

## SBML Model Report

**Model name: “Calzone2007\_CellCycle”**



May 6, 2016

### 1 General Overview

This is a document in SBML Level 2 Version 1 format. This model was created by the following three authors: Nicolas Le Novre<sup>1</sup>, Enuo He<sup>2</sup> and Laurence Calzone<sup>3</sup> at June eighth 2007 at 8:29 a. m. and last time modified at July fifth 2012 at 4:48 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	18
events	1	constraints	0
reactions	54	function definitions	0
global parameters	46	unit definitions	1
rules	3	initial assignments	0

### Model Notes

This is the Dynamical model of nuclear division cycles during early embryogenesis of *Drosophila*, without StringT regulation. so ksstg=kdstg=0. Figure1B has been simulated by MathSBML. Curator changed model from only one compartment into two compartments according to the paper. Detail explanation of the models are in the supplement information of the paper. The

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author didn't specify which compartment  $X_m$ ,  $Stgm$ ,  $X_p$  are located, we assume that they locate in cytoplasm.

Some of the parameter values for the equations are dimensionless parameters.

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## 2 Unit Definitions

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

### 2.1 Unit `time_1`

**Name** min

**Definition** 60 s

### 2.2 Unit `substance`

**Notes** Mole is the predefined SBML unit for substance.

**Definition** mol

### 2.3 Unit `volume`

**Notes** Litre is the predefined SBML unit for volume.

**Definition** l

### 2.4 Unit `area`

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

**Definition** m<sup>2</sup>

## 2.5 Unit length

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

**Definition** m

## 2.6 Unit time

**Notes** Second is the predefined SBML unit for time.

**Definition** s

# 3 Compartments

This model contains two compartments.

Table 2: Properties of all compartments.

Id	Name	SBO	Spatial Dimensions	Size	Unit	Constant	Outside
nuclei			3	1	litre	✓	
cytoplasm			3	1	litre	✓	

### 3.1 Compartment nuclei

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

### 3.2 Compartment cytoplasm

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

## 4 Species

This model contains 18 species. The boundary condition of one of these species is set to `true` so that this species' amount cannot be changed by any reaction. Section 9 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
MPFc	MPFc	cytoplasm	$\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
preMPFc	preMPFc	cytoplasm	$\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
StgPc	StgPc	cytoplasm	$\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
Wee1c	Wee1c	cytoplasm	$\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
Wee1Pc	Wee1Pc	cytoplasm	$\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Stgm	Stgm	cytoplasm	$\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
Xp	Xp	cytoplasm	$\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
Stgc	Stgc	cytoplasm	$\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
Xm	Xm	cytoplasm	$\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
MPFn	MPFn	nuclei	$\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
preMPFn	preMPFn	nuclei	$\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
Wee1Pn	Wee1Pn	nuclei	$\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
Wee1n	Wee1n	nuclei	$\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
StgPn	StgPn	nuclei	$\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
Stgn	Stgn	nuclei	$\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
FZYa	FZYa	nuclei	$\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
IEa_1		nuclei	$\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>
N	N	nuclei	$\text{mol} \cdot \text{l}^{-1}$	<input type="checkbox"/>	<input type="checkbox"/>

## 5 Parameters

This model contains 46 global parameters.

Table 4: Properties of each parameter.

Id	Name	SBO	Value	Unit	Constant
ksc	ksc		0.010		✓
kdc	kdc		0.010		✓
kdn	kdn		0.010		✓
kdn	kdnpp		1.500		✓
kaie	kaie		1.000		✓
kiie	kiie		0.400		✓
kafzy	kafzy		1.000		✓
kifzy	kifzy		0.200		✓
kweep	kweep		0.005		✓
kwee	kweepp		1.000		✓
kstgp	kstgp		0.200		✓
kstg	kstgpp		2.000		✓
ksstg	ksstg		0.000		✓
kdstg	kdstg		0.000		✓
kastgp	kastgp		0.000		✓
kastg	kastgpp		1.000		✓
kistg	kistg		0.300		✓
kawee	kawee		0.300		✓
kiweep	kiweep		0.010		✓
kiwee	kiweepp		1.000		✓
kt	kin		0.150		✓
Jaie	Jaie		0.010		✓
Jiie	Jiie		0.010		✓
Jafzy	Jafzy		0.010		✓
Jifzy	Jifzy		0.010		✓
Jastg	Jastg		0.050		✓
Jistg	Jistg		0.050		✓
Jawee	Jawee		0.050		✓
Jiwee	Jiwee		0.050		✓
Jm	Jm		0.050		✓
kdm	kdm		0.002		✓
kdm	kdmpp		0.200		✓
koutw_1	koutw		0.010		✓
kinw_1	kinw		0.040		✓
kouts_1	kouts		0.020		✓
kins_1	kins		0.080		✓
kez_1	kez		0.500		✓

Id	Name	SBO	Value	Unit	Constant
factor_1	factor		1.950		<input checked="" type="checkbox"/>
E_1	E		$7 \cdot 10^{-5}$		<input checked="" type="checkbox"/>
ksxp_1	ksxp		0.001		<input checked="" type="checkbox"/>
ksxm_1	ksxm		$5 \cdot 10^{-4}$		<input checked="" type="checkbox"/>
kout_1	kout		0.000		<input checked="" type="checkbox"/>
CycBT			0.000		<input type="checkbox"/>
StringT			0.800		<input checked="" type="checkbox"/>
Wee1T			0.800		<input checked="" type="checkbox"/>
StgPT			0.000		<input type="checkbox"/>

## 6 Rules

This is an overview of three rules.

### 6.1 Rule CycBT

Rule CycBT is an assignment rule for parameter CycBT:

$$\text{CycBT} = (1 - [N] \cdot E_1) \cdot ([\text{MPFc}] + [\text{preMPFc}]) + [N] \cdot E_1 \cdot ([\text{MPFn}] + [\text{preMPFn}]) \quad (1)$$

### 6.2 Rule StgPT

Rule StgPT is an assignment rule for parameter StgPT:

$$\text{StgPT} = (1 - [N] \cdot E_1) \cdot [\text{StgPc}] + [N] \cdot E_1 \cdot [\text{StgPn}] \quad (2)$$

### 6.3 Rule Wee1Pc

Rule Wee1Pc is an assignment rule for species Wee1Pc:

$$\text{Wee1Pc} = \frac{\text{Wee1T} - [N] \cdot E_1 \cdot ([\text{Wee1n}] + [\text{Wee1Pn}])}{1 - [N] \cdot E_1} - [\text{Wee1c}] \quad (3)$$

## 7 Event

This is an overview of one event. 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.

