nmol} \cdot \mathrm{l}^{-1}$	⊟	⊟
cP9n	cP9n	nucleus	$\mathrm{nmol} \cdot \mathrm{l}^{-1}$	⊟	⊟
cPn	cPn	nucleus	$\mathrm{nmol} \cdot \mathrm{l}^{-1}$	⊟	⊟
cTc	cTc	cytoplasm	$\mathrm{nmol} \cdot \mathrm{l}^{-1}$	⊟	⊟
cTm	cTm	nucleus	$\mathrm{nmol} \cdot \mathrm{l}^{-1}$	⊟	⊟
cTn	cTn	nucleus	$\mathrm{nmol} \cdot \mathrm{l}^{-1}$	⊟	⊟
cXc	cXc	cytoplasm	$\mathrm{nmol} \cdot \mathrm{l}^{-1}$	⊟	⊟
cXm	cXm	nucleus	$\mathrm{nmol} \cdot \mathrm{l}^{-1}$	⊟	⊟
cXn	cXn	nucleus	$\mathrm{nmol} \cdot \mathrm{l}^{-1}$	⊟	⊟
cYc	cYc	cytoplasm	$\mathrm{nmol} \cdot \mathrm{l}^{-1}$	⊟	⊟
cYm	cYm	nucleus	$\mathrm{nmol} \cdot \mathrm{l}^{-1}$	⊟	⊟
cYn	cYn	nucleus	$\mathrm{nmol} \cdot \mathrm{l}^{-1}$	⊟	⊟

5 Parameters

This model contains 93 global parameters.

Table 4: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
q1	q1		13.433	$(3600\ \mathrm{s})^{-1}$	☑
n1	n1		3.202	$\mathrm{nmol} \cdot \mathrm{l}^{-1} \cdot (3600\ \mathrm{s})^{-1}$	☑
g1	g1		9.041	$\mathrm{nmol} \cdot \mathrm{l}^{-1}$	☑
m1	m1		6.825	$\mathrm{nmol} \cdot \mathrm{l}^{-1} \cdot (3600\ \mathrm{s})^{-1}$	☑
k1	k1		13.059	$\mathrm{nmol} \cdot \mathrm{l}^{-1}$	☑
p1	p1		0.693	$(3600\ \mathrm{s})^{-1}$	☑
r1	r1		25.682	$(3600\ \mathrm{s})^{-1}$	☑
r2	r2		3.978	$(3600\ \mathrm{s})^{-1}$	☑
m2	m2		9.410	$\mathrm{nmol} \cdot \mathrm{l}^{-1} \cdot (3600\ \mathrm{s})^{-1}$	☑
k2	k2		30.564	$\mathrm{nmol} \cdot \mathrm{l}^{-1}$	☑
m3	m3		13.780	$\mathrm{nmol} \cdot \mathrm{l}^{-1} \cdot (3600\ \mathrm{s})^{-1}$	☑
k3	k3		33.514	$\mathrm{nmol} \cdot \mathrm{l}^{-1}$	☑
n2	n2		11.609	$\mathrm{nmol} \cdot \mathrm{l}^{-1} \cdot (3600\ \mathrm{s})^{-1}$	☑
g2	g2		16.660	$\mathrm{nmol} \cdot \mathrm{l}^{-1}$	☑
g3	g3		13.411	$\mathrm{nmol} \cdot \mathrm{l}^{-1}$	☑
m4	m4		12.123	$\mathrm{nmol} \cdot \mathrm{l}^{-1} \cdot (3600\ \mathrm{s})^{-1}$	☑
k4	k4		1.372	$\mathrm{nmol} \cdot \mathrm{l}^{-1}$	☑
p2	p2		0.540	$(3600\ \mathrm{s})^{-1}$	☑
p3	p3		6.912	$(3600\ \mathrm{s})^{-1}$	☑
r5	r5		29.461	$(3600\ \mathrm{s})^{-1}$	☑
r6	r6		4.503	$(3600\ \mathrm{s})^{-1}$	☑
m10	m10		8.552	$\mathrm{nmol} \cdot \mathrm{l}^{-1} \cdot (3600\ \mathrm{s})^{-1}$	☑
k8	k8		12.528	$\mathrm{nmol} \cdot \mathrm{l}^{-1}$	☑
m11	m11		23.600	$\mathrm{nmol} \cdot \mathrm{l}^{-1} \cdot (3600\ \mathrm{s})^{-1}$	☑
k9	k9		15.063	$\mathrm{nmol} \cdot \mathrm{l}^{-1}$	☑
n4	n4		1.783	$\mathrm{nmol} \cdot \mathrm{l}^{-1} \cdot (3600\ \mathrm{s})^{-1}$	☑

Id	Name	SBO	Value	Unit	Constant
n5	n5		7.462	$\text{nmol} \cdot \text{l}^{-1} \cdot (3600\,\text{s})^{-1}$	☑
g5	g5		1.599	$\text{nmol} \cdot \text{l}^{-1}$	☑
g6	g6		16.489	$\text{nmol} \cdot \text{l}^{-1}$	☑
m12	m12		5.950	$\text{nmol} \cdot \text{l}^{-1} \cdot (3600\,\text{s})^{-1}$	☑
k10	k10		11.569	$\text{nmol} \cdot \text{l}^{-1}$	☑
r3	r3		51.197	$(3600\,\text{s})^{-1}$	☑
r4	r4		8.915	$(3600\,\text{s})^{-1}$	☑
m5	m5		7.213	$\text{nmol} \cdot \text{l}^{-1} \cdot (3600\,\text{s})^{-1}$	☑
m6	m6		9.575	$\text{nmol} \cdot \text{l}^{-1} \cdot (3600\,\text{s})^{-1}$	☑
k5	k5		34.208	$\text{nmol} \cdot \text{l}^{-1}$	☑
m7	m7		1.103	$\text{nmol} \cdot \text{l}^{-1} \cdot (3600\,\text{s})^{-1}$	☑
m8	m8		2.201	$\text{nmol} \cdot \text{l}^{-1} \cdot (3600\,\text{s})^{-1}$	☑
k6	k6		56.760	$\text{nmol} \cdot \text{l}^{-1}$	☑
n3	n3		2.475	$\text{nmol} \cdot \text{l}^{-1} \cdot (3600\,\text{s})^{-1}$	☑
g4	g4		20.528	$\text{nmol} \cdot \text{l}^{-1}$	☑
m9	m9		4.219	$\text{nmol} \cdot \text{l}^{-1} \cdot (3600\,\text{s})^{-1}$	☑
k7	k7		14.911	$\text{nmol} \cdot \text{l}^{-1}$	☑
p4	p4		6.004	$(3600\,\text{s})^{-1}$	☑
r7	r7		35.784	$(3600\,\text{s})^{-1}$	☑
r8	r8		27.923	$(3600\,\text{s})^{-1}$	☑
m13	m13		7.596	$\text{nmol} \cdot \text{l}^{-1} \cdot (3600\,\text{s})^{-1}$	☑
k11	k11		26.964	$\text{nmol} \cdot \text{l}^{-1}$	☑
m14	m14		8.180	$\text{nmol} \cdot \text{l}^{-1} \cdot (3600\,\text{s})^{-1}$	☑
k12	k12		21.835	$\text{nmol} \cdot \text{l}^{-1}$	☑
p5	p5		0.500	$\text{nmol} \cdot \text{l}^{-1} \cdot (3600\,\text{s})^{-1}$	☑
k13	k13		1.200	$\text{nmol} \cdot \text{l}^{-1}$	☑
q3	q3		1.000	$(3600\,\text{s})^{-1}$	☑
m15	m15		1.200	$\text{nmol} \cdot \text{l}^{-1} \cdot (3600\,\text{s})^{-1}$	☑
g7	g7		0.278	$\text{nmol} \cdot \text{l}^{-1}$	☑

