

SBML Model Report

Model identifier: “MPhase”



February 28, 2009

1 General Overview

This is a document in SBML Level 2 Version 1 format. Table 1 gives an overview of the quantities of all components of this model.

Table 1: The SBML components in this model.
All components are described in more detail in the following sections.

Element	Quantity	Element	Quantity
compartment types	0	compartments	2
species types	0	species	20
events	0	constraints	0
reactions	11	function definitions	0
global parameters	0	unit definitions	0
rules	0	initial assignments	0

2 Unit Definitions

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

2.1 Unit substance

Notes Mole is the predefined SBML unit for substance.

Definition mol

2.2 Unit volume

Notes Litre is the predefined SBML unit for volume.

Definition 1

2.3 Unit area

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

Definition m^2

2.4 Unit length

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

Definition m

2.5 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
default			3	1	litre	<input checked="" type="checkbox"/>	
c1	cell		3	1	litre	<input checked="" type="checkbox"/>	default

3.1 Compartment default

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

3.2 Compartment c1

This is a three-dimensional compartment with a constant size of one litre that is surrounded by default.

Name cell

4 Species

This model contains 20 species. Section 6 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
s3	CyclinB	c1	$\text{mol} \cdot \text{l}^{-1}$	\square	\square
s5	PP2A	c1	$\text{mol} \cdot \text{l}^{-1}$	\square	\square
s6	Kinase X	c1	$\text{mol} \cdot \text{l}^{-1}$	\square	\square
s7	CAK	c1	$\text{mol} \cdot \text{l}^{-1}$	\square	\square
s10	Nim1	c1	$\text{mol} \cdot \text{l}^{-1}$	\square	\square
s11	Lamin	c1	$\text{mol} \cdot \text{l}^{-1}$	\square	\square
s12	M-Phase	c1	$\text{mol} \cdot \text{l}^{-1}$	\square	\square
s21	Lamin	c1	$\text{mol} \cdot \text{l}^{-1}$	\square	\square
s4	Cdc25	c1	$\text{mol} \cdot \text{l}^{-1}$	\square	\square
s8	Mik1	c1	$\text{mol} \cdot \text{l}^{-1}$	\square	\square
s9	Wee1	c1	$\text{mol} \cdot \text{l}^{-1}$	\square	\square
s22	Cdc25	c1	$\text{mol} \cdot \text{l}^{-1}$	\square	\square
s24	Wee1	c1	$\text{mol} \cdot \text{l}^{-1}$	\square	\square
s25	Mik1	c1	$\text{mol} \cdot \text{l}^{-1}$	\square	\square
s26	a33_degraded	c1	$\text{mol} \cdot \text{l}^{-1}$	\square	\square
s2	Cdc2	c1	$\text{mol} \cdot \text{l}^{-1}$	\square	\square
s27	Complex(CyclinB,Cdc2)	c1	$\text{mol} \cdot \text{l}^{-1}$	\square	\square
s28	Complex(CyclinB,Cdc2)	c1	$\text{mol} \cdot \text{l}^{-1}$	\square	\square
s29	Complex(CyclinB,Cdc2)	c1	$\text{mol} \cdot \text{l}^{-1}$	\square	\square
s30	Complex(CyclinB,Cdc2)	c1	$\text{mol} \cdot \text{l}^{-1}$	\square	\square

5 Reactions

This model contains eleven reactions. All reactions are listed in the following table and are subsequently described in detail. If a reaction is affected by one or more modifiers, the identifiers of the modifier species are written above the reaction arrow.

Table 4: Overview of all reactions

Nº	Id	Name	Reaction Equation	SBO
1	r1		$s_{21} \xrightarrow{s_{29}} s_{11}$	
2	r2		$s_{11} \longrightarrow s_{12}$	
3	r7		$s_4 \xrightarrow{s_5} s_{22}$	
4	r8		$s_{22} \xrightarrow{s_6} s_4$	
5	r11		$s_{25} \xrightarrow{s_{10}} s_8$	
6	r12		$s_{24} \xrightarrow{s_{10}} s_9$	
7	r13		$s_{27} \xrightarrow{s_7} s_{28}$	
8	r14		$s_{28} \xrightarrow{s_{22}} s_{29}$	
9	r15		$s_{30} \xrightarrow{s_{24}, s_{25}} s_{27}$	
10	r17		$s_{29} \longrightarrow s_2 + s_{26}$	
11	r18		$s_2 + s_3 \longrightarrow s_{30}$	

5.1 Reaction r_1

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

Reaction equation



Reactant

Table 5: Properties of each reactant.

Id	Name	SBO
s21	Lamin	

Modifier

Table 6: Properties of each modifier.