## 7.1 Event event\_0

**Notes** When  $Fzy=Kez$ (increasing), then the following changes are made instantaneously (for  $X=MPF, preMPF, Wee1, Wee1P, Stg$ , and  $StgP$ ) :

$$Xc \rightarrow (1-N \cdot E) \cdot Xc / (1-1.95 \cdot N \cdot E)$$

$$Xn \rightarrow Xn / 1.95$$

$$N \rightarrow 1.95N$$

**Trigger condition**

$$[FZYa] \geq kez\_1 \quad (4)$$

**Assignments**

$$N = factor\_1 \cdot [N] \quad (5)$$

$$MPFn = \frac{[MPFn]}{1.95} \quad (6)$$

$$preMPFn = \frac{[preMPFn]}{1.95} \quad (7)$$

$$Wee1n = \frac{[Wee1n]}{1.95} \quad (8)$$

$$Wee1Pn = \frac{[Wee1Pn]}{1.95} \quad (9)$$

$$Wee1c = [Wee1c] \cdot \frac{1 - [N] \cdot E\_1}{1 - 1.95 \cdot [N] \cdot E\_1} \quad (10)$$

$$Stgn = \frac{[Stgn]}{1.95} \quad (11)$$

$$StgPc = [StgPc] \cdot \frac{1 - [N] \cdot E\_1}{1 - 1.95 \cdot [N] \cdot E\_1} \quad (12)$$

$$Stgc = [Stgc] \cdot \frac{1 - [N] \cdot E\_1}{1 - 1.95 \cdot [N] \cdot E\_1} \quad (13)$$

$$StgPn = \frac{[StgPn]}{1.95} \quad (14)$$

$$MPFc = [MPFc] \cdot \frac{1 - [N] \cdot E\_1}{1 - 1.95 \cdot [N] \cdot E\_1} \quad (15)$$

## 8 Reactions

This model contains 54 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	R_1	Synthesis of MPFc	$\emptyset \longrightarrow \text{MPFc}$	
2	R_2	Activation of MPFc	$\text{preMPFc} \xrightarrow{\text{StgPc}} \text{MPFc}$	
3	R_3	Inactivation of MPFc	$\text{MPFc} \xrightarrow{\text{Wee1c}} \text{preMPFc}$	
4	R_6	Degradation of cyclin	$\text{preMPFc} \longrightarrow \emptyset$	
5	R_7	degradation of cyclin	$\text{MPFc} \longrightarrow \emptyset$	
6	R_8	Inactivation of Wee1c	$\text{Wee1c} \xrightarrow{\text{MPFc}} \text{Wee1Pc}$	
7	R_9	Activation of Wee1c	$\text{Wee1Pc} \xrightarrow{\text{Wee1Pc}} \text{Wee1c}$	
8	R_10	mRNA of Stg	$\text{Stgm} \xrightarrow{\text{Xp}} \emptyset$	
9	R_12	Synthesis of Stg	$\emptyset \xrightarrow{\text{Stgm}} \text{Stgc}$	
10	R_13	activation of Stgc	$\text{Stgc} \xrightarrow{\text{MPFc}} \text{StgPc}$	
11	R_14	inactivation of Stgc	$\text{StgPc} \longrightarrow \text{Stgc}$	
12	R_15	degradation of Stgc	$\text{Stgc} \longrightarrow \emptyset$	
13	R_16	degradation of active Stgc	$\text{StgPc} \longrightarrow \emptyset$	
14	R_19	export of MPF from cytoplasm	$\text{MPFc} \xrightarrow{\text{N}} \emptyset$	
15	importofMPFintocytoplasm _1	import of MPF into cytoplasm	$\emptyset \xrightarrow{\text{N, MPFn}} \text{MPFc}$	
16	_16	import of MPF into nucleus	$\emptyset \xrightarrow{\text{MPFc}} \text{MPFn}$	
17	exportofMPFfromnucleus _1	export of MPF from nucleus	$\text{MPFn} \longrightarrow \emptyset$	



Nº	Id	Name	Reaction Equation	SBO
18	importofpreMPFinto cytoplasm _1	import of preMPF into cytoplasm	$\emptyset \xrightarrow{\text{preMPFn, N}} \text{preMPFc}$	
19	R_20	export of preMPF from cytoplasm	$\text{preMPFc} \xrightarrow{\text{N}} \emptyset$	
20	_18	import of preMPF into nucleus	$\emptyset \xrightarrow{\text{preMPFc}} \text{preMPFn}$	
21	exportofpreMPFnfrom nucleus _1	export of preMPFn from nucleus	$\text{preMPFn} \longrightarrow \emptyset$	
22	R_21	export of Wee1P from nucleus	$\text{Wee1Pn} \longrightarrow \emptyset$	
23	_182_1	import of Wee1P into cytoplasm	$\emptyset \xrightarrow{\text{Wee1Pn, N}} \text{Wee1Pc}$	
24	R_22	export of Wee1P from cytoplasm	$\text{Wee1Pc} \xrightarrow{\text{N}} \emptyset$	
25	_20	import of Wee1P into nucleus	$\emptyset \xrightarrow{\text{Wee1Pc}} \text{Wee1Pn}$	
26	R_23	export of Wee1 from nucleus	$\text{Wee1n} \longrightarrow \emptyset$	
27	_22	import of Wee1 into cytoplasm	$\emptyset \xrightarrow{\text{Wee1n, N}} \text{Wee1c}$	
28	R_24	export of Wee1c from cytoplasm	$\text{Wee1c} \xrightarrow{\text{N}} \emptyset$	
29	_24	import of Wee1 into nucleus	$\emptyset \xrightarrow{\text{Wee1c}} \text{Wee1n}$	
30	R_25	export of StgP from nucleus	$\text{StgPn} \longrightarrow \emptyset$	
31	_26	import of StgP into cytoplasm	$\emptyset \xrightarrow{\text{StgPn, N}} \text{StgPc}$	
32	R_26	export of StgP from cytoplasm	$\text{StgPc} \xrightarrow{\text{N}} \emptyset$	
33	_28	import of StgP into nucleus	$\emptyset \xrightarrow{\text{StgPc}} \text{StgPn}$	
34	R_27	export of Stg from nucleus	$\text{Stgn} \longrightarrow \emptyset$	
35	_30	import of Stg into cytoplasm	$\emptyset \xrightarrow{\text{Stgn, N}} \text{Stgc}$	
36	R_28	export of Stg from cytoplasm	$\text{Stgc} \xrightarrow{\text{N}} \emptyset$	
37	_32	import of Stg into nucleus	$\emptyset \xrightarrow{\text{Stgc}} \text{Stgn}$	