Id	Name	SBO	Value	Unit	Constant
g8	g8		0.919	$\mathrm{nmol \cdot l^{-1}}$	☑
n6	n6		11.092	$\mathrm{nmol \cdot l^{-1} \cdot (3600\ s)^{-1}}$	☑
g9	g9		20.380	$\mathrm{nmol \cdot l^{-1}}$	☑
m16	m16		9.319	$\mathrm{nmol \cdot l^{-1} \cdot (3600\ s)^{-1}}$	☑
k14	k14		51.261	$\mathrm{nmol \cdot l^{-1}}$	☑
p6	p6		9.842	$\mathrm{(3600\ s)^{-1}}$	☑
r9	r9		24.569	$\mathrm{(3600\ s)^{-1}}$	☑
r10	r10		0.502	$\mathrm{(3600\ s)^{-1}}$	☑
m17	m17		3.614	$\mathrm{nmol \cdot l^{-1} \cdot (3600\ s)^{-1}}$	☑
k15	k15		32.939	$\mathrm{nmol \cdot l^{-1}}$	☑
m18	m18		6.746	$\mathrm{nmol \cdot l^{-1} \cdot (3600\ s)^{-1}}$	☑
k16	k16		24.451	$\mathrm{nmol \cdot l^{-1}}$	☑
n7	n7		0.103	$\mathrm{nmol \cdot l^{-1} \cdot (3600\ s)^{-1}}$	☑
g10	g10		5.842	$\mathrm{nmol \cdot l^{-1}}$	☑
m19	m19		1.923	$\mathrm{nmol \cdot l^{-1} \cdot (3600\ s)^{-1}}$	☑
k17	k17		9.807	$\mathrm{nmol \cdot l^{-1}}$	☑
p7	p7		1.532	$\mathrm{(3600\ s)^{-1}}$	☑
r11	r11		25.754	$\mathrm{(3600\ s)^{-1}}$	☑
r12	r12		27.245	$\mathrm{(3600\ s)^{-1}}$	☑
m20	m20		3.748	$\mathrm{nmol \cdot l^{-1} \cdot (3600\ s)^{-1}}$	☑
k18	k18		25.974	$\mathrm{nmol \cdot l^{-1}}$	☑
m21	m21		0.019	$\mathrm{nmol \cdot l^{-1} \cdot (3600\ s)^{-1}}$	☑
k19	k19		21.644	$\mathrm{nmol \cdot l^{-1}}$	☑
q4	q4		6.274	$\mathrm{(3600\ s)^{-1}}$	☑
n8	n8		3.526	$\mathrm{nmol \cdot l^{-1}}$	☑
a	a		1.250	dimensionless	☑
b	b		4.213	dimensionless	☑
c	c		1.451	dimensionless	☑
d	d		1.306	dimensionless	☑
e	e		2.415	dimensionless	☑
f	f		2.135	dimensionless	☑
h	h		1.418	dimensionless	☑
i	i		2.007	dimensionless	☑

Id	Name	SBO	Value	Unit	Constant
j	j		1.762	dimensionless	☑
k	k		3.888	dimensionless	☑
ld	ld		1.000	dimensionless	⊟
lmax	lmax		1.000	dimensionless	☑
Day_in_hours			24.000	3600 s	⊟

6 Events

This is an overview of two events. Each event is initiated whenever its trigger condition switches from `false` to `true`. A delay function postpones the effects of an event to a later time point. At the time of execution, an event can assign values to species, parameters or compartments if these are not set to constant.

6.1 Event `event_0000001`

Trigger condition

$$\text{Day\_in\_hours} - \text{t} \leq 0 \tag{1}$$

Assignments

$$\text{Day\_in\_hours} = \text{Day\_in\_hours} + 24 \tag{2}$$

$$\text{ld} = 1 \tag{3}$$

6.2 Event `event_0000002`

Trigger condition

$$(\text{Day\_in\_hours} - \text{t} \leq 16) \wedge (\text{Day\_in\_hours} - \text{t} > 0) \tag{4}$$

Assignment

$$\text{ld} = 0 \tag{5}$$

7 Reactions

This model contains 46 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

№	Id	Name	Reaction Equation	SBO
1	R1	Light dependent cLm production	$\emptyset \xrightarrow{\text{cPn}} \text{cLm}$	
2	R2	Light independent cLm production	$\emptyset \xrightarrow{\text{cXn, cP7n, cP9n}} \text{cLm}$	
3	R3	cLm degradation	$\text{cLm} \longrightarrow \emptyset$	
4	R4	cLc synthesis	$\emptyset \xrightarrow{\text{cLm}} \text{cLc}$	
5	R5	cLc transport to nucleus	$\text{cLc} \longrightarrow \text{cLn}$	
6	R6	cLn transport to cytoplasm	$\text{cLn} \longrightarrow \text{cLc}$	
7	R7	cLc degradation	$\text{cLc} \longrightarrow \emptyset$	
8	R8	cLn degradation	$\text{cLn} \longrightarrow \emptyset$	
9	R9	cTm transcription	$\emptyset \xrightarrow{\text{cYn, cLn}} \text{cTm}$	
10	R10	cTm degradation	$\text{cTm} \longrightarrow \emptyset$	
11	R11	cTc synthesis	$\emptyset \xrightarrow{\text{cTm}} \text{cTc}$	
12	R12	cTc transport to nucleus	$\text{cTc} \longrightarrow \text{cTn}$	
13	R13	cTn transport to cytoplasm	$\text{cTn} \longrightarrow \text{cTc}$	
14	R14	cTc degradation	$\text{cTc} \longrightarrow \emptyset$	
15	R15	cTn degradation	$\text{cTn} \longrightarrow \emptyset$	
16	R16	Species X transcription	$\emptyset \xrightarrow{\text{cTn}} \text{cXm}$	
17	R17	Species X degradation	$\text{cXm} \longrightarrow \emptyset$	
18	R18	cXc synthesis	$\emptyset \xrightarrow{\text{cXm}} \text{cXc}$	
19	R19	cXc transport to nucleus	$\text{cXc} \longrightarrow \text{cXn}$	
20	R20	cXn transport to cytoplasm	$\text{cXn} \longrightarrow \text{cXc}$	