Id	Name	SBO
s29	Complex(CyclinB,Cdc2)	

Product

Table 7: Properties of each product.

Id	Name	SBO
s11	Lamin	

Kinetic Law

$$v_1 = \text{not specified} \quad (2)$$

5.2 Reaction r_2

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

Reaction equation



Reactant

Table 8: Properties of each reactant.

Id	Name	SBO
s11	Lamin	

Product

Table 9: Properties of each product.

Id	Name	SBO
s12	M-Phase	

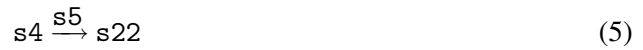
Kinetic Law

$$v_2 = \text{not specified} \quad (4)$$

5.3 Reaction r7

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

Reaction equation



Reactant

Table 10: Properties of each reactant.

Id	Name	SBO
s4	Cdc25	

Modifier

Table 11: Properties of each modifier.

Id	Name	SBO
s5	PP2A	

Product

Table 12: Properties of each product.

Id	Name	SBO
s22	Cdc25	

Kinetic Law

$$v_3 = \text{not specified} \quad (6)$$

5.4 Reaction r8

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

Reaction equation



Reactant

Table 13: Properties of each reactant.

Id	Name	SBO
s22	Cdc25	

Modifier

Table 14: Properties of each modifier.

Id	Name	SBO
s6	Kinase X	

Product

Table 15: Properties of each product.

Id	Name	SBO
s4	Cdc25	

Kinetic Law

$$v_4 = \text{not specified} \quad (8)$$

5.5 Reaction r11

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

Reaction equation



Reactant

Table 16: Properties of each reactant.

Id	Name	SBO
s25	Mik1	

Modifier

Table 17: Properties of each modifier.

Id	Name	SBO
s10	Nim1	

Product

Table 18: Properties of each product.

Id	Name	SBO
s8	Mik1	

Kinetic Law

$$v_5 = \text{not specified} \quad (10)$$

5.6 Reaction r12

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

Reaction equation



Reactant

Table 19: Properties of each reactant.

Id	Name	SBO
s24	Wee1	

Modifier

Table 20: Properties of each modifier.

Id	Name	SBO
s10	Nim1	

Product

Table 21: Properties of each product.

Id	Name	SBO
s9	Wee1	

Kinetic Law

$$v_6 = \text{not specified} \quad (12)$$

5.7 Reaction r13

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

Reaction equation



Reactant

Table 22: Properties of each reactant.

Id	Name	SBO
s27	Complex(CyclinB,Cdc2)	

Modifier

Table 23: Properties of each modifier.

Id	Name	SBO
s7	CAK	

Product

Table 24: Properties of each product.

Id	Name	SBO
s28	Complex(CyclinB,Cdc2)	

Kinetic Law

$$v_7 = \text{not specified} \quad (14)$$

5.8 Reaction r14

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

Reaction equation



Reactant

Table 25: Properties of each reactant.

Id	Name	SBO
s28	Complex(CyclinB,Cdc2)	

Modifier

Table 26: Properties of each modifier.

Id	Name	SBO
s22	Cdc25	

Product

Table 27: Properties of each product.

Id	Name	SBO
s29	Complex(CyclinB,Cdc2)	

Kinetic Law

$$v_8 = \text{not specified} \quad (16)$$

5.9 Reaction r15

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

Reaction equation



Reactant

Table 28: Properties of each reactant.

Id	Name	SBO
s30	Complex(CyclinB,Cdc2)	

Modifiers

Table 29: Properties of each modifier.

Id	Name	SBO
s24	Wee1	
s25	Mik1	

Product

Table 30: Properties of each product.

Id	Name	SBO
s27	Complex(CyclinB,Cdc2)	

Kinetic Law

$$v_9 = \text{not specified} \quad (18)$$

5.10 Reaction r17

This is an irreversible reaction of one reactant forming two products.

Reaction equation



Reactant

Table 31: Properties of each reactant.

Id	Name	SBO
s29	Complex(CyclinB,Cdc2)	

Products

Table 32: Properties of each product.

Id	Name	SBO
s2	Cdc2	
s26	a33_degraded	

Kinetic Law

$$v_{10} = \text{not specified} \quad (20)$$

5.11 Reaction r18

This is an irreversible reaction of two reactants forming one product.

Reaction equation



Reactants

Table 33: Properties of each reactant.

Id	Name	SBO
s2	Cdc2	
s3	CyclinB	

Product

Table 34: Properties of each product.

Id	Name	SBO
s30	Complex(CyclinB,Cdc2)	

Kinetic Law

$$v_{11} = \text{not specified} \quad (22)$$

6 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.

The identifiers for reactions, which are not defined properly or which are lacking a kinetic equation, are highlighted in red.