Nº	Id	Name	Reaction Equation	SBO
38	R_29	activation of MPFn	$\text{preMPFn} \xrightarrow{\text{StgPn}} \text{MPFn}$	
39	R_30	inactivation of MPFn	$\text{MPFn} \xrightarrow{\text{Wee1n}} \text{preMPFn}$	
40	R_33	degradation of preMPFn	$\text{preMPFn} \xrightarrow{\text{FZYa}} \emptyset$	
41	R_34	degradation of MPFn	$\text{MPFn} \xrightarrow{\text{FZYa}} \emptyset$	
42	R_37	activation of intermediary enzyme	$\text{IEa.1} \longrightarrow \emptyset$	
43	R_38	inactivation of intermediary enzyme	$\emptyset \xrightarrow{\text{MPFn}} \text{IEa.1}$	
44	R_39	activation of FZY	$\emptyset \xrightarrow{\text{IEa.1}} \text{FZYa}$	
45	R_40	inactivation of FZY	$\text{FZYa} \longrightarrow \emptyset$	
46	R_41	inactivation of Wee1n	$\text{Wee1n} \xrightarrow{\text{MPFn}} \text{Wee1Pn}$	
47	R_42	activation of Wee1n	$\text{Wee1Pn} \longrightarrow \text{Wee1n}$	
48	R_43	activation of StgPn	$\text{Stgn} \xrightarrow{\text{MPFn}} \text{StgPn}$	
49	R_44	inactivation of StgPn	$\text{StgPn} \longrightarrow \text{Stgn}$	
50	R_45	degradation of Stgn	$\text{Stgn} \longrightarrow \emptyset$	
51	R_46	degradation of StgPn	$\text{StgPn} \longrightarrow \emptyset$	
52	Nuclei_1	Nuclei	$\emptyset \longrightarrow \text{N}$	
53	_50	Zygotic mRNA	$\emptyset \xrightarrow{\text{N}} \text{Xm}$	
54	_51	Zygotic proteins	$\emptyset \xrightarrow{\text{Xm}} \text{Xp}$	

### 8.1 Reaction R\_1

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

**Name** Synthesis of MPFc

#### Reaction equation



#### Product

Table 6: Properties of each product.

Id	Name	SBO
MPFc	MPFc	

#### Kinetic Law

**Derived unit** contains undeclared units

$$v_1 = k_{sc} \cdot \text{vol}(\text{cytoplasm}) \quad (17)$$

### 8.2 Reaction R\_2

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** Activation of MPFc

#### Reaction equation



#### Reactant

Table 7: Properties of each reactant.

Id	Name	SBO
preMPFc	preMPFc	

#### Modifier

Table 8: Properties of each modifier.

Id	Name	SBO
StgPc	StgPc	

## Product

Table 9: Properties of each product.

Id	Name	SBO
MPFc	MPFc	

## Kinetic Law

**Derived unit** contains undeclared units

$$v_2 = \text{vol}(\text{cytoplasm}) \cdot (\text{kstgp} + \text{kstg} \cdot [\text{StgPc}]) \cdot [\text{preMPFc}] \quad (19)$$

## 8.3 Reaction R\_3

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** Inactivation of MPFc

## Reaction equation



## Reactant

Table 10: Properties of each reactant.

Id	Name	SBO
MPFc	MPFc	

## Modifier

Table 11: Properties of each modifier.

Id	Name	SBO
Wee1c	Wee1c	

## Product

Table 12: Properties of each product.

Id	Name	SBO
preMPFc	preMPFc	

## Kinetic Law

**Derived unit** contains undeclared units

$$v_3 = \text{vol}(\text{cytoplasm}) \cdot (k_{\text{weep}} + k_{\text{wee}} \cdot [\text{Wee1c}]) \cdot [\text{MPFc}] \quad (21)$$

## 8.4 Reaction R\_6

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

**Name** Degradation of cyclin

## Reaction equation



## Reactant

Table 13: Properties of each reactant.

Id	Name	SBO
preMPFc	preMPFc	

## Kinetic Law

**Derived unit** contains undeclared units

$$v_4 = \text{vol}(\text{cytoplasm}) \cdot k_{\text{dc}} \cdot [\text{preMPFc}] \quad (23)$$

## 8.5 Reaction R\_7

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

**Name** degradation of cyclin

## Reaction equation



## Reactant

Table 14: Properties of each reactant.

Id	Name	SBO
MPFc	MPFc	

## Kinetic Law

**Derived unit** contains undeclared units

$$v_5 = \text{vol}(\text{cytoplasm}) \cdot k_{dc} \cdot [\text{MPFc}] \quad (25)$$

## 8.6 Reaction R\_8

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** Inactivation of Wee1c

## Reaction equation



## Reactant

Table 15: Properties of each reactant.

Id	Name	SBO
Wee1c	Wee1c	

## Modifier

Table 16: Properties of each modifier.

Id	Name	SBO
MPFc	MPFc	

## Product

Table 17: Properties of each product.

Id	Name	SBO
Wee1Pc	Wee1Pc	

### Kinetic Law

**Derived unit** contains undeclared units

$$v_6 = \text{vol}(\text{cytoplasm}) \cdot \frac{(\text{kiweep} + \text{kiwee} \cdot [\text{MPFc}]) \cdot [\text{Wee1c}]}{\text{Jiwee} + [\text{Wee1c}]} \quad (27)$$

### 8.7 Reaction R\_9

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** Activation of Wee1c

### Reaction equation



### Reactant

Table 18: Properties of each reactant.

Id	Name	SBO
Wee1Pc	Wee1Pc	

### Modifier

Table 19: Properties of each modifier.

Id	Name	SBO
Wee1Pc	Wee1Pc	

### Product

Table 20: Properties of each product.

Id	Name	SBO
Wee1c	Wee1c	

Id	Name	SBO
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### Kinetic Law

**Derived unit** contains undeclared units

$$v_7 = \text{vol}(\text{cytoplasm}) \cdot \frac{\text{kawee} \cdot [\text{Wee1Pc}]}{\text{Jawee} + [\text{Wee1Pc}]} \quad (29)$$

### 8.8 Reaction R\_10

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

**Name** mRNA of Stg

### Reaction equation



### Reactant

Table 21: Properties of each reactant.

Id	Name	SBO
Stgm	Stgm	

### Modifier

Table 22: Properties of each modifier.

Id	Name	SBO
Xp	Xp	

### Kinetic Law

**Derived unit** contains undeclared units

$$v_8 = \text{vol}(\text{nuclei}) \cdot \left( \frac{\text{kdm} \cdot [\text{Stgm}]}{\text{Jm} + [\text{Stgm}]} + \text{kdm} \cdot [\text{Xp}] \cdot [\text{Stgm}] \right) \quad (31)$$

### 8.9 Reaction R\_12

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



**Name** Synthesis of Stg

### Reaction equation



### Modifier

Table 23: Properties of each modifier.

Id	Name	SBO
Stgm	Stgm	

### Product

Table 24: Properties of each product.

Id	Name	SBO
Stgc	Stgc	

### Kinetic Law

**Derived unit** contains undeclared units

$$v_9 = \text{vol}(\text{cytoplasm}) \cdot \text{ksstg} \cdot [\text{Stgm}] \quad (33)$$

## 8.10 Reaction R\_13

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** activation of Stgc

### Reaction equation



### Reactant

Table 25: Properties of each reactant.

Id	Name	SBO
Stgc	Stgc	

## Modifier

Table 26: Properties of each modifier.