№	Id	Name	Reaction Equation	SBO
21	R21	cXc degradation	$\mathrm{cXc} \longrightarrow \emptyset$	
22	R22	cXn degradation	$\mathrm{cXn} \longrightarrow \emptyset$	
23	R23	Species Y transcription	$\emptyset \xrightarrow{\mathrm{cTn,\ cLn,\ cPn}} \mathrm{cYm}$	
24	R24	cYm degradation	$\mathrm{cYm} \longrightarrow \emptyset$	
25	R25	cYc synthesis	$\emptyset \xrightarrow{\mathrm{cYm}} \mathrm{cYc}$	
26	R26	cYc transport to nucleus	$\mathrm{cYc} \longrightarrow \mathrm{cYn}$	
27	R27	cYn transport to cytoplasm	$\mathrm{cYn} \longrightarrow \mathrm{cYc}$	
28	R28	cYc degradation	$\mathrm{cYc} \longrightarrow \emptyset$	
29	R29	cYn degradation	$\mathrm{cYn} \longrightarrow \emptyset$	
30	R30	cPn synthesis	$\emptyset \longrightarrow \mathrm{cPn}$	
31	R31a	cPn degradation	$\mathrm{cPn} \longrightarrow \emptyset$	
32	R31b	cPn light dependent degradation	$\mathrm{cPn} \longrightarrow \emptyset$	
33	R32	cP7m transcription	$\emptyset \xrightarrow{\mathrm{cLn}} \mathrm{cP7m}$	
34	R33	cP7m degradation	$\mathrm{cP7m} \longrightarrow \emptyset$	
35	R34	cP7c synthesis	$\emptyset \xrightarrow{\mathrm{cP7m}} \mathrm{cP7c}$	
36	R35	cP7c transport to nucleus	$\mathrm{cP7c} \longrightarrow \mathrm{cP7n}$	
37	R36	cP7n transport to cytoplasm	$\mathrm{cP7n} \longrightarrow \mathrm{cP7c}$	
38	R37	cP7c degradation	$\mathrm{cP7c} \longrightarrow \emptyset$	
39	R38	cP7n degradation	$\mathrm{cP7n} \longrightarrow \emptyset$	
40	R39	cP9m transcription	$\emptyset \xrightarrow{\mathrm{cPn,\ cLn}} \mathrm{cP9m}$	
41	R40	cP9m degradation	$\mathrm{cP9m} \longrightarrow \emptyset$	
42	R41	cP9c synthesis	$\emptyset \xrightarrow{\mathrm{cP9m}} \mathrm{cP9c}$	
43	R42	cP9c transport to nucleus	$\mathrm{cP9c} \longrightarrow \mathrm{cP9n}$	
44	R43	cP9n transport to cytoplasm	$\mathrm{cP9n} \longrightarrow \mathrm{cP9c}$	
45	R44	cP9c degradation	$\mathrm{cP9c} \longrightarrow \emptyset$	
46	R45	cP9n degradation	$\mathrm{cP9n} \longrightarrow \emptyset$	

7.1 Reaction R1

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

Name Light dependent cLm production

Reaction equation

$$\emptyset \xrightarrow{\text{cPn}} \text{cLm} \tag{6}$$

Modifier

Table 6: Properties of each modifier.

Id	Name	SBO
cPn	cPn	

Product

Table 7: Properties of each product.

Id	Name	SBO
cLm	cLm	

Kinetic Law

Derived unit $(3600\ \text{s})^{-1} \cdot \text{nmol}$

$$v_1 = \text{vol}(\text{nucleus}) \cdot \text{ld} \cdot \text{q1} \cdot [\text{cPn}] \tag{7}$$

7.2 Reaction R2

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

Name Light independent cLm production

Reaction equation

$$\emptyset \xrightarrow{\text{cXn, cP7n, cP9n}} \text{cLm} \tag{8}$$

Modifiers

Table 8: Properties of each modifier.

Id	Name	SBO
cXn	cXn	
cP7n	cP7n	
cP9n	cP9n	

Product

Table 9: Properties of each product.

Id	Name	SBO
cLm	cLm	

Kinetic Law

Derived unit contains undeclared units

$$v_2 = \mathrm{vol}\,(\mathrm{nucleus}) \cdot \frac{\mathrm{n1} \cdot [\mathrm{cXn}]^{\mathrm{a}}}{\mathrm{g1}^{\mathrm{a}} + [\mathrm{cXn}]^{\mathrm{a}}} \cdot \frac{\mathrm{g7}^{\mathrm{h}}}{\mathrm{g7}^{\mathrm{h}} + [\mathrm{cP7n}]^{\mathrm{h}}} \cdot \frac{\mathrm{g8}^{\mathrm{i}}}{\mathrm{g8}^{\mathrm{i}} + [\mathrm{cP9n}]^{\mathrm{i}}} \tag{9}$$

7.3 Reaction R3

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

Name cLm degradation

Reaction equation

$$\mathrm{cLm} \longrightarrow \emptyset \tag{10}$$

Reactant

Table 10: Properties of each reactant.

Id	Name	SBO
cLm	cLm	

Kinetic Law

Derived unit $9.999999999999998 \cdot 10^{-10}\ \mathrm{mol} \cdot (3600\ \mathrm{s})^{-1}$

$$v_3 = \frac{\mathrm{vol}\,(\mathrm{nucleus}) \cdot \mathrm{m1} \cdot [\mathrm{cLm}]}{\mathrm{k1} + [\mathrm{cLm}]} \tag{11}$$

7.4 Reaction R4

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

Name cLc synthesis

Reaction equation

$$\emptyset \xrightarrow{\mathrm{cLm}} \mathrm{cLc} \tag{12}$$

Modifier

Table 11: Properties of each modifier.

Id	Name	SBO
cLm	cLm	

Product

Table 12: Properties of each product.

Id	Name	SBO
cLc	cLc	

Kinetic Law

Derived unit $(3600\ \mathrm{s})^{-1} \cdot \mathrm{nmol}$

$$v_4 = \mathrm{vol}\,(\mathrm{cytoplasm}) \cdot \mathrm{p1} \cdot [\mathrm{cLm}] \tag{13}$$

7.5 Reaction R5

This is an irreversible reaction of one reactant forming one product.

Name cLc transport to nucleus

Reaction equation

$$\mathrm{cLc} \longrightarrow \mathrm{cLn} \tag{14}$$

Reactant

Table 13: Properties of each reactant.

Id	Name	SBO
cLc	cLc	

Product

Table 14: Properties of each product.

Id	Name	SBO
cLn	cLn	

Kinetic Law

Derived unit $(3600\ \mathrm{s})^{-1} \cdot \mathrm{nmol}$

$$v_5 = \mathrm{vol}\,(\mathrm{cytoplasm}) \cdot \mathrm{r1} \cdot [\mathrm{cLc}] \tag{15}$$

7.6 Reaction R6

This is an irreversible reaction of one reactant forming one product.