6.1 Species s3

Name CyclinB

Initial amount 0 mol

This species takes part in one reaction (as a reactant in [r18](#)).

$$\frac{d}{dt}s3 = -v_{11} \quad (23)$$

6.2 Species s5

Name PP2A

Initial amount 0 mol

This species takes part in one reaction (as a modifier in [r7](#)).

$$\frac{d}{dt}s5 = 0 \quad (24)$$

6.3 Species s6

Name Kinase X

Initial amount 0 mol

This species takes part in one reaction (as a modifier in [r8](#)).

$$\frac{d}{dt}s6 = 0 \quad (25)$$

6.4 Species s7

Name CAK

Initial amount 0 mol

This species takes part in one reaction (as a modifier in [r13](#)).

$$\frac{d}{dt}s7 = 0 \quad (26)$$

6.5 Species s10

Name Nim1

Initial amount 0 mol

This species takes part in two reactions (as a modifier in [r11](#), [r12](#)).

$$\frac{d}{dt}s10 = 0 \quad (27)$$

6.6 Species s11

Name Lamin

Initial amount 0 mol

This species takes part in two reactions (as a reactant in [r2](#) and as a product in [r1](#)).

$$\frac{d}{dt}s11 = v_1 - v_2 \quad (28)$$

6.7 Species s12

Name M-Phase

Initial amount 0 mol

This species takes part in one reaction (as a product in [r2](#)).

$$\frac{d}{dt}s12 = v_2 \quad (29)$$

6.8 Species s21

Name Lamin

Initial amount 0 mol

This species takes part in one reaction (as a reactant in [r1](#)).

$$\frac{d}{dt}s_{21} = -v_1 \quad (30)$$

6.9 Species s4

Name Cdc25

Initial amount 0 mol

This species takes part in two reactions (as a reactant in [r7](#) and as a product in [r8](#)).

$$\frac{d}{dt}s_4 = v_4 - v_3 \quad (31)$$

6.10 Species s8

Name Mik1

Initial amount 0 mol

This species takes part in one reaction (as a product in [r11](#)).

$$\frac{d}{dt}s_8 = v_5 \quad (32)$$

6.11 Species s9

Name Wee1

Initial amount 0 mol

This species takes part in one reaction (as a product in [r12](#)).

$$\frac{d}{dt}s_9 = v_6 \quad (33)$$

6.12 Species s22

Name Cdc25

Initial amount 0 mol

This species takes part in three reactions (as a reactant in [r8](#) and as a product in [r7](#) and as a modifier in [r14](#)).

$$\frac{d}{dt}s_{22} = v_3 - v_4 \quad (34)$$

6.13 Species s24

Name Wee1

Initial amount 0 mol

This species takes part in two reactions (as a reactant in [r12](#) and as a modifier in [r15](#)).

$$\frac{d}{dt}s_{24} = -v_6 \quad (35)$$

6.14 Species s25

Name Mik1

Initial amount 0 mol

This species takes part in two reactions (as a reactant in [r11](#) and as a modifier in [r15](#)).

$$\frac{d}{dt}s_{25} = -v_5 \quad (36)$$

6.15 Species s26

Name a33_degraded

Initial amount 0 mol

This species takes part in one reaction (as a product in [r17](#)).

$$\frac{d}{dt}s_{26} = v_{10} \quad (37)$$

6.16 Species s2

Name Cdc2

Initial amount 0 mol

This species takes part in two reactions (as a reactant in [r18](#) and as a product in [r17](#)).

$$\frac{d}{dt}s_2 = v_{10} - v_{11} \quad (38)$$

6.17 Species s27

Name Complex(CyclinB,Cdc2)

Initial amount 0 mol

This species takes part in two reactions (as a reactant in [r13](#) and as a product in [r15](#)).

$$\frac{d}{dt}s_{27} = v_9 - v_7 \quad (39)$$

6.18 Species s28

Name Complex(CyclinB,Cdc2)

Initial amount 0 mol

This species takes part in two reactions (as a reactant in r14 and as a product in r13).

$$\frac{d}{dt}s_{28} = v_7 - v_8 \quad (40)$$

6.19 Species s29

Name Complex(CyclinB,Cdc2)

Initial amount 0 mol

This species takes part in three reactions (as a reactant in r17 and as a product in r14 and as a modifier in r1).

$$\frac{d}{dt}s_{29} = v_8 - v_{10} \quad (41)$$

6.20 Species s30

Name Complex(CyclinB,Cdc2)

Initial amount 0 mol

This species takes part in two reactions (as a reactant in r15 and as a product in r18).

$$\frac{d}{dt}s_{30} = v_{11} - v_9 \quad (42)$$

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