Id	Name	SBO
MPFc	MPFc	

## Product

Table 27: Properties of each product.

Id	Name	SBO
StgPc	StgPc	

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{10} = \text{vol}(\text{cytoplasm}) \cdot \frac{(\text{kastgp} + \text{kastg} \cdot [\text{MPFc}]) \cdot [\text{Stgc}]}{\text{Jastg} + [\text{Stgc}]} \quad (35)$$

### 8.11 Reaction R\_14

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

**Name** inactivation of Stgc

## Reaction equation



## Reactant

Table 28: Properties of each reactant.

Id	Name	SBO
StgPc	StgPc	

## Product

Table 29: Properties of each product.

Id	Name	SBO
Stgc	Stgc	

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{11} = \text{vol}(\text{cytoplasm}) \cdot \frac{k_{\text{stg}} \cdot [\text{StgPc}]}{J_{\text{stg}} + [\text{StgPc}]} \quad (37)$$

### 8.12 Reaction R\_15

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

**Name** degradation of Stgc

### Reaction equation



### Reactant

Table 30: Properties of each reactant.

Id	Name	SBO
Stgc	Stgc	

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{12} = \text{vol}(\text{cytoplasm}) \cdot k_{\text{dstg}} \cdot [\text{Stgc}] \quad (39)$$

### 8.13 Reaction R\_16

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

**Name** degradation of active Stgc

### Reaction equation



## Reactant

Table 31: Properties of each reactant.

Id	Name	SBO
StgPc	StgPc	

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{13} = \text{vol}(\text{cytoplasm}) \cdot \text{kdstg} \cdot [\text{StgPc}] \quad (41)$$

### 8.14 Reaction R\_19

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

**Name** export of MPF from cytoplasm

## Reaction equation



## Reactant

Table 32: Properties of each reactant.

Id	Name	SBO
MPFc	MPFc	

## Modifier

Table 33: Properties of each modifier.

Id	Name	SBO
N	N	

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{14} = \text{vol}(\text{cytoplasm}) \cdot \frac{\text{kt} \cdot [\text{MPFc}] \cdot \text{E\_1} \cdot [\text{N}]}{1 - [\text{N}] \cdot \text{E\_1}} \quad (43)$$

### 8.15 Reaction importofMPFintocytoplasm\_1

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

**Name** import of MPF into cytoplasm

#### Reaction equation



#### Modifiers

Table 34: Properties of each modifier.

Id	Name	SBO
N	N	
MPFn	MPFn	

#### Product

Table 35: Properties of each product.

Id	Name	SBO
MPFc	MPFc	

#### Kinetic Law

**Derived unit** contains undeclared units

$$v_{15} = \text{vol}(\text{nuclei}) \cdot \frac{k_{\text{out}_1} \cdot [\text{MPFn}] \cdot E_1 \cdot [N]}{1 - [N] \cdot E_1} \quad (45)$$

### 8.16 Reaction \_16

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

**Name** import of MPF into nucleus

#### Reaction equation



#### Modifier

Table 36: Properties of each modifier.

Id	Name	SBO
MPFc	MPFc	

## Product

Table 37: Properties of each product.

Id	Name	SBO
MPFn	MPFn	

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{16} = \text{vol}(\text{cytoplasm}) \cdot k_t \cdot [\text{MPFc}] \quad (47)$$

## 8.17 Reaction `exportofMPFfromnucleus_1`

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

**Name** export of MPF from nucleus

## Reaction equation



## Reactant

Table 38: Properties of each reactant.

Id	Name	SBO
MPFn	MPFn	

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{17} = \text{vol}(\text{nuclei}) \cdot k_{\text{out}_1} \cdot [\text{MPFn}] \quad (49)$$

### 8.18 Reaction `importofpreMPFintocytoplasm_1`

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

**Name** import of preMPF into cytoplasm

#### Reaction equation



#### Modifiers

Table 39: Properties of each modifier.

Id	Name	SBO
preMPFn	preMPFn	
N	N	

#### Product

Table 40: Properties of each product.

Id	Name	SBO
preMPFc	preMPFc	

#### Kinetic Law

**Derived unit** contains undeclared units

$$v_{18} = \text{vol}(\text{nuclei}) \cdot \frac{k_{\text{out}_1} \cdot [\text{preMPFn}] \cdot [\text{N}] \cdot E_1}{1 - [\text{N}] \cdot E_1} \quad (51)$$

### 8.19 Reaction `R_20`

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

**Name** export of preMPF from cytoplasm

#### Reaction equation



#### Reactant

Table 41: Properties of each reactant.

Id	Name	SBO
preMPFc	preMPFc	

### Modifier

Table 42: Properties of each modifier.

Id	Name	SBO
N	N	

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{19} = \text{vol}(\text{cytoplasm}) \cdot \frac{kt \cdot [\text{preMPFc}] \cdot E\_1 \cdot [N]}{1 - [N] \cdot E\_1} \quad (53)$$

## 8.20 Reaction \_18

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

**Name** import of preMPF into nucleus

### Reaction equation



### Modifier

Table 43: Properties of each modifier.

Id	Name	SBO
preMPFc	preMPFc	

### Product



Table 44: Properties of each product.

Id	Name	SBO
preMPFn	preMPFn	

#### Kinetic Law

**Derived unit** contains undeclared units

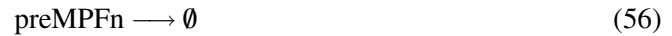
$$v_{20} = \text{vol}(\text{cytoplasm}) \cdot k_t \cdot [\text{preMPFc}] \quad (55)$$

#### 8.21 Reaction exportofpreMPFnfromnucleus\_1

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

**Name** export of preMPFn from nucleus

#### Reaction equation



#### Reactant

Table 45: Properties of each reactant.

Id	Name	SBO
preMPFn	preMPFn	

#### Kinetic Law

**Derived unit** contains undeclared units

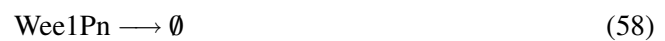
$$v_{21} = \text{vol}(\text{nuclei}) \cdot k_{\text{out}_1} \cdot [\text{preMPFn}] \quad (57)$$

#### 8.22 Reaction R\_21

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

**Name** export of Wee1P from nucleus

#### Reaction equation



**Reactant**

Table 46: Properties of each reactant.

Id	Name	SBO
Wee1Pn	Wee1Pn	

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{22} = \text{vol}(\text{nuclei}) \cdot \text{koutw\_1} \cdot [\text{Wee1Pn}] \quad (59)$$

### 8.23 Reaction \_182\_1

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

**Name** import of Wee1P into cytoplasm

### Reaction equation



### Modifiers

Table 47: Properties of each modifier.

Id	Name	SBO
Wee1Pn	Wee1Pn	
N	N	

### Product

Table 48: Properties of each product.