Name cLn transport to cytoplasm

Reaction equation

$$\mathrm{cLn} \longrightarrow \mathrm{cLc} \tag{16}$$

Reactant

Table 15: Properties of each reactant.

Id	Name	SBO
cLn	cLn	

Product

Table 16: Properties of each product.

Id	Name	SBO
cLc	cLc	

Kinetic Law

Derived unit $(3600\ \mathrm{s})^{-1} \cdot \mathrm{nmol}$

$$v_6 = \mathrm{vol}\,(\mathrm{nucleus}) \cdot \mathrm{r2} \cdot [\mathrm{cLn}] \tag{17}$$

7.7 Reaction R7

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

Name cLc degradation

Reaction equation

$$\mathrm{cLc} \longrightarrow \emptyset \tag{18}$$

Reactant

Table 17: Properties of each reactant.

Id	Name	SBO
cLc	cLc	

Kinetic Law

Derived unit $9.999999999999998 \cdot 10^{-10}\ \mathrm{mol} \cdot (3600\ \mathrm{s})^{-1}$

$$v_7 = \frac{\mathrm{vol}\,(\mathrm{cytoplasm}) \cdot \mathrm{m2} \cdot [\mathrm{cLc}]}{\mathrm{k2} + [\mathrm{cLc}]} \tag{19}$$

7.8 Reaction R8

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

Name cLn degradation

Reaction equation

$$\mathrm{cLn} \longrightarrow \emptyset \tag{20}$$

Reactant

Table 18: Properties of each reactant.

Id	Name	SBO
cLn	cLn	

Kinetic Law

Derived unit $9.999999999999998 \cdot 10^{-10}\ \mathrm{mol} \cdot (3600\ \mathrm{s})^{-1}$

$$v_8 = \frac{\mathrm{vol}\,(\mathrm{nucleus}) \cdot \mathrm{m3} \cdot [\mathrm{cLn}]}{\mathrm{k3} + [\mathrm{cLn}]} \tag{21}$$

7.9 Reaction R9

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

Name cTm transcription

Reaction equation

$$\emptyset \xrightarrow{\mathrm{cYn,\ cLn}} \mathrm{cTm} \tag{22}$$

Modifiers

Table 19: Properties of each modifier.

Id	Name	SBO
cYn	cYn	
cLn	cLn	

Product

Table 20: Properties of each product.

Id	Name	SBO
cTm	cTm	

Kinetic Law

Derived unit contains undeclared units

$$v_9 = \mathrm{vol}\,(\mathrm{nucleus}) \cdot \frac{\mathrm{n2} \cdot [\mathrm{cYn}]^{\mathrm{b}}}{\mathrm{g2}^{\mathrm{b}} + [\mathrm{cYn}]^{\mathrm{b}}} \cdot \frac{\mathrm{g3}^{\mathrm{c}}}{\mathrm{g3}^{\mathrm{c}} + [\mathrm{cLn}]^{\mathrm{c}}} \tag{23}$$

7.10 Reaction R10

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

Name cTm degradation

Reaction equation

$$\mathrm{cTm} \longrightarrow \emptyset \tag{24}$$

Reactant

Table 21: Properties of each reactant.

Id	Name	SBO
cTm	cTm	

Kinetic Law

Derived unit $9.999999999999998 \cdot 10^{-10}\ \mathrm{mol} \cdot (3600\ \mathrm{s})^{-1}$

$$v_{10} = \frac{\mathrm{vol}\,(\mathrm{nucleus}) \cdot \mathrm{m4} \cdot [\mathrm{cTm}]}{\mathrm{k4} + [\mathrm{cTm}]} \tag{25}$$

7.11 Reaction R11

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

Name cTc synthesis

Reaction equation

$$\emptyset \xrightarrow{\mathrm{cTm}} \mathrm{cTc} \tag{26}$$

Modifier

Table 22: Properties of each modifier.

Id	Name	SBO
cTm	cTm	

Product

Table 23: Properties of each product.

Id	Name	SBO
cTc	cTc	

Kinetic Law

Derived unit $(3600\ \mathrm{s})^{-1} \cdot \mathrm{nmol}$

$$v_{11} = \mathrm{vol}\,(\mathrm{cytoplasm}) \cdot \mathrm{p2} \cdot [\mathrm{cTm}] \tag{27}$$

7.12 Reaction R12

This is an irreversible reaction of one reactant forming one product.

Name cTc transport to nucleus

Reaction equation

$$\mathrm{cTc} \longrightarrow \mathrm{cTn} \tag{28}$$

Reactant

Table 24: Properties of each reactant.

Id	Name	SBO
cTc	cTc	

Product

Table 25: Properties of each product.

Id	Name	SBO
cTn	cTn	

Kinetic Law

Derived unit $(3600\ \mathrm{s})^{-1} \cdot \mathrm{nmol}$

$$v_{12} = \mathrm{vol}\,(\mathrm{cytoplasm}) \cdot \mathrm{r3} \cdot [\mathrm{cTc}] \tag{29}$$

7.13 Reaction R13

This is an irreversible reaction of one reactant forming one product.

Name cTn transport to cytoplasm

Reaction equation

$$\mathrm{cTn} \longrightarrow \mathrm{cTc} \tag{30}$$

Reactant

Table 26: Properties of each reactant.

Id	Name	SBO
cTn	cTn	

Product

Table 27: Properties of each product.

Id	Name	SBO
cTc	cTc	

Kinetic Law

Derived unit $(3600\ \mathrm{s})^{-1} \cdot \mathrm{nmol}$

$$v_{13} = \mathrm{vol}(\mathrm{nucleus}) \cdot \mathrm{r4} \cdot [\mathrm{cTn}] \tag{31}$$

7.14 Reaction R14

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

Name cTc degradation

Reaction equation

$$\mathrm{cTc} \longrightarrow \emptyset \tag{32}$$

Reactant

Table 28: Properties of each reactant.

Id	Name	SBO
cTc	cTc	

Kinetic Law

Derived unit $\text{nmol} \cdot (3600\ \text{s})^{-1}$

$$v_{14} = \text{vol}(\text{cytoplasm}) \cdot ((\text{lmax} - \text{ld}) \cdot \text{m5} + \text{m6}) \cdot \frac{[\text{cTc}]}{\text{k5} + [\text{cTc}]} \tag{33}$$

7.15 Reaction R15

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

Name cTn degradation

Reaction equation

$$\text{cTn} \longrightarrow \emptyset \tag{34}$$

Reactant

Table 29: Properties of each reactant.

Id	Name	SBO
cTn	cTn	

Kinetic Law

Derived unit $\text{nmol} \cdot (3600\ \text{s})^{-1}$

$$v_{15} = \text{vol}(\text{nucleus}) \cdot ((\text{lmax} - \text{ld}) \cdot \text{m7} + \text{m8}) \cdot \frac{[\text{cTn}]}{\text{k6} + [\text{cTn}]} \tag{35}$$

7.16 Reaction R16

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

Name Species X transcription

Reaction equation

$$\emptyset \xrightarrow{\text{cTn}} \text{cXm} \tag{36}$$

Modifier

Table 30: Properties of each modifier.