Id	Name	SBO
Wee1Pc	Wee1Pc	

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{23} = \text{vol}(\text{nuclei}) \cdot \frac{\text{koutw\_1} \cdot [\text{Wee1Pn}] \cdot [\text{N}] \cdot \text{E\_1}}{1 - [\text{N}] \cdot \text{E\_1}} \quad (61)$$

### 8.24 Reaction R\_22

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

**Name** export of Wee1P from cytoplasm

#### Reaction equation



#### Reactant

Table 49: Properties of each reactant.

Id	Name	SBO
Wee1Pc	Wee1Pc	

#### Modifier

Table 50: Properties of each modifier.

Id	Name	SBO
N	N	

#### Kinetic Law

**Derived unit** contains undeclared units

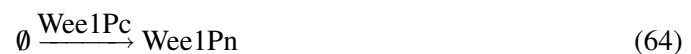
$$v_{24} = \text{vol}(\text{cytoplasm}) \cdot \frac{\text{kinw\_1} \cdot [\text{Wee1Pc}] \cdot \text{E\_1} \cdot [\text{N}]}{1 - [\text{N}] \cdot \text{E\_1}} \quad (63)$$

### 8.25 Reaction \_20

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

**Name** import of Wee1P into nucleus

#### Reaction equation



#### Modifier

Table 51: Properties of each modifier.

Id	Name	SBO
Wee1Pc	Wee1Pc	

## Product

Table 52: Properties of each product.

Id	Name	SBO
Wee1Pn	Wee1Pn	

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{25} = \text{vol}(\text{cytoplasm}) \cdot \text{kinw\_1} \cdot [\text{Wee1Pc}] \quad (65)$$

## 8.26 Reaction R\_23

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

**Name** export of Wee1 from nucleus

## Reaction equation



## Reactant

Table 53: Properties of each reactant.

Id	Name	SBO
Wee1n	Wee1n	

## Kinetic Law

**Derived unit** contains undeclared units

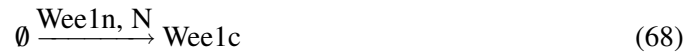
$$v_{26} = \text{vol}(\text{nuclei}) \cdot \text{koutw\_1} \cdot [\text{Wee1n}] \quad (67)$$

## 8.27 Reaction \_22

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

**Name** import of Wee1 into cytoplasm

### Reaction equation



### Modifiers

Table 54: Properties of each modifier.

Id	Name	SBO
Wee1n	Wee1n	
N	N	

### Product

Table 55: Properties of each product.

Id	Name	SBO
Wee1c	Wee1c	

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{27} = \text{vol}(\text{nuclei}) \cdot \frac{\text{koutw\_1} \cdot [\text{Wee1n}] \cdot [\text{N}] \cdot \text{E\_1}}{1 - [\text{N}] \cdot \text{E\_1}} \quad (69)$$

## 8.28 Reaction R\_24

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

**Name** export of Wee1c from cytoplasm

### Reaction equation



### Reactant

Table 56: Properties of each reactant.

Id	Name	SBO
Wee1c	Wee1c	

## Modifier

Table 57: Properties of each modifier.

Id	Name	SBO
N	N	

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{28} = \text{vol}(\text{cytoplasm}) \cdot \frac{\text{kinw\_1} \cdot [\text{Wee1c}] \cdot E\_1 \cdot [N]}{1 - [N] \cdot E\_1} \quad (71)$$

## 8.29 Reaction \_24

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

**Name** import of Wee1 into nucleus

## Reaction equation



## Modifier

Table 58: Properties of each modifier.

Id	Name	SBO
Wee1c	Wee1c	

## Product

Table 59: Properties of each product.

Id	Name	SBO
Wee1n	Wee1n	

Id	Name	SBO
----	------	-----

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{29} = \text{vol}(\text{cytoplasm}) \cdot \text{kinw\_1} \cdot [\text{Wee1c}] \quad (73)$$

### 8.30 Reaction R\_25

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

**Name** export of StgP from nucleus

### Reaction equation



### Reactant

Table 60: Properties of each reactant.

Id	Name	SBO
StgPn	StgPn	

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{30} = \text{vol}(\text{nuclei}) \cdot \text{kouts\_1} \cdot [\text{StgPn}] \quad (75)$$

### 8.31 Reaction \_26

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

**Name** import of StgP into cytoplasm

### Reaction equation



### Modifiers



Table 61: Properties of each modifier.

Id	Name	SBO
StgPn	StgPn	
N	N	

## Product

Table 62: Properties of each product.

Id	Name	SBO
StgPc	StgPc	

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{31} = \text{vol}(\text{nuclei}) \cdot \frac{k_{\text{outs}_1} \cdot [\text{StgPn}] \cdot E_{-1} \cdot [\text{N}]}{1 - [\text{N}] \cdot E_{-1}} \quad (77)$$

## 8.32 Reaction R\_26

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

**Name** export of StgP from cytoplasm

## Reaction equation



## Reactant

Table 63: Properties of each reactant.

Id	Name	SBO
StgPc	StgPc	

## Modifier

Table 64: Properties of each modifier.

Id	Name	SBO
N	N	

**Kinetic Law****Derived unit** contains undeclared units

$$v_{32} = \text{vol}(\text{cytoplasm}) \cdot \frac{\text{kins\_1} \cdot [\text{StgPc}] \cdot E\_1 \cdot [N]}{1 - [N] \cdot E\_1} \quad (79)$$

**8.33 Reaction \_28**

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

**Name** import of StgP into nucleus**Reaction equation****Modifier**

Table 65: Properties of each modifier.

Id	Name	SBO
StgPc	StgPc	

**Product**

Table 66: Properties of each product.

Id	Name	SBO
StgPn	StgPn	

**Kinetic Law****Derived unit** contains undeclared units

$$v_{33} = \text{vol}(\text{cytoplasm}) \cdot \text{kins\_1} \cdot [\text{StgPc}] \quad (81)$$

### 8.34 Reaction R\_27

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

**Name** export of Stg from nucleus

#### Reaction equation



#### Reactant

Table 67: Properties of each reactant.

Id	Name	SBO
Stgn	Stgn	

#### Kinetic Law

**Derived unit** contains undeclared units

$$v_{34} = \text{vol}(\text{nuclei}) \cdot \text{kouts}_1 \cdot [\text{Stgn}] \quad (83)$$

### 8.35 Reaction \_30

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

**Name** import of Stg into cytoplasm

#### Reaction equation



#### Modifiers

Table 68: Properties of each modifier.

Id	Name	SBO
Stgn	Stgn	
N	N	

#### Product

Table 69: Properties of each product.

Id	Name	SBO
Stgc	Stgc	

### Kinetic Law

**Derived unit** contains undeclared units

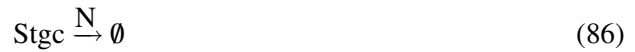
$$v_{35} = \text{vol}(\text{nuclei}) \cdot \frac{k_{\text{outs}_1} \cdot [\text{Stgn}] \cdot E_{-1} \cdot [\text{N}]}{1 - [\text{N}] \cdot E_{-1}} \quad (85)$$

### 8.36 Reaction R\_28

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

**Name** export of Stg from cytoplasm

### Reaction equation



### Reactant

Table 70: Properties of each reactant.