Id	Name	SBO
cTn	cTn	

Product

Table 31: Properties of each product.

Id	Name	SBO
cXm	cXm	

Kinetic Law

Derived unit contains undeclared units

$$v_{16} = \frac{\mathrm{vol}\,(\mathrm{nucleus}) \cdot \mathrm{n3} \cdot [\mathrm{cTn}]^{\mathrm{d}}}{\mathrm{g4}^{\mathrm{d}} + [\mathrm{cTn}]^{\mathrm{d}}} \tag{37}$$

7.17 Reaction R17

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

Name Species X degradation

Reaction equation

$$\mathrm{cXm} \longrightarrow \emptyset \tag{38}$$

Reactant

Table 32: Properties of each reactant.

Id	Name	SBO
cXm	cXm	

Kinetic Law

Derived unit $9.999999999999998 \cdot 10^{-10}\ \mathrm{mol} \cdot (3600\ \mathrm{s})^{-1}$

$$v_{17} = \frac{\mathrm{vol}\,(\mathrm{nucleus}) \cdot \mathrm{m9} \cdot [\mathrm{cXm}]}{\mathrm{k7} + [\mathrm{cXm}]} \tag{39}$$

7.18 Reaction R18

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

Name cXc synthesis

Reaction equation

$$\emptyset \xrightarrow{\mathrm{cXm}} \mathrm{cXc} \tag{40}$$

Modifier

Table 33: Properties of each modifier.

Id	Name	SBO
cXm	cXm	

Product

Table 34: Properties of each product.

Id	Name	SBO
cXc	cXc	

Kinetic Law

Derived unit $(3600\ \mathrm{s})^{-1} \cdot \mathrm{nmol}$

$$v_{18} = \mathrm{vol}\,(\mathrm{cytoplasm}) \cdot \mathrm{p3} \cdot [\mathrm{cXm}] \tag{41}$$

7.19 Reaction R19

This is an irreversible reaction of one reactant forming one product.

Name cXc transport to nucleus

Reaction equation

$$\mathrm{cXc} \longrightarrow \mathrm{cXn} \tag{42}$$

Reactant

Table 35: Properties of each reactant.

Id	Name	SBO
cXc	cXc	

Product

Table 36: Properties of each product.

Id	Name	SBO
cXn	cXn	

Kinetic Law

Derived unit $(3600\ \mathrm{s})^{-1} \cdot \mathrm{nmol}$

$$v_{19} = \mathrm{vol}\,(\mathrm{cytoplasm}) \cdot \mathrm{r5} \cdot [\mathrm{cXc}] \tag{43}$$

7.20 Reaction R20

This is an irreversible reaction of one reactant forming one product.

Name cXn transport to cytoplasm

Reaction equation

$$\mathrm{cXn} \longrightarrow \mathrm{cXc} \tag{44}$$

Reactant

Table 37: Properties of each reactant.

Id	Name	SBO
cXn	cXn	

Product

Table 38: Properties of each product.

Id	Name	SBO
cXc	cXc	

Kinetic Law

Derived unit $(3600\ \mathrm{s})^{-1} \cdot \mathrm{nmol}$

$$v_{20} = \mathrm{vol}\,(\mathrm{nucleus}) \cdot \mathrm{r6} \cdot [\mathrm{cXn}] \tag{45}$$

7.21 Reaction R21

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

Name cXc degradation

Reaction equation

$$\mathrm{cXc} \longrightarrow \emptyset \tag{46}$$

Reactant

Table 39: Properties of each reactant.

Id	Name	SBO
cXc	cXc	

Kinetic Law

Derived unit $9.999999999999998 \cdot 10^{-10}\ \mathrm{mol} \cdot (3600\ \mathrm{s})^{-1}$

$$v_{21} = \frac{\mathrm{vol}\,(\mathrm{cytoplasm}) \cdot \mathrm{m10} \cdot [\mathrm{cXc}]}{\mathrm{k8} + [\mathrm{cXc}]} \tag{47}$$

7.22 Reaction R22

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

Name cXn degradation

Reaction equation

$$\mathrm{cXn} \longrightarrow \emptyset \tag{48}$$

Reactant

Table 40: Properties of each reactant.

Id	Name	SBO
cXn	cXn	

Kinetic Law

Derived unit $9.999999999999998 \cdot 10^{-10}\ \mathrm{mol} \cdot (3600\ \mathrm{s})^{-1}$

$$v_{22} = \frac{\mathrm{vol}\,(\mathrm{nucleus}) \cdot \mathrm{m11} \cdot [\mathrm{cXn}]}{\mathrm{k9} + [\mathrm{cXn}]} \tag{49}$$

7.23 Reaction R23

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

Name Species Y transcription

Reaction equation

$$\emptyset \xrightarrow{\mathrm{cTn},\ \mathrm{cLn},\ \mathrm{cPn}} \mathrm{cYm} \tag{50}$$

Modifiers

Table 41: Properties of each modifier.

Id	Name	SBO
cTn	cTn	
cLn	cLn	
cPn	cPn	

Product

Table 42: Properties of each product.

Id	Name	SBO
cYm	cYm	

Kinetic Law

Derived unit contains undeclared units

$$v_{23} = \mathrm{vol}\,(\mathrm{nucleus}) \cdot \frac{(\mathrm{ld} \cdot \mathrm{n4} + \mathrm{n5}) \cdot \mathrm{g5}^{\mathrm{e}}}{\mathrm{g5}^{\mathrm{e}} + [\mathrm{cTn}]^{\mathrm{e}}} \cdot \frac{\mathrm{g6}^{\mathrm{f}}}{\mathrm{g6}^{\mathrm{f}} + [\mathrm{cLn}]^{\mathrm{f}}} \tag{51}$$

7.24 Reaction R24

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

Name cYm degradation

Reaction equation

$$\mathrm{cYm} \longrightarrow \emptyset \tag{52}$$

Reactant

Table 43: Properties of each reactant.

Id	Name	SBO
cYm	cYm	

Kinetic Law

Derived unit $9.999999999999998 \cdot 10^{-10}\ \mathrm{mol} \cdot (3600\ \mathrm{s})^{-1}$

$$v_{24} = \frac{\mathrm{vol}\,(\mathrm{nucleus}) \cdot \mathrm{m12} \cdot [\mathrm{cYm}]}{\mathrm{k10} + [\mathrm{cYm}]} \tag{53}$$

7.25 Reaction R25

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

Name cYc synthesis

Reaction equation

$$\emptyset \xrightarrow{\mathrm{cYm}} \mathrm{cYc} \tag{54}$$

Modifier

Table 44: Properties of each modifier.

Id	Name	SBO
cYm	cYm	

Product

Table 45: Properties of each product.