Id	Name	SBO
Stgc	Stgc	

### Modifier

Table 71: Properties of each modifier.

Id	Name	SBO
N	N	

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{36} = \text{vol}(\text{cytoplasm}) \cdot \frac{k_{\text{ins}_1} \cdot [\text{Stgc}] \cdot E_{-1} \cdot [\text{N}]}{1 - [\text{N}] \cdot E_{-1}} \quad (87)$$

8.37 Reaction \_32

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

**Name** import of Stg into nucleus

Reaction equation



Modifier

Table 72: Properties of each modifier.

Id	Name	SBO
Stgc	Stgc	

Product

Table 73: Properties of each product.

Id	Name	SBO
Stgn	Stgn	

Kinetic Law

**Derived unit** contains undeclared units

$$v_{37} = \text{vol}(\text{cytoplasm}) \cdot \text{kins\_1} \cdot [\text{Stgc}]$$

(89)

8.38 Reaction R\_29

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** activation of MPFn

Reaction equation



Reactant

Table 74: Properties of each reactant.

Id	Name	SBO
preMPFn	preMPFn	

## Modifier

Table 75: Properties of each modifier.

Id	Name	SBO
StgPn	StgPn	

## Product

Table 76: Properties of each product.

Id	Name	SBO
MPFn	MPFn	

## Kinetic Law

**Derived unit** contains undeclared units

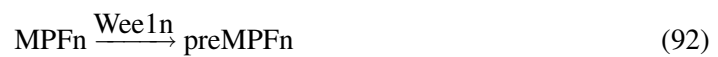
$$v_{38} = \text{vol}(\text{nuclei}) \cdot (\text{kstgp} + \text{kstg} \cdot [\text{StgPn}]) \cdot [\text{preMPFn}] \quad (91)$$

### 8.39 Reaction R\_30

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** inactivation of MPFn

## Reaction equation



## Reactant

Table 77: Properties of each reactant.

Id	Name	SBO
MPFn	MPFn	

## Modifier

Table 78: Properties of each modifier.

Id	Name	SBO
Wee1n	Wee1n	

## Product

Table 79: Properties of each product.

Id	Name	SBO
preMPFn	preMPFn	

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{39} = \text{vol}(\text{nuclei}) \cdot (\text{kweep} + \text{kwee} \cdot [\text{Wee1n}]) \cdot [\text{MPFn}] \quad (93)$$

### 8.40 Reaction R\_33

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

**Name** degradation of preMPFn

#### Reaction equation



## Reactant

Table 80: Properties of each reactant.

Id	Name	SBO
preMPFn	preMPFn	

## Modifier

Table 81: Properties of each modifier.

Id	Name	SBO
FZYa	FZYa	

**Kinetic Law****Derived unit** contains undeclared units

$$v_{40} = \text{vol}(\text{nuclei}) \cdot (\text{kdn} + \text{kdn} \cdot [\text{FZYa}]) \cdot [\text{preMPFn}] \quad (95)$$

**8.41 Reaction R\_34**

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

**Name** degradation of MPFn**Reaction equation****Reactant**

Table 82: Properties of each reactant.

Id	Name	SBO
MPFn	MPFn	

**Modifier**

Table 83: Properties of each modifier.

Id	Name	SBO
FZYa	FZYa	

**Kinetic Law****Derived unit** contains undeclared units

$$v_{41} = \text{vol}(\text{nuclei}) \cdot (\text{kdn} + \text{kdn} \cdot [\text{FZYa}]) \cdot [\text{MPFn}] \quad (97)$$



### 8.42 Reaction R\_37

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

**Name** activation of intermediary enzyme

#### Reaction equation



#### Reactant

Table 84: Properties of each reactant.

Id	Name	SBO
IEa_1		

#### Kinetic Law

**Derived unit** contains undeclared units

$$v_{42} = \text{vol}(\text{nuclei}) \cdot \frac{k_{iie} \cdot [\text{IEa\_1}]}{J_{iie} + [\text{IEa\_1}]} \quad (99)$$

### 8.43 Reaction R\_38

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

**Name** inactivation of intermediary enzyme

#### Reaction equation



#### Modifier

Table 85: Properties of each modifier.

Id	Name	SBO
MPFn	MPFn	

#### Product

Table 86: Properties of each product.

Id	Name	SBO
IEa_1		

**Kinetic Law****Derived unit** contains undeclared units

$$v_{43} = \text{vol}(\text{nuclei}) \cdot \frac{\text{kaie} \cdot (1 - [\text{IEa}_1]) \cdot [\text{MPFn}]}{\text{Jaie} + 1 - [\text{IEa}_1]} \quad (101)$$

**8.44 Reaction R\_39**

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

**Name** activation of FZY**Reaction equation****Modifier**

Table 87: Properties of each modifier.

Id	Name	SBO
IEa_1		

**Product**

Table 88: Properties of each product.

Id	Name	SBO
FZYa	FZYa	

**Kinetic Law****Derived unit** contains undeclared units

$$v_{44} = \text{vol}(\text{nuclei}) \cdot \frac{\text{kafzy} \cdot [\text{IEa}_1] \cdot (1 - [\text{FZYa}])}{\text{Jafzy} + 1 - [\text{FZYa}]} \quad (103)$$

8.45 Reaction R\_40

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

**Name** inactivation of FZY

Reaction equation



Reactant

Table 89: Properties of each reactant.

Id	Name	SBO
FZYa	FZYa	

Kinetic Law

**Derived unit** contains undeclared units

$$v_{45} = \text{vol}(\text{nuclei}) \cdot \frac{\text{kifzy} \cdot [\text{FZYa}]}{\text{Jifzy} + [\text{FZYa}]}$$

(105)

8.46 Reaction R\_41

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** inactivation of Wee1n

Reaction equation



Reactant

Table 90: Properties of each reactant.

Id	Name	SBO
Wee1n	Wee1n	

Modifier

Table 91: Properties of each modifier.

Id	Name	SBO
MPFn	MPFn	

## Product

Table 92: Properties of each product.

Id	Name	SBO
Wee1Pn	Wee1Pn	

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{46} = \text{vol}(\text{nuclei}) \cdot \frac{(\text{kiweep} + \text{kiwee} \cdot [\text{MPFn}]) \cdot [\text{Wee1n}]}{\text{Jiwee} + [\text{Wee1n}]} \quad (107)$$

## 8.47 Reaction R\_42

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

**Name** activation of Wee1n

## Reaction equation



## Reactant

Table 93: Properties of each reactant.

Id	Name	SBO
Wee1Pn	Wee1Pn	

## Product

Table 94: Properties of each product.