Id	Name	SBO
cYc	cYc	

Kinetic Law

Derived unit $(3600\ \mathrm{s})^{-1} \cdot \mathrm{nmol}$

$$v_{25} = \mathrm{vol}\,(\mathrm{cytoplasm}) \cdot \mathrm{p4} \cdot [\mathrm{cYm}] \tag{55}$$

7.26 Reaction R26

This is an irreversible reaction of one reactant forming one product.

Name cYc transport to nucleus

Reaction equation

$$\mathrm{cYc} \longrightarrow \mathrm{cYn} \tag{56}$$

Reactant

Table 46: Properties of each reactant.

Id	Name	SBO
cYc	cYc	

Product

Table 47: Properties of each product.

Id	Name	SBO
cYn	cYn	

Kinetic Law

Derived unit $(3600\ \mathrm{s})^{-1} \cdot \mathrm{nmol}$

$$v_{26} = \mathrm{vol}\,(\mathrm{cytoplasm}) \cdot \mathrm{r7} \cdot [\mathrm{cYc}] \tag{57}$$

7.27 Reaction R27

This is an irreversible reaction of one reactant forming one product.

Name cYn transport to cytoplasm

Reaction equation

$$\mathrm{cYn} \longrightarrow \mathrm{cYc} \tag{58}$$

Reactant

Table 48: Properties of each reactant.

Id	Name	SBO
cYn	cYn	

Product

Table 49: Properties of each product.

Id	Name	SBO
cYc	cYc	

Kinetic Law

Derived unit $(3600\ \mathrm{s})^{-1} \cdot \mathrm{nmol}$

$$v_{27} = \mathrm{vol}\,(\mathrm{nucleus}) \cdot \mathrm{r8} \cdot [\mathrm{cYn}] \tag{59}$$

7.28 Reaction R28

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

Name cYc degradation

Reaction equation

$$\mathrm{cYc} \longrightarrow \emptyset \tag{60}$$

Reactant

Table 50: Properties of each reactant.

Id	Name	SBO
cYc	cYc	

Kinetic Law

Derived unit $9.999999999999998 \cdot 10^{-10}\ \mathrm{mol} \cdot (3600\ \mathrm{s})^{-1}$

$$v_{28} = \frac{\mathrm{vol}(\mathrm{cytoplasm}) \cdot \mathrm{m13} \cdot [\mathrm{cYc}]}{\mathrm{k11} + [\mathrm{cYc}]} \tag{61}$$

7.29 Reaction R29

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

Name cYn degradation

Reaction equation

$$\mathrm{cYn} \longrightarrow \emptyset \tag{62}$$

Reactant

Table 51: Properties of each reactant.

Id	Name	SBO
cYn	cYn	

Kinetic Law

Derived unit $9.999999999999998 \cdot 10^{-10}\ \mathrm{mol} \cdot (3600\ \mathrm{s})^{-1}$

$$v_{29} = \frac{\mathrm{vol}(\mathrm{nucleus}) \cdot \mathrm{m14} \cdot [\mathrm{cYn}]}{\mathrm{k12} + [\mathrm{cYn}]} \tag{63}$$

7.30 Reaction R30

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

Name cPn synthesis

Reaction equation

$$\emptyset \longrightarrow \mathrm{cPn} \tag{64}$$

Product

Table 52: Properties of each product.

Id	Name	SBO
cPn	cPn	

Kinetic Law

Derived unit $\text{nmol} \cdot (3600\ \text{s})^{-1}$

$$v_{30} = \text{vol}(\text{nucleus}) \cdot (\text{lmax} - \text{ld}) \cdot \text{p5} \tag{65}$$

7.31 Reaction R31a

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

Name cPn degradation

Reaction equation

$$\text{cPn} \longrightarrow \emptyset \tag{66}$$

Reactant

Table 53: Properties of each reactant.

Id	Name	SBO
cPn	cPn	

Kinetic Law

Derived unit $9.999999999999998 \cdot 10^{-10}\ \text{mol} \cdot (3600\ \text{s})^{-1}$

$$v_{31} = \frac{\text{vol}(\text{nucleus}) \cdot \text{m15} \cdot [\text{cPn}]}{\text{k13} + [\text{cPn}]} \tag{67}$$

7.32 Reaction R31b

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

Name cPn light dependent degradation

Reaction equation

$$\mathrm{cPn} \longrightarrow \emptyset \tag{68}$$

Reactant

Table 54: Properties of each reactant.

Id	Name	SBO
cPn	cPn	

Kinetic Law

Derived unit $(3600\ \mathrm{s})^{-1} \cdot \mathrm{nmol}$

$$v_{32} = \mathrm{vol}\,(\mathrm{nucleus}) \cdot \mathrm{q3} \cdot \mathrm{ld} \cdot [\mathrm{cPn}] \tag{69}$$

7.33 Reaction R32

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

Name cP7m transcription

Reaction equation

$$\emptyset \xrightarrow{\mathrm{cLn}} \mathrm{cP7m} \tag{70}$$

Modifier

Table 55: Properties of each modifier.

Id	Name	SBO
cLn	cLn	

Product

Table 56: Properties of each product.

Id	Name	SBO
cP7m	cP7m	

Kinetic Law

Derived unit contains undeclared units

$$v_{33} = \frac{\mathrm{vol}\,(\mathrm{nucleus}) \cdot \mathrm{n6} \cdot [\mathrm{cLn}]^{\mathrm{j}}}{\mathrm{g9}^{\mathrm{j}} + [\mathrm{cLn}]^{\mathrm{j}}} \tag{71}$$

7.34 Reaction R33

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

Name cP7m degradation

Reaction equation

$$\mathrm{cP7m} \longrightarrow \emptyset \tag{72}$$

Reactant

Table 57: Properties of each reactant.

Id	Name	SBO
cP7m	cP7m	

Kinetic Law

Derived unit $9.999999999999998 \cdot 10^{-10}\ \mathrm{mol} \cdot (3600\ \mathrm{s})^{-1}$

$$v_{34} = \frac{\mathrm{vol}\,(\mathrm{nucleus}) \cdot \mathrm{m16} \cdot [\mathrm{cP7m}]}{\mathrm{k14} + [\mathrm{cP7m}]} \tag{73}$$

7.35 Reaction R34

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

Name cP7c synthesis

Reaction equation

$$\emptyset \xrightarrow{\mathrm{cP7m}} \mathrm{cP7c} \tag{74}$$

Modifier

Table 58: Properties of each modifier.

Id	Name	SBO
cP7m	cP7m	

Product

Table 59: Properties of each product.

Id	Name	SBO
cP7c	cP7c	

Kinetic Law

Derived unit $(3600\ \mathrm{s})^{-1} \cdot \mathrm{nmol}$

$$v_{35} = \mathrm{vol}\,(\mathrm{cytoplasm}) \cdot \mathrm{p6} \cdot [\mathrm{cP7m}] \tag{75}$$

7.36 Reaction R35

This is an irreversible reaction of one reactant forming one product.