Id	Name	SBO
Wee1n	Wee1n	

Id	Name	SBO
----	------	-----

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{47} = \text{vol}(\text{nuclei}) \cdot \frac{\text{kawee} \cdot [\text{Wee1Pn}]}{\text{Jawee} + [\text{Wee1Pn}]} \quad (109)$$

## 8.48 Reaction R\_43

This is an irreversible reaction of one reactant forming one product influenced by one modifier.

**Name** activation of StgPn

## Reaction equation



## Reactant

Table 95: Properties of each reactant.

Id	Name	SBO
Stgn	Stgn	

## Modifier

Table 96: Properties of each modifier.

Id	Name	SBO
MPFn	MPFn	

## Product

Table 97: Properties of each product.

Id	Name	SBO
StgPn	StgPn	

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{48} = \text{vol}(\text{nuclei}) \cdot \frac{(\text{kastgp} + \text{kastg} \cdot [\text{MPFn}]) \cdot [\text{Stgn}]}{\text{Jastg} + [\text{Stgn}]} \quad (111)$$

## 8.49 Reaction R\_44

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

**Name** inactivation of StgPn

### Reaction equation



## Reactant

Table 98: Properties of each reactant.

Id	Name	SBO
StgPn	StgPn	

## Product

Table 99: Properties of each product.

Id	Name	SBO
Stgn	Stgn	

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{49} = \text{vol}(\text{nuclei}) \cdot \frac{\text{kistg} \cdot [\text{StgPn}]}{\text{Jistg} + [\text{StgPn}]} \quad (113)$$

## 8.50 Reaction R\_45

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

**Name** degradation of Stgn

### Reaction equation



### Reactant

Table 100: Properties of each reactant.

Id	Name	SBO
Stgn	Stgn	

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{50} = \text{vol}(\text{nuclei}) \cdot \text{kdstg} \cdot [\text{Stgn}] \quad (115)$$

### 8.51 Reaction R\_46

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

**Name** degradation of StgPn

### Reaction equation



### Reactant

Table 101: Properties of each reactant.

Id	Name	SBO
StgPn	StgPn	

### Kinetic Law

**Derived unit** contains undeclared units

$$v_{51} = \text{vol}(\text{nuclei}) \cdot \text{kdstg} \cdot [\text{StgPn}] \quad (117)$$

### 8.52 Reaction Nuclei\_1

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

**Name** Nuclei

### Reaction equation



### Product

Table 102: Properties of each product.

Id	Name	SBO
N	N	

### Kinetic Law

**Derived unit** not available

$$v_{52} = 0 \quad (119)$$

## 8.53 Reaction \_50

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

**Name** Zygotic mRNA

### Reaction equation



### Modifier

Table 103: Properties of each modifier.

Id	Name	SBO
N	N	

### Product

Table 104: Properties of each product.

Id	Name	SBO
Xm	Xm	



## Kinetic Law

**Derived unit** contains undeclared units

$$v_{53} = \text{vol}(\text{nuclei}) \cdot \text{ksxm}_1 \cdot [\text{N}] \quad (121)$$

## 8.54 Reaction \_51

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

**Name** Zygotic proteins

## Reaction equation



## Modifier

Table 105: Properties of each modifier.

Id	Name	SBO
Xm	Xm	

## Product

Table 106: Properties of each product.

Id	Name	SBO
Xp	Xp	

## Kinetic Law

**Derived unit** contains undeclared units

$$v_{54} = \text{vol}(\text{cytoplasm}) \cdot \text{ksxp}_1 \cdot [X_m] \quad (123)$$

# 9 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.

Identifiers for kinetic laws highlighted in gray cannot be verified to evaluate to units of SBML substance per time. As a result, some SBML interpreters may not be able to verify the consistency of the units on quantities in the model. Please check if

- parameters without an unit definition are involved or
- volume correction is necessary because the `hasOnlySubstanceUnits` flag may be set to `false` and `spacialDimensions`  $> 0$  for certain species.

## 9.1 Species MPFc

**Name** MPFc

**Initial concentration**  $1 \text{ mol} \cdot \text{l}^{-1}$

**Involved in event** [event\\_0](#)

This species takes part in nine reactions (as a reactant in [R\\_3](#), [R\\_7](#), [R\\_19](#) and as a product in [R\\_1](#), [R\\_2](#), [importofMPFintocytoplasm\\_1](#) and as a modifier in [R\\_8](#), [R\\_13](#), [\\_16](#)).

$$\frac{d}{dt}\text{MPFc} = v_1 + v_2 + v_{15} - v_3 - v_5 - v_{14} \quad (124)$$

Furthermore, one event influences this species' rate of change.

## 9.2 Species preMPFc

**Name** preMPFc

**Initial concentration**  $0 \text{ mol} \cdot \text{l}^{-1}$

This species takes part in six reactions (as a reactant in [R\\_2](#), [R\\_6](#), [R\\_20](#) and as a product in [R\\_3](#), [importofpreMPFintocytoplasm\\_1](#) and as a modifier in [\\_18](#)).

$$\frac{d}{dt}\text{preMPFc} = v_3 + v_{18} - v_2 - v_4 - v_{19} \quad (125)$$

## 9.3 Species StgPc

**Name** StgPc

**Initial concentration**  $0.8 \text{ mol} \cdot \text{l}^{-1}$

**Involved in event** [event\\_0](#)

This species takes part in seven reactions (as a reactant in [R\\_14](#), [R\\_16](#), [R\\_26](#) and as a product in [R\\_13](#), [\\_26](#) and as a modifier in [R\\_2](#), [\\_28](#)).

$$\frac{d}{dt}\text{StgPc} = v_{10} + v_{31} - v_{11} - v_{13} - v_{32} \quad (126)$$

Furthermore, one event influences this species' rate of change.

## 9.4 Species *Wee1c*

**Name** *Wee1c*

**Initial concentration**  $0 \text{ mol} \cdot \text{l}^{-1}$

**Involved in event** *event\_0*

This species takes part in six reactions (as a reactant in [R\\_8](#), [R\\_24](#) and as a product in [R\\_9](#), [\\_22](#) and as a modifier in [R\\_3](#), [\\_24](#)).

$$\frac{d}{dt} \text{Wee1c} = v_7 + v_{27} - v_6 - v_{28} \quad (127)$$

Furthermore, one event influences this species' rate of change.

## 9.5 Species *Wee1Pc*

**Name** *Wee1Pc*

**Notes** *Wee1Pc* has been defined as boundarycondition, only change with the assignment rule.

**Initial concentration**  $0.8 \text{ mol} \cdot \text{l}^{-1}$

**Involved in rule** *Wee1Pc*

This species takes part in six reactions (as a reactant in [R\\_9](#), [R\\_22](#) and as a product in [R\\_8](#), [\\_182\\_1](#) and as a modifier in [R\\_9](#), [\\_20](#)). Not these but one rule determines the species' quantity because this species is on the boundary of the reaction system.

## 9.6 Species *Stgm*

**Name** *Stgm*

**Initial concentration**  $1 \text{ mol} \cdot \text{l}^{-1}$

This species takes part in two reactions (as a reactant in [R\\_10](#) and as a modifier in [R\\_12](#)).

$$\frac{d}{dt} \text{Stgm} = -v_8 \quad (128)$$

## 9.7 Species *Xp*

**Name** *Xp*

**Initial concentration**  $0 \text{ mol} \cdot \text{l}^{-1}$

This species takes part in two reactions (as a product in [\\_51](#) and as a modifier in [R\\_10](#)).

$$\frac{d}{dt} \text{Xp} = v_{54} \quad (129)$$

## 9.8 Species $\text{Stgc}$

**Name**  $\text{Stgc}$

**Initial concentration**  $0 \text{ mol} \cdot \text{l}^{-1}$

**Involved in event** [event\\_0](#)

This species takes part in seven reactions (as a reactant in [R\\_13](#), [R\\_15](#), [R\\_28](#) and as a product in [R\\_12](#), [R\\_14](#), [\\_30](#) and as a modifier in [\\_32](#)).

$$\frac{d}{dt}\text{Stgc} = v_9 + v_{11} + v_{35} - v_{10} - v_{12} - v_{36} \quad (130)$$

Furthermore, one event influences this species' rate of change.

## 9.9 Species $X_m$

**Name**  $X_m$

**Initial concentration**  $0 \text{ mol} \cdot \text{l}^{-1}$

This species takes part in two reactions (as a product in [\\_50](#) and as a modifier in [\\_51](#)).

$$\frac{d}{dt}X_m = v_{53} \quad (131)$$

## 9.10 Species $\text{MPFn}$

**Name**  $\text{MPFn}$

**Initial concentration**  $0 \text{ mol} \cdot \text{l}^{-1}$

**Involved in event** [event\\_0](#)

This species takes part in nine reactions (as a reactant in [exportofMPFfromnucleus\\_1](#), [R\\_30](#), [R\\_34](#) and as a product in [\\_16](#), [R\\_29](#) and as a modifier in [importofMPFintocytoplasm\\_1](#), [R\\_38](#), [R\\_41](#), [R\\_43](#)).

$$\frac{d}{dt}\text{MPFn} = v_{16} + v_{38} - v_{17} - v_{39} - v_{41} \quad (132)$$

Furthermore, one event influences this species' rate of change.

### 9.11 Species `preMPFn`

**Name** `preMPFn`

**Initial concentration**  $0 \text{ mol} \cdot \text{l}^{-1}$

**Involved in event** `event_0`

This species takes part in six reactions (as a reactant in `exportofpreMPFnfromnucleus_1`, `R_29`, `R_33` and as a product in `_18`, `R_30` and as a modifier in `importofpreMPFintocytoplasm_1`).

$$\frac{d}{dt}\text{preMPFn} = v_{20} + v_{39} - v_{21} - v_{38} - v_{40} \quad (133)$$

Furthermore, one event influences this species' rate of change.

### 9.12 Species `Wee1Pn`

**Name** `Wee1Pn`

**Initial concentration**  $0 \text{ mol} \cdot \text{l}^{-1}$

**Involved in event** `event_0`

This species takes part in five reactions (as a reactant in `R_21`, `R_42` and as a product in `_20`, `R_41` and as a modifier in `_182_1`).

$$\frac{d}{dt}\text{Wee1Pn} = v_{25} + v_{46} - v_{22} - v_{47} \quad (134)$$

Furthermore, one event influences this species' rate of change.

### 9.13 Species `Wee1n`

**Name** `Wee1n`

**Initial concentration**  $0 \text{ mol} \cdot \text{l}^{-1}$

**Involved in event** `event_0`

This species takes part in six reactions (as a reactant in `R_23`, `R_41` and as a product in `_24`, `R_42` and as a modifier in `_22`, `R_30`).

$$\frac{d}{dt}\text{Wee1n} = v_{29} + v_{47} - v_{26} - v_{46} \quad (135)$$

Furthermore, one event influences this species' rate of change.

### 9.14 Species StgPn

**Name** StgPn

**Initial concentration** 0 mol · l<sup>-1</sup>

**Involved in event** event\_0

This species takes part in seven reactions (as a reactant in R\_25, R\_44, R\_46 and as a product in \_28, R\_43 and as a modifier in \_26, R\_29).

$$\frac{d}{dt}\text{StgPn} = v_{33} + v_{48} - v_{30} - v_{49} - v_{51} \quad (136)$$

Furthermore, one event influences this species' rate of change.

### 9.15 Species Stgn

**Name** Stgn

**Initial concentration** 0 mol · l<sup>-1</sup>

**Involved in event** event\_0

This species takes part in six reactions (as a reactant in R\_27, R\_43, R\_45 and as a product in \_32, R\_44 and as a modifier in \_30).

$$\frac{d}{dt}\text{Stgn} = v_{37} + v_{49} - v_{34} - v_{48} - v_{50} \quad (137)$$

Furthermore, one event influences this species' rate of change.

### 9.16 Species FZYa

**Name** FZYa

**Initial concentration** 0 mol · l<sup>-1</sup>

This species takes part in four reactions (as a reactant in R\_40 and as a product in R\_39 and as a modifier in R\_33, R\_34).

$$\frac{d}{dt}\text{FZYa} = v_{44} - v_{45} \quad (138)$$

### 9.17 Species IEa\_1

**Initial concentration** 0 mol · l<sup>-1</sup>

This species takes part in three reactions (as a reactant in R\_37 and as a product in R\_38 and as a modifier in R\_39).

$$\frac{d}{dt}\text{IEa}_1 = v_{43} - v_{42} \quad (139)$$

## 9.18 Species N

**Name** N

**Initial concentration** 1 mol · l<sup>-1</sup>

**Involved in event** [event\\_0](#)

This species takes part in 14 reactions (as a product in [Nuclei\\_1](#) and as a modifier in [R\\_19](#), [importofMPFintocytoplasm\\_1](#), [importofpreMPFintocytoplasm\\_1](#), [R\\_20](#), [\\_182\\_1](#), [R\\_22](#), [\\_22](#), [R\\_24](#), [\\_26](#), [R\\_26](#), [\\_30](#), [R\\_28](#), [\\_50](#)).

$$\frac{d}{dt}N = v_{52} \quad (140)$$

Furthermore, one event influences this species' rate of change.

SBML2<sup>A</sup>TeX was developed by Andreas Dräger<sup>a</sup>, Hannes Planatscher<sup>a</sup>, Dieudonné M Wouamba<sup>a</sup>, Adrian Schröder<sup>a</sup>, Michael Hucka<sup>b</sup>, Lukas Endler<sup>c</sup>, Martin Golebiewski<sup>d</sup> and Andreas Zell<sup>a</sup>. Please see <http://www.ra.cs.uni-tuebingen.de/software/SBML2LaTeX> for more information.

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