Name cP7c transport to nucleus

Reaction equation

$$\mathrm{cP7c} \longrightarrow \mathrm{cP7n} \tag{76}$$

Reactant

Table 60: Properties of each reactant.

Id	Name	SBO
cP7c	cP7c	

Product

Table 61: Properties of each product.

Id	Name	SBO
cP7n	cP7n	

Kinetic Law

Derived unit $(3600\ \mathrm{s})^{-1} \cdot \mathrm{nmol}$

$$v_{36} = \mathrm{vol}\,(\mathrm{cytoplasm}) \cdot \mathrm{r9} \cdot [\mathrm{cP7c}] \tag{77}$$

7.37 Reaction R36

This is an irreversible reaction of one reactant forming one product.

Name cP7n transport to cytoplasm

Reaction equation

$$\mathrm{cP7n} \longrightarrow \mathrm{cP7c} \tag{78}$$

Reactant

Table 62: Properties of each reactant.

Id	Name	SBO
cP7n	cP7n	

Product

Table 63: Properties of each product.

Id	Name	SBO
cP7c	cP7c	

Kinetic Law

Derived unit $(3600\ \mathrm{s})^{-1} \cdot \mathrm{nmol}$

$$v_{37} = \mathrm{vol}\,(\mathrm{nucleus}) \cdot \mathrm{r10} \cdot [\mathrm{cP7n}] \tag{79}$$

7.38 Reaction R37

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

Name cP7c degradation

Reaction equation

$$\mathrm{cP7c} \longrightarrow \emptyset \tag{80}$$

Reactant

Table 64: Properties of each reactant.

Id	Name	SBO
cP7c	cP7c	

Kinetic Law

Derived unit $9.999999999999998 \cdot 10^{-10}\ \mathrm{mol} \cdot (3600\ \mathrm{s})^{-1}$

$$v_{38} = \frac{\mathrm{vol}\,(\mathrm{cytoplasm}) \cdot \mathrm{m17} \cdot [\mathrm{cP7c}]}{\mathrm{k15} + [\mathrm{cP7c}]} \tag{81}$$

7.39 Reaction R38

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

Name cP7n degradation

Reaction equation

$$\mathrm{cP7n} \longrightarrow \emptyset \tag{82}$$

Reactant

Table 65: Properties of each reactant.

Id	Name	SBO
cP7n	cP7n	

Kinetic Law

Derived unit $9.999999999999998 \cdot 10^{-10}\ \mathrm{mol} \cdot (3600\ \mathrm{s})^{-1}$

$$v_{39} = \frac{\mathrm{vol}\,(\mathrm{nucleus}) \cdot \mathrm{m18} \cdot [\mathrm{cP7n}]}{\mathrm{k16} + [\mathrm{cP7n}]} \tag{83}$$

7.40 Reaction R39

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

Name cP9m transcription

Reaction equation

$$\emptyset \xrightarrow{\text{cPn, cLn}} \text{cP9m} \tag{84}$$

Modifiers

Table 66: Properties of each modifier.

Id	Name	SBO
cPn	cPn	
cLn	cLn	

Product

Table 67: Properties of each product.

Id	Name	SBO
cP9m	cP9m	

Kinetic Law

Derived unit contains undeclared units

$$v_{40} = \text{vol}\,(\text{nucleus}) \cdot \frac{(\text{ld} \cdot \text{q4} \cdot [\text{cPn}] + \text{n7} \cdot \text{ld} + \text{n8}) \cdot [\text{cLn}]^{\text{k}}}{\text{g10}^{\text{k}} + [\text{cLn}]^{\text{k}}} \tag{85}$$

7.41 Reaction R40

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

Name cP9m degradation

Reaction equation

$$\text{cP9m} \longrightarrow \emptyset \tag{86}$$

Reactant

Table 68: Properties of each reactant.

Id	Name	SBO
cP9m	cP9m	

Kinetic Law

Derived unit $9.999999999999998 \cdot 10^{-10}\ \mathrm{mol} \cdot (3600\ \mathrm{s})^{-1}$

$$v_{41} = \frac{\mathrm{vol}\,(\mathrm{nucleus}) \cdot \mathrm{m19} \cdot [\mathrm{cP9m}]}{\mathrm{k17} + [\mathrm{cP9m}]} \tag{87}$$

7.42 Reaction R41

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

Name cP9c synthesis

Reaction equation

$$\emptyset \xrightarrow{\mathrm{cP9m}} \mathrm{cP9c} \tag{88}$$

Modifier

Table 69: Properties of each modifier.

Id	Name	SBO
cP9m	cP9m	

Product

Table 70: Properties of each product.

Id	Name	SBO
cP9c	cP9c	

Kinetic Law

Derived unit $(3600\ \mathrm{s})^{-1} \cdot \mathrm{nmol}$

$$v_{42} = \mathrm{vol}\,(\mathrm{cytoplasm}) \cdot \mathrm{p7} \cdot [\mathrm{cP9m}] \tag{89}$$

7.43 Reaction R42

This is an irreversible reaction of one reactant forming one product.

Name cP9c transport to nucleus

Reaction equation

$$\text{cP9c} \longrightarrow \text{cP9n} \tag{90}$$

Reactant

Table 71: Properties of each reactant.

Id	Name	SBO
cP9c	cP9c	

Product

Table 72: Properties of each product.

Id	Name	SBO
cP9n	cP9n	

Kinetic Law

Derived unit $(3600\ \text{s})^{-1} \cdot \text{nmol}$

$$v_{43} = \text{vol}\,(\text{cytoplasm}) \cdot \text{r11} \cdot [\text{cP9c}] \tag{91}$$

7.44 Reaction R43

This is an irreversible reaction of one reactant forming one product.

Name cP9n transport to cytoplasm

Reaction equation

$$\text{cP9n} \longrightarrow \text{cP9c} \tag{92}$$

Reactant

Table 73: Properties of each reactant.

Id	Name	SBO
cP9n	cP9n	

Product

Table 74: Properties of each product.

Id	Name	SBO
cP9c	cP9c	

Kinetic Law

Derived unit $(3600\ \mathrm{s})^{-1} \cdot \mathrm{nmol}$

$$v_{44} = \mathrm{vol}\,(\mathrm{nucleus}) \cdot \mathrm{r12} \cdot [\mathrm{cP9n}] \tag{93}$$

7.45 Reaction R44

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

Name cP9c degradation

Reaction equation

$$\mathrm{cP9c} \longrightarrow \emptyset \tag{94}$$

Reactant

Table 75: Properties of each reactant.

Id	Name	SBO
cP9c	cP9c	

Kinetic Law

Derived unit $9.999999999999998 \cdot 10^{-10}\ \mathrm{mol} \cdot (3600\ \mathrm{s})^{-1}$

$$v_{45} = \frac{\mathrm{vol}\,(\mathrm{cytoplasm}) \cdot \mathrm{m20} \cdot [\mathrm{cP9c}]}{\mathrm{k18} + [\mathrm{cP9c}]} \tag{95}$$

7.46 Reaction R45

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

Name cP9n degradation

Reaction equation

$$\text{cP9n} \longrightarrow \emptyset \tag{96}$$

Reactant

Table 76: Properties of each reactant.

Id	Name	SBO
cP9n	cP9n	

Kinetic Law

Derived unit $9.999999999999998 \cdot 10^{-10}\ \text{mol} \cdot (3600\ \text{s})^{-1}$

$$v_{46} = \frac{\text{vol}\,(\text{nucleus}) \cdot \text{m21} \cdot [\text{cP9n}]}{\text{k19} + [\text{cP9n}]} \tag{97}$$

8 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.

8.1 Species cLc

Name cLc

Initial concentration $0.0659\ \text{nmol} \cdot \text{l}^{-1}$

This species takes part in four reactions (as a reactant in R5, R7 and as a product in R4, R6).

$$\frac{\text{d}}{\text{d}t}\text{cLc} = v_4 + v_6 - v_5 - v_7 \tag{98}$$

8.2 Species cLm

Name cLm

Initial concentration $0.1951\ \text{nmol} \cdot \text{l}^{-1}$

This species takes part in four reactions (as a reactant in R3 and as a product in R1, R2 and as a modifier in R4).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{cLm} = v_1 + v_2 - v_3 \tag{99}$$

8.3 Species cLn

Name cLn

Initial concentration $0.3952\ \mathrm{nmol}\cdot\mathrm{l}^{-1}$

This species takes part in seven reactions (as a reactant in R6, R8 and as a product in R5 and as a modifier in R9, R23, R32, R39).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{cLn} = v_5 - v_6 - v_8 \tag{100}$$

8.4 Species cP7c

Name cP7c

Initial concentration $0.0861\ \mathrm{nmol}\cdot\mathrm{l}^{-1}$

This species takes part in four reactions (as a reactant in R35, R37 and as a product in R34, R36).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{cP7c} = v_{35} + v_{37} - v_{36} - v_{38} \tag{101}$$

8.5 Species cP7m

Name cP7m

Initial concentration $0.0772\ \mathrm{nmol}\cdot\mathrm{l}^{-1}$

This species takes part in three reactions (as a reactant in R33 and as a product in R32 and as a modifier in R34).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{cP7m} = v_{33} - v_{34} \tag{102}$$

8.6 Species cP7n

Name cP7n

Initial concentration $2.7182\ \mathrm{nmol}\cdot\mathrm{l}^{-1}$

This species takes part in four reactions (as a reactant in R36, R38 and as a product in R35 and as a modifier in R2).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{cP7n} = v_{36} - v_{37} - v_{39} \tag{103}$$

8.7 Species cP9c

Name cP9c

Initial concentration $0.0077\ \mathrm{nmol}\cdot\mathrm{l}^{-1}$

This species takes part in four reactions (as a reactant in R42, R44 and as a product in R41, R43).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{cP9c} = v_{42} + v_{44} - v_{43} - v_{45} \tag{104}$$

8.8 Species cP9m

Name cP9m

Initial concentration $0.0011\ \mathrm{nmol}\cdot\mathrm{l}^{-1}$

This species takes part in three reactions (as a reactant in R40 and as a product in R39 and as a modifier in R41).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{cP9m} = v_{40} - v_{41} \tag{105}$$

8.9 Species cP9n

Name cP9n

Initial concentration $0.0073\ \mathrm{nmol}\cdot\mathrm{l}^{-1}$

This species takes part in four reactions (as a reactant in R43, R45 and as a product in R42 and as a modifier in R2).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{cP9n} = v_{43} - v_{44} - v_{46} \tag{106}$$

8.10 Species cPn

Name cPn

Initial concentration $0\ \mathrm{nmol}\cdot\mathrm{l}^{-1}$

This species takes part in six reactions (as a reactant in R31a, R31b and as a product in R30 and as a modifier in R1, R23, R39).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{cPn} = v_{30} - v_{31} - v_{32} \tag{107}$$

8.11 Species cTc

Name cTc

Initial concentration $0.7852\ \mathrm{nmol}\cdot\mathrm{l}^{-1}$

This species takes part in four reactions (as a reactant in R12, R14 and as a product in R11, R13).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{cTc} = v_{11} + v_{13} - v_{12} - v_{14} \tag{108}$$

8.12 Species cTm

Name cTm

Initial concentration $0.1234\ \mathrm{nmol}\cdot\mathrm{l}^{-1}$

This species takes part in three reactions (as a reactant in R10 and as a product in R9 and as a modifier in R11).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{cTm} = v_{9} - v_{10} \tag{109}$$

8.13 Species cTn

Name cTn

Initial concentration $4.5209\ \mathrm{nmol}\cdot\mathrm{l}^{-1}$

This species takes part in five reactions (as a reactant in R13, R15 and as a product in R12 and as a modifier in R16, R23).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{cTn} = v_{12} - v_{13} - v_{15} \tag{110}$$

8.14 Species cXc

Name cXc

Initial concentration $2.5615\ \mathrm{nmol}\cdot\mathrm{l}^{-1}$

This species takes part in four reactions (as a reactant in R19, R21 and as a product in R18, R20).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{cXc} = v_{18} + v_{20} - v_{19} - v_{21} \tag{111}$$

8.15 Species cXm

Name cXm

Initial concentration $1.6104\ \mathrm{nmol}\cdot\mathrm{l}^{-1}$

This species takes part in three reactions (as a reactant in R17 and as a product in R16 and as a modifier in R18).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{cXm} = v_{16} - v_{17} \tag{112}$$

8.16 Species cXn

Name cXn

Initial concentration $14.5474\ \mathrm{nmol}\cdot\mathrm{l}^{-1}$

This species takes part in four reactions (as a reactant in R20, R22 and as a product in R19 and as a modifier in R2).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{cXn} = v_{19} - v_{20} - v_{22} \tag{113}$$

8.17 Species cYc

Name cYc

Initial concentration $7.6795\ \mathrm{nmol}\cdot\mathrm{l}^{-1}$

This species takes part in four reactions (as a reactant in R26, R28 and as a product in R25, R27).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{cYc} = v_{25} + v_{27} - v_{26} - v_{28} \tag{114}$$

8.18 Species cYm

Name cYm

Initial concentration $1.1149\ \mathrm{nmol}\cdot\mathrm{l}^{-1}$

This species takes part in three reactions (as a reactant in R24 and as a product in R23 and as a modifier in R25).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{cYm} = v_{23} - v_{24} \tag{115}$$

8.19 Species cYn

Name cYn

Initial concentration $9.7016\,\mathrm{nmol}\cdot\mathrm{l}^{-1}$

This species takes part in four reactions (as a reactant in R27, R29 and as a product in R26 and as a modifier in R9).

$$\frac{\mathrm{d}}{\mathrm{d}t}\mathrm{cYn} = v_{26} - v_{27} - v_{29} \tag{116}$$

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